ANÁLISE DE RISCO

Avaliação dos riscos do modelo de enchimento fracionado de recipientes de GLP conforme TCP Nº07/2018 da ANP

AGR Engenharia
Soluções em Riscos Industriais

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Sumário

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SUMÁRIO EXECUTIVO

Neste estudo foram estimados e avaliados os riscos decorrentes da adoção do modelo de enchimento fracionado de recipientes transportáveis de GLP em 4 diferentes cenários operacionais propostos. Foram ainda estimados e avaliados os riscos decorrentes do modelo de enchimento de recipientes transportáveis de GLP atualmente adotado no Brasil.

Os riscos foram estimados sob a forma de risco individual, representando a chance de 1 fatalidade no entorno da instalação, e risco social, representando o número de fatalidades pela chance de ocorrência dos eventos acidentais, sendo estes avaliados segundo critérios de avaliação de riscos tecnológicos amplamente adotados no Brasil.

Foi realizada a análise histórica dos eventos acidentais ocorridos em países que adotam o modelo de enchimento fracionado de recipientes transportáveis de GLP, tendo sido concluído que se trata de um modelo operacional reconhecidamente perigoso, adotado em decorrência da ausência de unidades engarrafadoras nestes países e que demanda padrões de segurança rígidos por se tratar de atividades de risco em meio à população.

O modelo de enchimento de recipientes transportáveis de GLP atualmente adotado no Brasil é submetido a normas e padrões técnicos de segurança que contribuem de forma direta na redução e controle dos riscos de acidentes durante as atividades. A adoção de outros modelos de enchimento de recipientes transportáveis de GLP demandarão o estabelecimento de padrões de segurança específicos, devendo ser observado a realização das atividades com gás inflamável em meio a comunidade.

Como resultado desta análise foi pontuado que somente o cenário operacional de enchimento fracionado de recipientes transportáveis de GLP em revendas fora de áreas urbanas dos municípios (cenário operacional nº5) apresenta viabilidade em relação aos riscos de acidentes tecnológicos. Isto porque estas revendas foram idealizadas com locação afastada das áreas de comunidade. No entanto, o crescimento populacional em direção destas revendas tornará o risco intolerável.

Desta forma o modelo de enchimento de recipientes transportáveis de GLP em bases engarrafadoras, atualmente adotado pelo Brasil, é a opção mais segura em termos de riscos de acidentes tecnológicos, sendo estas unidades submetidas a processos de licenciamento nos quais é avaliada a tolerabilidade destes riscos.

1. INTRODUÇÃO

Neste relatório de análise de riscos está apresentada a estimativa e avaliação dos riscos decorrentes do modelo de enchimento fracionado de recipientes transportáveis de GLP por parte de distribuidores e a comercialização de GLP em recipientes de outras marcas.

Este relatório foi composto em um único volume contendo 10 capítulos, 3 anexos e um sumário.

A Anotação de Responsabilidade Técnica (ART) está apresentada após o capítulo contendo a equipe técnica.

1.1 Objetivo deste Relatório

Este relatório tem por objetivo principal avaliar os riscos decorrentes da adoção do modelo de enchimento fracionado de recipientes transportáveis de GLP por parte de distribuidores e a comercialização de GLP em recipientes de outras marcas, conforme Tomada Pública de Contribuições TPC Nº 07/2018 realizada pela Agência Nacional de Petróleo, Gás Natural e Biocombustíveis (ANP).

Para isto foram idealizados e avaliados os riscos decorrentes de cenários operacionais possíveis do modelo de enchimento fracionado de recipientes transportáveis de GLP por parte de distribuidores e a comercialização de GLP em recipientes de outras marcas.

Os riscos decorrentes do cenário operacional enchimento de recipientes transportáveis de GLP atualmente adotado no Brasil também foram estimados para comparação com os cenários operacionais idealizados para esta proposta da Agência Nacional de Petróleo, Gás Natural e Biocombustíveis (ANP).

2. HISTÓRICO DE ACIDENTES DECORRENTES DA OPERAÇÃO NA MODALIDADE PRETENDIDA

A seguir estão relacionados os 2 principais acidentes ocorridos nos países Gana e Nigéria em decorrência da operação de enchimento fracionado de recipientes transportáveis de GLP por parte de distribuidores, bem como outros eventos acidentais que ocorreram nestes países em decorrência desta atividade.

2.1 Eventos Acidentais

2.1.1 Kwame Nkrumah Avenue, Acra, Gana. Junho/2015. 130 fatalidades

Este acidente ocorreu quando o caminhão-tanque estava descarregando gás na estação de enchimento. O motorista percebeu que o gás estava vazando e avisou para as pessoas se afastarem, mas mesmo assim continuou a operação de descarga. A descarga estava sendo realizada no período noturno, período este no qual não era permitida a atividade. A nuvem de gás inflamável formada pegou fogo ocasionando 130 fatalidades.

Além destes acidentes foram encontrados registros de outros eventos acidentais nestes países, tais como a explosão ocorrida na cidade de Kumasi em setembro de 2007, em uma estação de enchimento da Engels, resultando em 3 fatalidades, ferimento de diversas pessoas e destruição massiva de propriedades no entorno.

Nesta mesma cidade há registro também da explosão de um cilindro de gás no posto de abastecimento de gás da Nnatony Gas Company, durante a atividade de limpeza de um tanque de armazenamento de GLP, resultando na morte de 2 pessoas.

Em Gana, a troca de um cilindro vazio por um cheio foi a prática nas décadas de 1960 e 1970. As poucas famílias que usavam GLP para cozinhar compravam GLP levavam seus cilindros vazios para postos como a British Petroleum (BP), AGIP e Mobil e trocavam por cilindros já cheios. Não havia estações de enchimento de GLP como é a prática atual.

A situação mudou quando muitas famílias começaram a usar o GLP como combustível alternativo e mais barato para cozinhar. Este foi o resultado da campanha do governo no final dos anos 80 sobre o uso de fogões de GLP. Uma medida destinada a reduzir o esgotamento rápido da floresta devido ao corte de árvores para lenha e carvão.

A alta demanda de GLP por parte de residências e outros usuários comerciais resultou na instalação de estações de enchimento de GLP com a aprovação das instituições estaduais apropriadas para vender o produto aos consumidores. Atualmente existem muitas estações de enchimento de GLP nas cidades para que os consumidores não precisem viajar longas distâncias para comprar GLP.

Fica claro que não houve um plano a longo prazo sobre como os consumidores de GLP conseguiriam comprar o produto sem criar condições perigosas para eles e para o meio ambiente quando a campanha foi lançada para as famílias mudarem de carvão e lenha para fogões de GLP.

O debate sobre o transporte seguro de GLP, bem como as operações das estações de enchimento de GLP, continua porque atualmente em Gana não há um sistema onde os consumidores de GLP levam seus cilindros vazios para um ponto de venda / fornecedores para trocarem por cilindros já cheios, como praticado no Brasil atualmente.

A implantação desse sistema em Gana exigirá a instalação de Bases de engarrafamento de GLP, como as existentes no Brasil. Uma vez que este modelo de negócios entre em operação no país, com a venda de GLP em cilindros já cheios, haverá uma redução gradual do número de pessoas que vão para estas estações de enchimento de GLP para abastecer seus botijões.

Assim, em Gana, o Governo pretende, gradualmente que seja alterado o sistema de enchimento de cilindros pelo sistema de troca de cilindros vazios por cilindros já cheios, pois considera-se este último mais seguro para a população em geral.

2.1.2. Nnewi, Anambra, Nigéria. Dezembro/2015. Dezenas de fatalidades

No dia 24 de dezembro de 2015 uma explosão de um tanque de butano presente em uma estação de enchimento de botijões matou dezenas de pessoas que estavam na fila para reabastecer seus botijões, assim como pessoas que estavam passando pelo local no instante do acidente.

Uma outra explosão ocorreu mais recentemente em 10 de setembro de 2018 na cidade de Lafia, estado de Nassaraua, Nigéria. Esta explosão ocorreu por volta das 10h00’ da manhã no depósito da Monaco Gas, dentro do posto de abastecimento Natson, próximo ao hotel Sandaji. Como consequência da explosão houve 35 mortes e centenas de pessoas ficaram feridas. Grande parte das pessoas que morreram foram aquelas que correram em direção ao local da ocorrência. Segundo informações a causa imediata da ocorrência foi a colisão de uma motocicleta com triciclo que gerou uma faísca e provocou a explosão. O acidente aconteceu no momento que o caminhão-tanque descarregava gás na estação da cidade.

Nas cidades da Nigéria muitos comerciantes de gás operam pequenos depósitos com estações de enchimento de GLP e gás butano. Esta prática é comum em outras regiões da África Ocidental, na qual as pessoas dependem muito do gás engarrafado para cozinhar.

Assim, são comuns as ocorrências de acidentes causados pelas atividades relacionadas com o enchimento de botijões de GLP em instalações comerciais em meio a população.
Em decorrência do acidente ocorrido no dia 10 de setembro de 2018, e devido à frequente ocorrência de acidentes no setor, o secretário executivo da Associação Nigeriana de Comercializadores de Gás Liquefeito de Petróleo enfatizou a necessidade da aplicação de padrões de segurança mais rígidos no setor de Gás Liquefeito de Petróleo (GLP), afirmando que não é possível minimizar a segurança, testemunhando a ocorrência frequente de explosões.

2.2 Conclusão da Análise Histórica dos Eventos Acidentais

Frente ao exposto na análise histórica dos eventos acidentais ocorridos em países que adotaram o modelo de enchimento fracionado de recipientes transportáveis de GLP conclui-se que:

- este é um modelo de enchimento reconhecidamente perigoso pelas nações que o fazem uso;
- é adotado em decorrência da ausência de unidades engarrafadoras implantadas nestes países;
- é um modelo que demanda a aplicação de padrões de segurança rígidos devido às atividades ocorrerem em meio à população.

3. NORMAS E REGULAMENTAÇÕES APLICADAS ÀS ENGARRAFADORAS DE GLP

No Brasil, a indústria de engarrafamento de GLP é submetida à normas e padrões técnicos definidos por órgãos governamentais, os quais contribuem de forma direta na redução e controle dos riscos de acidentes durante as atividades, além dos padrões estabelecidos internamente pelas próprias empresas.

Os padrões definidos por órgãos governamentais são fiscalizados a partir da obtenção de licenças para a instalação e operação, e mantidos a partir do processo de manutenção e renovação das licenças aplicáveis à operação. Exemplos destes são:

- Auto de Vistoria do Corpo de Bombeiros (AVCB), com atendimento às instruções técnicas e padrões de segurança estabelecidos pelo Corpo de Bombeiros estadual, com o objetivo de prover os recursos humanos e materiais necessários para o combate inicial ao incêndio e assegurar o abandono/remoção segura das pessoas presentes na unidade;
- Licença Ambiental de Operação, com etapa de análise de riscos de acidentes ampliados para avaliação da tolerabilidade dos riscos impostos à população (comunidade) presente nas proximidades da unidade;
- Normas Regulamentadoras do Ministério do Trabalho e Emprego, com definição de áreas classificadas como inflamáveis para determinação do uso de equipamentos eletroeletrônicos apropriados e controle de fontes de ignição para operação nestas áreas, o estabelecimento de padrões de segurança para gestão dos riscos na operação com inflamáveis e combustíveis, além de outros requisitos como atividades em espaços confinados, atividades em altura e controle de exposição a agentes ambientes com potencial danos a vida e a saúde dos colaboradores da unidade;
- Normas técnicas voltadas a assegurar padrões de segurança para instalações envolvendo engarrafamento de GLP, dentre outros tipos de instalações industriais, tais como:
  - ✓ NBR 15.186 - Base de armazenamento, envasamento e distribuição de GLP - Projeto e construção;
  - ✓ NBR 15.514 - Área de armazenamento de recipientes transportáveis de gás liquefeito de petróleo (GLP), destinados ou não à comercialização - Critérios de segurança;

- ✓ NBR 5419 – Proteção contra descargas atmosféricas;
- ✓ Dentre outras.

Sendo assim, para que sejam mantidos os padrões de segurança atualmente exigidos às operações com engarrafamento de GLP é necessário que a atividade de enchimento de cilindros transportáveis de GLP por parte de distribuidores seja submetida à normas e padrões técnicos equivalentes ou até mesmo superiores, uma vez que:

- haverá exposição direta de pessoas (comunidade) não envolvidas com a atividade;
- as pessoas expostas não necessariamente terão conhecimento dos riscos relacionados;
- dependendo de onde for realizada a atividade não será possível o controle de fontes de ignição no ambiente entorno desta, expondo eventuais vazamentos à uma alta chance de ignição da nuvem inflamável, tal como os eventos acidentais identificados na análise histórica de acidentes neste tipo de atividade.

4. MÉTODO APLICADO À ANÁLISE DOS RISCOS

Para esta análise de riscos foi adotado o método quantitativo de estimativa e avaliação dos riscos.

Os riscos foram estimados e avaliados sob a forma de risco social e risco individual.

O risco social consiste no risco imposto à um determinado grupamento de pessoas, as quais estão expostas aos efeitos físicos decorrentes das situações de risco identificadas, levando-se em consideração a natureza dos danos que possam ser causados e o período em que os mesmos possam ocorrer, e representa o número de fatalidades por chance de ocorrência dos eventos.

O risco individual consiste no risco inerente à instalação, imposto a um indivíduo em função dos efeitos físicos decorrentes das situações de risco identificadas, levando-se em consideração a natureza dos danos que possam ser causados e o período em que os mesmos possam ocorrer, e representa a chance de 1 fatalidade no entorno da instalação.

O método de cálculo para estimativa dos riscos social e individual adotado foi aquele definido em normas e padrões definidos por órgãos ambientais brasileiros, e que estão alinhados com o método aplicado nos países em que os riscos social e individual são usados como ferramentas para avaliação dos riscos impostos à sociedade, estando estes disponíveis para acesso/consulta no site dos respectivos órgão ambientais, sendo:

- Norma CETESB P4.261 - Risco de Acidente de Origem Tecnológica - Método para decisão e termos de referência, 2011, São Paulo;
- Manual de Análise de Riscos Industriais da FEPAM, 2016, Rio Grande do Sul;
- Norma Técnica NT 01/2017 – Análise e Gerenciamento de Riscos Acidentais para Substâncias Perigosas, 2017, Bahia

Para possibilitar a estimativa dos riscos foram propostas hipóteses de acidentes em cada cenário operacional analisado, estando estas listadas diretamente em cada cenário acidental operacional analisado.

Foi estimada a amplitude das consequências para cada hipótese de acidente considerada, conforme as tipologias acidentais definidas nas árvores de eventos a seguir, segundo cada tipo de vazamento analisado.

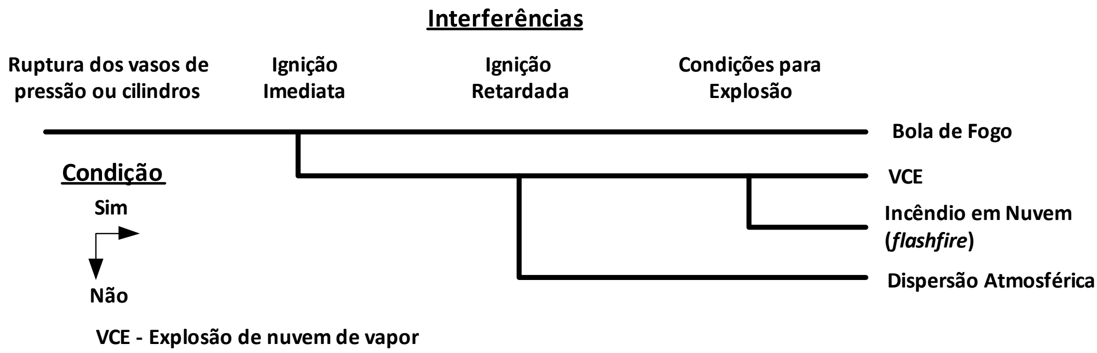

Figura 4.1 – Ruptura Catastrófica de Gás Liquefeito de Petróleo – GLP

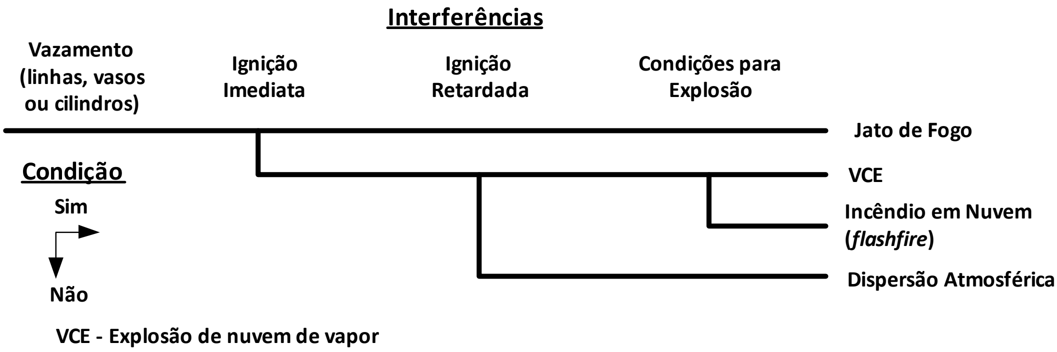

Figura 4.2 – Vazamento Contínuo de Gás Liquefeito de Petróleo – GLP

Cada tipologia acidental estudada foi associada a um tipo de efeito físico, sendo:

- radiação térmica, para ignição da substância vazada nas tipologias acidentais de jato de fogo, bola de fogo e ignição da nuvem inflamável (flashfire ou incêndio em nuvem);
- sobrepressão, para a explosão do vapor inflamável na atmosfera.

Os níveis de fatalidade associados aos efeitos físicos em estudo estão apresentados na tabela a seguir.

Tabela 4.1 – Níveis de Fatalidade

Tipologia Acidental	Nível Adotado	Descrição	Referência
Jato de fogo (*jetfire*)	35 kW/m²	100% de fatalidade	*Reference Manual Bevi Risk Assessments; Version* 3.2; 2009; RIVM (*National Institute of Public Health and the Environment*) – Tabela 18.
	Níveis de fatalidade para exposição por 20 segundos, definidos conforme aplicação de equação de fatalidades proposta por Tsao & Perry; 1979		Equação de Tsao & Perry, 1979
Bola de fogo (*fireball*)	35 kW/m²	100% de fatalidade	*Reference Manual Bevi Risk Assessments; Version* 3.2; 2009; RIVM (*National Institute of Public Health and the Environment*) – Tabela 18.
	Níveis de fatalidade para exposição no tempo de duração da bola de fogo, definidos conforme aplicação de equação de fatalidades proposta por Tsao & Perry; 1979		Equação de Tsao & Perry, 1979
Incêndio em nuvem (*flashfire*)	100% Limite Inferior de Inflamabilidade (LII)	100% fatalidade	Delimitação da área inflamável da nuvem
Explosão	0,3 bar	50% de fatalidade	*Reference Manual Bevi Risk Assessments; Version* 3.2; 2009; RIVM (*National Institute of Public Health and the Environment*) – Tabela 14.
	0,1 bar	1% de fatalidade	

A seguir está apresentada a equação de Tsao & Perry (1979) aplicada para determinação dos níveis de fatalidade para as tipologias acidentais de jato de fogo e bola de fogo:

$$\text{Probit} = -36{,}38 + 2{,}56 \times \ln (q^{4/3} \times T)$$

Onde: q – Intensidade térmica

T – Tempo de duração da bola de fogo (s)

Probit – Valor referente a probabilidade de fatalidade de interesse conforme tabela 5.2

Tabela 4.2 – Probabilidades de Fatalidade em Função do Número de Probit

% Fatalidade	0	1	2	3	4	5	6	7	8	9
0	-	2,67	2,95	3,12	3,25	3,36	3,45	3,52	3,59	3,66
10	3,72	3,77	3,82	3,87	3,92	3,96	4,01	4,05	4,08	4,12
20	4,16	4,19	4,23	4,26	4,29	4,33	4,36	4,39	4,42	4,45
30	4,48	4,50	4,53	4,56	4,59	4,61	4,64	4,67	4,69	4,72
40	4,75	4,77	4,80	4,82	4,85	4,87	4,90	4,92	4,95	4,97
50	5,00	5,03	4,05	5,08	5,10	5,13	5,15	5,18	5,20	5,23
60	5,25	5,28	5,31	5,33	5,36	5,39	5,41	5,44	5,47	5,50
70	5,52	5,55	5,58	5,61	5,64	5,67	5,71	5,74	5,77	5,81
80	5,84	5,88	5,92	5,95	5,99	6,04	6,08	6,13	6,18	6,23
90	6,28	6,34	6,41	6,48	6,55	6,64	6,75	6,88	7,05	7,33

Para possibilitar a determinação da amplitude das consequências foram utilizados os dados meteorológicos da região em que está localizada a base de engarrafamento modelada no Cenário Operacional nº1, região esta de Uberlândia – MG, sendo estes apresentados a seguir.

Os dados meteorológicos utilizados nesta análise foram determinados por um profissional em meteorologia, estando o laudo meteorológico apresentado no Anexo 1 deste relatório.

Tabela 4.3 – Dados Meteorológicos para o Estudo de Consequências

Parâmetro	Período Diurno	Período Noturno
Temperatura Ambiente (°C)	24,5°C	20,3°C
Temperatura do Solo (°C)	29,5°C	20,3°C
Umidade Relativa (%)	54,6%	68,8%
Velocidade dos Ventos (m/s)	4,3 m/s	3,5 m/s

Os dados de distribuição dos ventos por direção estão apresentados a seguir para conhecimento das direções predominantes por período.

Tabela 4.4 – Frequência de Ocorrência dos Ventos

Direção	Frequência (%)	
De → Para	Período Diurno	Período Noturno
N→S	18,7	5,9
NE→SO	36,1	22,0
E→O	20,7	42,4
SE→NO	3,2	10,1
S→N	4,7	12,0
SO→NE	4,0	3,2
O→E	4,4	1,6
NO→SE	8,2	2,8

Os dados meteorológicos fornecidos não possuem informações quanto a categorias de estabilidade atmosférica (Pasquill), sendo desta forma utilizada a Tabela 4.5 abaixo para a classificação destas, levando-se em consideração as velocidades do vento e as características de insolação e nebulosidade da região.

Tabela 4.5 – Categorias de Estabilidade em Função das Condições Atmosféricas

Velocidade do vento (V) a 10 m (m/s)	Período diurno			Período noturno	
	Insolação			Nebulosidade	
	Forte	Moderada	Fraca	Parcialmente encoberto	Encoberto
< 2	A	A - B	B	E	F
2 - 3	A - B	B	C	E	F
3 – 5	B	B - C	C	D	E
5 - 6	C	C - D	D	D	D
> 6	C	D	D	D	D

A – extremamente instável; B – moderadamente instável; C – levemente instável; D – neutra; E – levemente estável; F – moderadamente estável.

Referência: NOAA – National Oceanic and Atmospheric Administration

Com base na Tabela 4.5 foram adotadas as categorias B-C para o período diurno e E para o período noturno, sendo estas compatíveis com as características da região em estudo.

Com base nestas definições, e a partir dos dados de entrada representativos para cada hipótese de acidente em análise, foram determinadas as amplitudes das consequências com o uso do software Phast Risk versão 8.22, comercializado pela empresa DNVGL e amplamente empregado em análises de riscos de acidentes ampliados.

Os dados de entrada empregados nas modelagens das consequências estão apresentados no Anexo 2 deste relatório. Já os relatórios contendo os resultados de amplitude das consequências estão apresentados no Anexo 3 deste relatório.

À estas hipóteses de acidentes foram associadas frequências de ocorrência oriundas do manual de análise de riscos empregado na Holanda para planejamento do uso e ocupação do solo, documento este denominado "Reference Manual Bevi Risk Assessments", publicado pelo RIVM (National Institute for Public Health and the Environment), e amplamente utilizado para análises quantitativas de riscos voltados ao licenciamento ambiental no Brasil.

As frequências de ocorrência foram associadas às consequências no próprio software Phast Risk versão 8.22.

A partir da amplitude das consequências e das frequências de ocorrência associadas a cada hipótese acidental foram estimados os riscos individual e social para cada cenário operacional. Para isto foi considerada a distribuição populacional apresentada pelo Censo

2010 para o município usado nesta análise (Uberlândia/MG). Para a área industrial do município, na qual foi estudado o cenário operacional nº1, foram levantadas junto as industrias presentes na região o número de colaboradores presentes em cada instalação, em cada período do dia.

Os riscos individual e social obtidos foram avaliados segundo os critérios de avaliação definidos e apresentados no Capítulo 6 (Critérios Usados para Avaliação dos Riscos) deste relatório. Os resultados estão apresentados diretamente no Capítulo 7 (Análise dos Riscos Cenários Acidentais) deste relatório.

5. CENÁRIOS OPERACIONAIS AVALIADOS

Em função de não ter sido estabelecido pela ANP o tipo de atividade ou instalação que será autorizada para o modelo proposto na Tomada Pública de Contribuições TPC Nº 07/2018 para enchimento de cilindros transportáveis de GLP por parte de distribuidores, para esta análise de riscos foram idealizados e avaliados 4 diferentes cenários operacionais, acrescidos do cenário operacional atualmente praticado no Brasil, com enchimento de botijões de GLP nas unidades engarrafadoras.

Para cada cenário operacional foram identificadas as principais hipóteses de acidentes potenciais, alinhadas com as hipóteses de acidentes praticadas em estudos de análise quantitativa de riscos tecnológicos. Estas hipóteses estão listadas para cada cenário operacional juntamente com a descrição da instalação e/ou tipo de atividade considerada em cada cenário.

A seguir estão apresentados os cenários operacionais idealizados e analisados juntamente com a descrição das instalações e/ou tipo de atividades consideradas e a indicação das hipóteses de acidentes consideradas na análise dos riscos.

- **Cenário Operacional nº1** – Cenário atual com engarrafamento de botijões P2, P5 e P13 somente nas bases de armazenamento e engarrafamento de GLP.

  Este cenário operacional foi idealizado sobre 1 base de armazenamento e engarrafamento de GLP atualmente em operação em um município do Brasil. Esta base opera com armazenamento de GLP em 4 vasos de pressão com 60 toneladas cada vaso. Esta unidade recebe GLP por carreta-tanque, realiza abastecimento de veículos do tipo autotanque e enchimento de botijões do tipo P2, P5 e P13 e cilindros do tipo P20 e P45, com enchimento diário de cerca de 10.000 unidades de botijões P13 e cerca de 620 unidades de cilindros P.20 e P.45 (somatórias de ambos cilindros). O enchimento diário de botijões do tipo P2 e P5 é muito baixo, tendo sido considerado nesta análise até 10 unidades de cada tipo destes botijões. Por ser uma área classificada (toda a área operacional de uma unidade engarrafadora), as fontes de ignição foram dispostas somente em área externa à área operacional e de armazenamento de GLP na Unidade, sendo estas dispersas uniformemente.

  A seguir estão listadas as hipóteses de acidentes consideradas para este cenário operacional. Para este cenário operacional além das hipóteses de acidentes relacionadas às atividades e instalações voltadas ao engarrafamento de recipientes transportáveis de GLP foram consideradas também as hipóteses de acidentes relacionadas com as demais instalações e atividades da Unidade.

- ✓ Ruptura catastrófica dos vasos de pressão (vasos de armazenamento);
- ✓ Furo no costado dos vasos de pressão (vasos de armazenamento);
- ✓ Vazamento de todo o inventário dos vasos de pressão (vasos de armazenamento) em 600 segundos;
- ✓ Ruptura catastrófica das linhas de GLP que alimentam as plataformas de enchimento de recipientes transportáveis;
- ✓ Furo/fissura nas linhas de GLP que alimentam as plataformas de enchimento de recipientes transportáveis;
- ✓ Ruptura catastrófica das linhas de GLP que retornam das plataformas de degasagem de recipientes transportáveis;
- ✓ Furo/fissura nas linhas de GLP que retornam das plataformas de degasagem de recipientes transportáveis;
- ✓ Ruptura catastrófica dos recipientes transportáveis de GLP;
- ✓ Furo no costado dos recipientes transportáveis de GLP;
- ✓ Vazamento de todo o inventário dos recipientes transportáveis de GLP em 600 segundos;
- ✓ Ruptura catastrófica das linhas de GLP que alimentam as plataformas de carregamento de veículos autotanque;
- ✓ Furo/fissura nas linhas de GLP que alimentam as plataformas de carregamento de veículos autotanque;
- ✓ Ruptura catastrófica das linhas de retorno de GLP gás das plataformas de carregamento de veículos autotanque;
- ✓ Furo/fissura nas linhas de retorno de GLP gás das plataformas de carregamento de veículos autotanque;
- ✓ Ruptura catastrófica de veículos autotanque;
- ✓ Vazamento por meio da maior conexão de veículos autotanque;
- ✓ Ruptura catastrófica das linhas para recebimento de GLP por carretas tanque;
- ✓ Furo/fissura nas linhas para recebimento de GLP por carretas tanque;
- ✓ Ruptura catastrófica das linhas de retorno de GLP gás para as carretas tanque;
- ✓ Furo/fissura nas linhas de retorno de GLP gás para as carretas tanque;
- ✓ Ruptura catastrófica de carretas tanque;
- ✓ Vazamento por meio da maior conexão de carretas tanque.

- **Cenário Operacional nº2** – Cenário com engarrafamento de botijões P2, P5 e P13 em postos de combustível localizados no interior de áreas urbanas dos municípios;

  Este cenário operacional foi idealizado sobre 1 posto de combustível instalado em área urbana do mesmo município da base de armazenamento e engarrafamento de GLP considerada no cenário 1 (município de Uberlândia). Foi adotada como premissa a instalação de uma central de GLP composta por um vaso de pressão do tipo P4.000, com capacidade para armazenamento de 3,4 toneladas de GLP, na área interna do posto de combustível.

  O enchimento de botijões P2, P5 e P13 poderá ocorrer em qualquer horário do dia. O modelo de abastecimento de botijões idealizado/considerado foi o mesmo usado em instalações industriais para enchimento de cilindros P20 (pit stop), com 1 estação de enchimento.

  Foi idealizado um enchimento médio de 192 botijões/dia a partir das seguintes considerações:

  - 3 horas de horário de alta demanda (horário de pico) de enchimento em período diurno, dentre 07h01' e 19h00' e 3 horas de horário de alta demanda de enchimento em período noturno, entre 19h01' e 07h00':
    - 1 botijão a cada 5 minutos, totalizando 20 botijões/hora, nos horários de alta demanda.
  - 9 horas de enchimento fora do horário de alta demanda, em cada período:
    - 1 botijão a cada 15 minutos, totalizando 4 botijões/hora, nos horários de baixa demanda.

  Sabendo que esta demanda pode ser superior em finais de semana, o número médio de enchimentos/dia considerado foi de 200 botijões/dia.

  Como inventário médio considerado por botijão, sabendo que a maior demanda de enchimentos de botijões estará concentrada em botijões do tipo P13, foi de 6,5 kg, relativo a 50% do inventário de um botijão P13.

  Com base nesta premissa foi estimada a demanda média de inventário de 1,3 ton/dia, sendo necessário o abastecimento do vaso de pressão P4.000, em média, a cada 2,5 dias, totalizando 12 operações de abastecimento do vaso de pressão P4.000 por mês. As fontes de ignição foram dispersas uniformemente em toda a região, com exceção à área de armazenamento do GLP em vaso de pressão.

A seguir estão listadas as hipóteses de acidentes consideradas para este cenário operacional. Para este cenário operacional não foram consideradas as instalações já presentes nos postos de combustível, uma vez que foi avaliado somente o risco adicional decorrente da introdução destas atividades nestas instalações.

- ✓ Ruptura catastrófica do vaso de pressão (vaso de armazenamento P4.000);
- ✓ Furo no costado do vaso de pressão (vaso de armazenamento P4.000);
- ✓ Vazamento de todo o inventário do vaso de pressão (vaso de armazenamento P4.000) em 600 segundos;
- ✓ Ruptura catastrófica da linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;
- ✓ Furo/fissura na linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;
- ✓ Ruptura catastrófica do recipiente transportável de GLP presente no local;
- ✓ Furo no costado do recipiente transportável de GLP presente no local;
- ✓ Vazamento de todo o inventário do recipiente transportável de GLP presente no local em 600 segundos;
- ✓ Ruptura catastrófica do mangote de GLP usado para abastecimento do vaso de pressão P4.000 a partir do veículo autotanque;
- ✓ Furo/fissura no mangote de GLP usado para abastecimento do vaso de pressão P4.000 a partir do veículo autotanque;
- ✓ Ruptura catastrófica do veículo autotanque usado no abastecimento do vaso de pressão P4.000;
- ✓ Vazamento por meio da maior conexão do veículo autotanque usado no abastecimento do vaso de pressão P4.000.

- **Cenário Operacional nº3** – Cenário com engarrafamento de botijões P2, P5 e P13 em revendas de botijões de GLP localizadas no interior de áreas urbanas dos municípios;

  Este cenário operacional foi idealizado sobre 1 revenda de cilindros de GLP instalada em área urbana do mesmo município da base de armazenamento e engarrafamento de GLP considerada no cenário 1 (município de Uberlândia). Foram adotadas 2 situações distintas como premissa para análise deste cenário, sendo:

- Cenário 3A: Instalação de uma central de GLP composta por um vaso de pressão do tipo P4.000, com capacidade para armazenamento de 3,4 toneladas de GLP, na área interna da revenda. O enchimento de botijões P2, P5 e P13 ocorrerá predominantemente no período diurno, durante o horário de funcionamento da revenda. O modelo de abastecimento de botijões idealizado/considerado foi o mesmo usado em instalações industriais para enchimento de cilindros P20 (pit stop), com 1 estação de enchimento;
- Cenário 3B: Instalação de uma central de GLP composta por 2 cilindros do tipo P190, com capacidade para armazenamento total de 380 kg de GLP considerando os 2 cilindros interligados, na área interna da revenda. O enchimento de botijões P2, P5 e P13 ocorrerá predominantemente no período diurno, durante o horário de funcionamento da revenda. O modelo de abastecimento de botijões idealizado/considerado foi o mesmo usado em instalações industriais para enchimento de cilindros P20 (pit stop), com 1 estação de enchimento.

Nas duas situações analisadas foi idealizado um enchimento médio relativo a 50% da quantidade de botijões idealizada para o posto de combustível somente no período de funcionamento da revenda, considerado neste estudo como sendo o período diurno (compreendido entre 07h01’ e 19h00’), resultando em um total de 50 botijões/dia, uma vez que a revenda também armazena cilindros cheios os quais continuarão a ser comercializados.

Como inventário médio considerado por botijão, sabendo que a maior demanda de enchimentos de botijões estará concentrada em botijões do tipo P13, foi de 6,5 kg, relativo a 50% do inventário de um botijão P13.

Com base nesta premissa foi estimada a demanda média de inventário de 325 kg/dia, sendo necessário:

- Cenário 3A: abastecimento do vaso de pressão P4.000, em média, a cada 10 dias, totalizando 3 operações de abastecimento do vaso de pressão P4.000 por mês;
- Cenário 3B: abastecimento dos cilindros P.190 diariamente.

A seguir estão listadas as hipóteses de acidentes consideradas para este cenário operacional, em cada uma das variações analisadas. Para este cenário operacional não foram consideradas as instalações já presentes na revenda (cilindros de GLP cheios), uma vez que foi avaliado somente o risco adicional decorrente da introdução destas atividades nestas instalações. As fontes de ignição foram dispersas uniformemente em toda a região externa à área da revenda.

- ✓ Ruptura catastrófica do vaso de pressão (cenário 3A: vaso de armazenamento P4.000; cenário 3B: 2 cilindros do tipo P.190);
- ✓ Furo no costado do vaso de pressão (cenário 3A: vaso de armazenamento P4.000; cenário 3B: 2 cilindros do tipo P.190);
- ✓ Vazamento de todo o inventário do vaso de pressão (cenário 3A: vaso de armazenamento P4.000; cenário 3B: 2 cilindros do tipo P.190) em 600 segundos;
- ✓ Ruptura catastrófica da linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;
- ✓ Furo/fissura na linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;
- ✓ Ruptura catastrófica do recipiente transportável de GLP presente no local;
- ✓ Furo no costado do recipiente transportável de GLP presente no local;
- ✓ Vazamento de todo o inventário do recipiente transportável de GLP presente no local em 600 segundos;
- ✓ Ruptura catastrófica do mangote de GLP usado para abastecimento do sistema de armazenamento (cenário 3A: vaso de armazenamento P4.000; cenário 3B: 2 cilindros do tipo P.190) a partir do veículo autotanque;
- ✓ Furo/fissura no mangote de GLP usado para abastecimento do sistema de armazenamento (cenário 3A: vaso de armazenamento P4.000; cenário 3B: 2 cilindros do tipo P.190) a partir do veículo autotanque;
- ✓ Ruptura catastrófica do veículo autotanque usado no abastecimento do sistema de armazenamento (cenário 3A: vaso de armazenamento P4.000; cenário 3B: 2 cilindros do tipo P.190);
- ✓ Vazamento por meio da maior conexão do veículo autotanque usado no abastecimento do sistema de armazenamento (cenário 3A: vaso de armazenamento P4.000; cenário 3B: 2 cilindros do tipo P.190).

- **Cenário Operacional nº4** – Cenário com engarrafamento de botijões P2, P5 e P13 nas vias públicas, em áreas urbanas dos municípios;

Esta análise foi realizada sobre 1 veículo do tipo autotanque de GLP estacionado em via pública (em vaga de estacionamento comum em via pública) em meio a área urbana do mesmo município da base de armazenamento e engarrafamento de GLP considerada no cenário 1 (município de Uberlândia).

Foi adotado como premissa o uso de veículos do tipo autotanque com capacidade para 3 toneladas de GLP cada veículo. Nesta análise estes veículos foram espaçados em 300 m, considerando o atendimento local a 90.000 m^2, o que equivale a 9 quadras com extensão de 100 m x 100 m.

Foi considerado ainda que estes veículos permanecerão parados em via pública durante o período diurno, por um período total de 7 h, sendo 6 horas de operação de enchimento e 1 h de almoço dos colaboradores que realizarão as operações de enchimento. As demais horas da jornada de trabalho foram consideradas como deslocamento do veículo interno no município (desde a Unidade até o ponto de parada em via pública e o retorno deste à Unidade ao final da jornada).

Neste cenário foi idealizado um enchimento médio de 72 botijões/dia por autotanque, a partir das seguintes considerações:

- 3 horas de horário de alta demanda (horário de pico) de enchimento no período em que o autotanque está parado em via pública (em operação), dentre 07h01' e 19h00':
  - o 1 botijão a cada 5 minutos, totalizando 20 botijões/hora, nos horários de alta demanda.
- 3 horas de enchimento fora do horário de alta demanda:
  - o 1 botijão a cada 15 minutos, totalizando 4 botijões/hora, nos horários de baixa demanda.

O modelo de abastecimento de botijões idealizado/considerado foi o mesmo usado em instalações industriais para enchimento de cilindros P20 (pit stop), com 1 estação de enchimento. As fontes de ignição foram dispersas uniformemente em toda a região.

A seguir estão listadas as hipóteses de acidentes consideradas para este cenário operacional.

- ✓ Ruptura catastrófica da linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;
- ✓ Furo/fissura na linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;

- ✓ Ruptura catastrófica do recipiente transportável de GLP presente no local;
- ✓ Furo no costado do recipiente transportável de GLP presente no local;
- ✓ Vazamento de todo o inventário do recipiente transportável de GLP presente no local em 600 segundos;
- ✓ Ruptura catastrófica do veículo autotanque usado na atividade;
- ✓ Vazamento por meio da maior conexão do veículo autotanque usado na atividade.

- **Cenário Operacional nº5** – Cenário com engarrafamento de botijões P2, P5 e P13 em revendas de botijões de GLP localizados fora de áreas urbanas dos municípios.

  Esta análise foi realizada sobre 1 revenda de cilindros de GLP instalada fora de área urbana do mesmo município da base de armazenamento e engarrafamento de GLP considerada no cenário 1 (município de Uberlândia). Para este caso foi estudada a situação análoga ao cenário 3A, com um vaso de pressão de maior inventário, conforme descrito a seguir.

  - Instalação de uma central de GLP composta por um vaso de pressão do tipo P4.000, com capacidade para armazenamento de 3,4 toneladas de GLP, na área interna da revenda. O enchimento de botijões P2, P5 e P13 ocorrerá predominantemente no período diurno, durante o horário de funcionamento da revenda. O modelo de abastecimento de botijões idealizado/considerado foi o mesmo usado em instalações industriais para enchimento de cilindros P20 (pit stop), com 1 estação de enchimento.

  Da mesma forma que no Cenário 3, para esta situação analisada foi idealizado um enchimento médio relativo a 50% da quantidade de botijões idealizada para o posto de combustível somente no período de funcionamento da revenda, considerado neste estudo como sendo o período diurno (compreendido entre 07h01’ e 19h00’), resultando em um total de 50 botijões/dia, uma vez que a revenda também armazena cilindros cheios os quais continuarão a ser comercializados.

  Como inventário médio considerado por botijão, sabendo que a maior demanda de enchimentos de botijões estará concentrada em botijões do tipo P13, foi de 6,5 kg, relativo a 50% do inventário de um botijão P13.

Com base nesta premissa foi estimada a demanda média de inventário de 325 kg/dia, sendo necessário o abastecimento do vaso de pressão P4.000, em média, a cada 10 dias, totalizando 3 operações de abastecimento do vaso de pressão P4.000 por mês.

A seguir estão listadas as hipóteses de acidentes consideradas para este cenário operacional. Para este cenário operacional não foram consideradas as instalações já presentes na revenda, uma vez que foi avaliado somente o risco adicional decorrente da introdução destas atividades nestas instalações. As fontes de ignição foram dispersas uniformemente em toda a região externa à área da revenda.

- ✓ Ruptura catastrófica do vaso de pressão (vaso de armazenamento P4.000);
- ✓ Furo no costado do vaso de pressão (vaso de armazenamento P4.000);
- ✓ Vazamento de todo o inventário do vaso de pressão (vaso de armazenamento P4.000) em 600 segundos;
- ✓ Ruptura catastrófica da linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;
- ✓ Furo/fissura na linha/sistema (pit stop) usado no enchimento de recipientes transportáveis de GLP;
- ✓ Ruptura catastrófica do recipiente transportável de GLP presente no local;
- ✓ Furo no costado do recipiente transportável de GLP presente no local;
- ✓ Vazamento de todo o inventário do recipiente transportável de GLP presente no local em 600 segundos;
- ✓ Ruptura catastrófica do mangote de GLP usado para abastecimento do vaso de pressão P4.000 a partir do veículo autotanque;
- ✓ Furo/fissura no mangote de GLP usado para abastecimento do vaso de pressão P4.000 a partir do veículo autotanque;
- ✓ Ruptura catastrófica do veículo autotanque usado no abastecimento do vaso de pressão P4.000;
- ✓ Vazamento por meio da maior conexão do veículo autotanque usado no abastecimento do vaso de pressão P4.000.

Os riscos de acidentes ampliados em decorrência de vazamentos de GLP foram analisados em cada um destes cenários operacional, a partir da metodologia descrita neste relatório, estando estes apresentados no Capítulo 7.

6. CRITÉRIOS USADOS PARA A AVALIAÇÃO DOS RISCOS

Os riscos de acidentes ampliados, estimados sobre a forma de risco individual (risco locacional) e risco social, foram avaliados segundo os critérios de avaliação de riscos de acidentes tecnológicos definidos por órgãos ambientais brasileiros e amplamente empregados em análises de riscos.

Exemplos de padrões e normas publicados pelos órgãos ambientais brasileiros com a definição destes critérios são:

- Norma CETESB P4.261 - Risco de Acidente de Origem Tecnológica - Método para decisão e termos de referência, 2011, São Paulo;
- Manual de Análise de Riscos Industriais da FEPAM, 2016, Rio Grande do Sul;
- Norma Técnica NT 01/2017 – Análise e Gerenciamento de Riscos Acidentais para Substâncias Perigosas, 2017, Bahia.

Esclarece-se que estes critérios estão alinhados com critérios adotados em outros países que adotam a mesma técnica de avaliação de riscos de acidentes ampliados como ferramenta de gestão de riscos industriais em áreas com presença de população.

Para a presente análise de riscos foi adotado o seguinte critério de avaliação dos riscos:

- Risco Social: curva de frequência de ocorrência por número de fatalidades (curva F-N) com delimitação de 3 regiões.

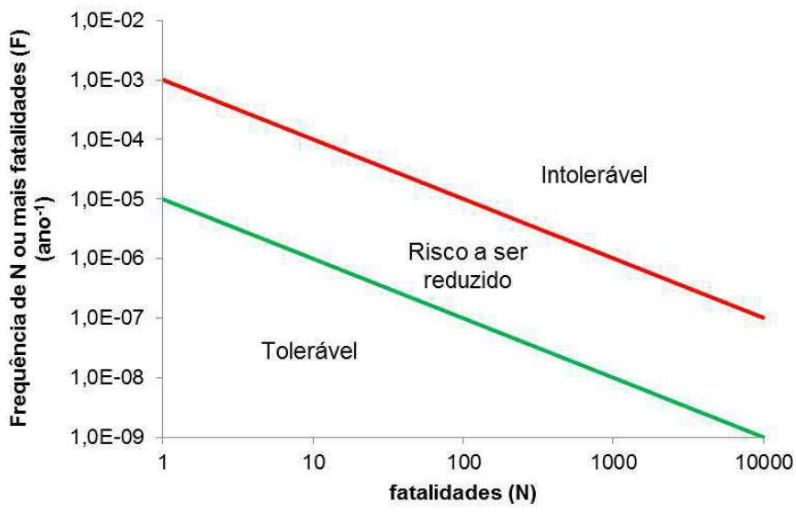

Figura 6.1 - Critério de Avaliação do Risco Social

- Risco Individual: curvas de isorrisco com a chance de ocorrência de 1 fatalidade no entorno da instalação analisada.

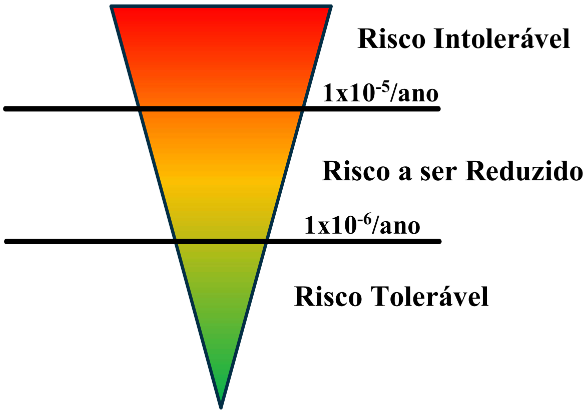

Figura 6.2 - Critério de Avaliação do Risco Individual

7. ANÁLISE DOS RISCOS DECORRENTES DE CADA CENÁRIO PROPOSTO PARA ANÁLISE

A seguir está apresentada a estimativa e avaliação dos riscos realizada para cada um dos cenários operacionais propostos neste estudo.

7.1. Cenário 1 – Cenário atual com engarrafamento de botijões P2, P5 e P13 somente nas bases de armazenamento e engarrafamento de GLP

A seguir estão apresentados os resultados para o risco locacional (risco individual) e risco de fatalidade imposto a sociedade (risco social) para a operação de uma base de armazenamento e engarrafamento GLP locada de acordo com o zoneamento municipal (zona industrial).

Figura 7.1 - Risco locacional (risco individual) resultante do cenário 1

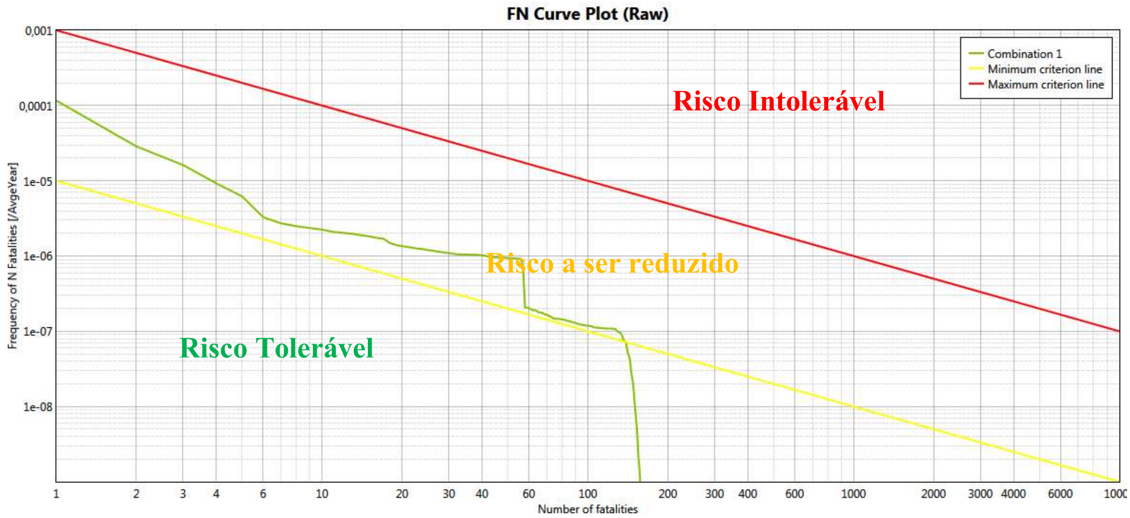

Figura 7.2 - Risco social resultante do cenário 1

Os riscos decorrentes deste cenário operacional são considerados toleráveis quando confrontados com critérios de avaliação de riscos individual e social empregados em estudos de análise de riscos tecnológicos. Embora o risco individual tenha resultado em curva com nível de risco 1,00 x 10^{-5} ano^{-1} fora dos limites da Unidade, esta ficou restrita à área industrial. Já o risco social se manteve em grande parte em região inferior de risco a ser reduzido, sem que fosse atingida a região intolerável.

É importante destacar que neste cenário operacional há controle de fontes de ignição nas áreas operacionais internas à Unidade, atendimento à normas e padrões de segurança aplicados à indústria engarrafadora de GLP e avaliação de todos os recipientes transportáveis quanto ao padrão de segurança, necessidade de requalificação e/ou descarte dos recipientes, além da redução da exposição da população aos riscos por meio de afastamento, por não haver acesso livre ao interior destas unidades.

7.2. Cenário 2 – Cenário com engarrafamento de botijões P2, P5 e P13 em postos de combustível localizados no interior de áreas urbanas dos municípios

A seguir estão apresentados os resultados para o risco locacional (risco individual) e risco de fatalidade imposto a sociedade (risco social) para a operação de uma central de GLP com operação de enchimento de botijões de GLP em um posto de combustível presente em área urbana do município.

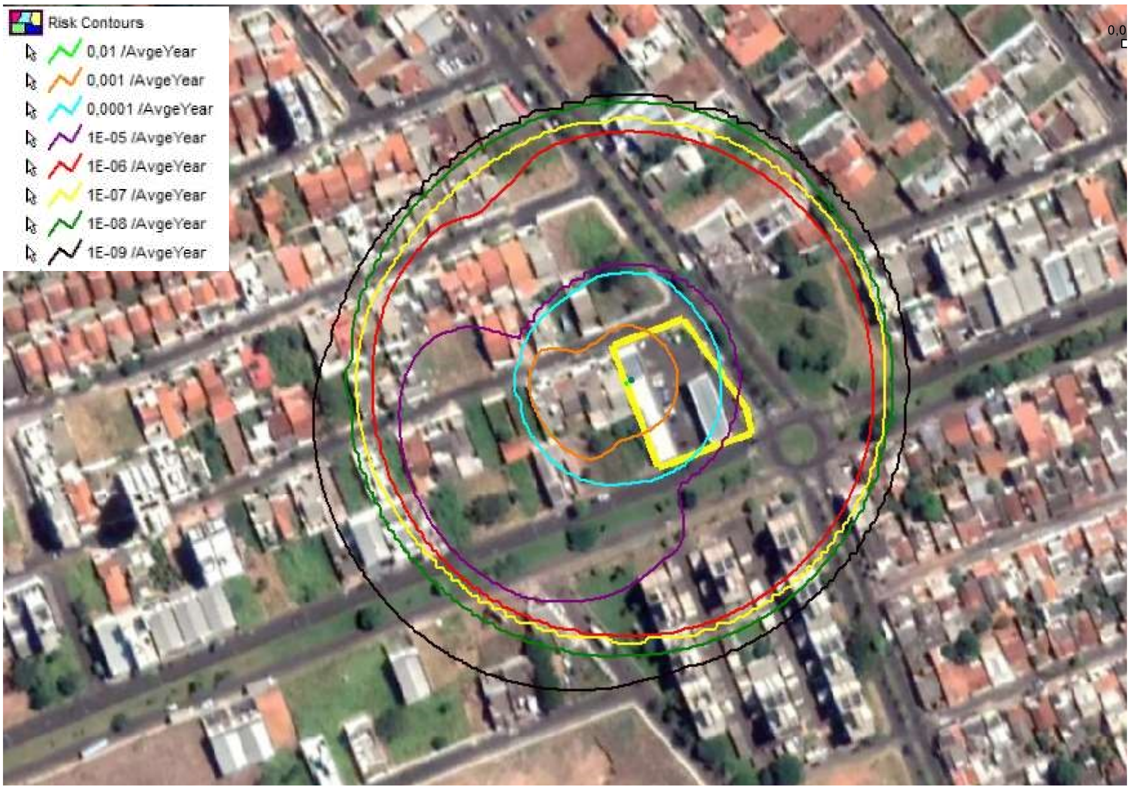

Figura 7.3 - Risco locacional (risco individual) resultante do cenário 2

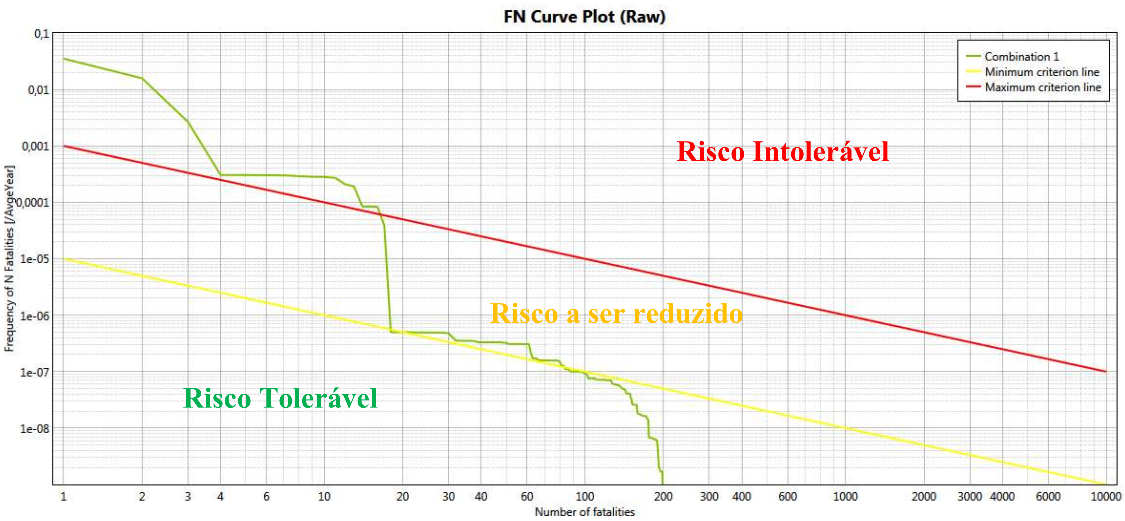

Figura 7.4 - Risco social resultante do cenário 2

Os riscos decorrentes deste cenário operacional são considerados intoleráveis quando confrontados com critérios de avaliação de riscos individual e social empregados em estudos de análise de riscos tecnológicos, uma vez que o risco individual resultou em curvas com nível de risco de 1,00 x 10^{-3} ano^{-1} a 1,00 x 10^{-5} ano^{-1} fora dos limites da área do posto de combustível e o risco social se situou em grande parte na região de risco intolerável.

É importante destacar que neste cenário operacional o controle de fontes de ignição depende da conscientização da população que frequentará este tipo de estabelecimento, seja para enchimento dos recipientes transportáveis de GLP, para abastecimento veicular com combustíveis comercializados (álcool, gasolina, óleo diesel e gás natural) e/ou para frequentar comércios locais (lojas de conveniência) cada vez mais presentes nestes estabelecimentos.

Neste tipo de estabelecimento há normas e padrões de segurança aplicados atualmente para postos de combustíveis, os quais terão que ser revisados para inclusão dos sistemas para enchimento dos recipientes transportáveis de GLP.

Neste tipo de atividade a avaliação dos recipientes transportáveis quanto ao padrão de segurança, necessidade de requalificação e/ou descarte dos recipientes ficará a cargo do funcionário do estabelecimento e/ou do proprietário do recipiente transportável, com oneração de alguma das partes quando da necessidade de substituição destes.

Além disto, não há controle de exposição da população aos riscos por meio de afastamento, uma vez que estes estabelecimentos são de livre acesso à toda população.

7.3. Cenário 3 – Cenário com engarrafamento de botijões P2, P5 e P13 em revendas de botijões de GLP localizadas no interior de áreas urbanas dos municípios

A seguir estão apresentados os resultados para o risco locacional (risco individual) e risco de fatalidade imposto a sociedade (risco social) para a operação de uma central de GLP com enchimento de botijões em uma revenda de cilindros presente em área urbana. Os riscos estão apresentados para as 2 variações deste cenário, com armazenamento de GLP em vaso de pressão estacionário do tipo P4000 (cenário 3A) e com armazenamento de GLP em 2 cilindros com capacidade para 190 kg (cenário 3B).

Figura 7.5 - Risco locacional (risco individual) resultante do cenário 3A

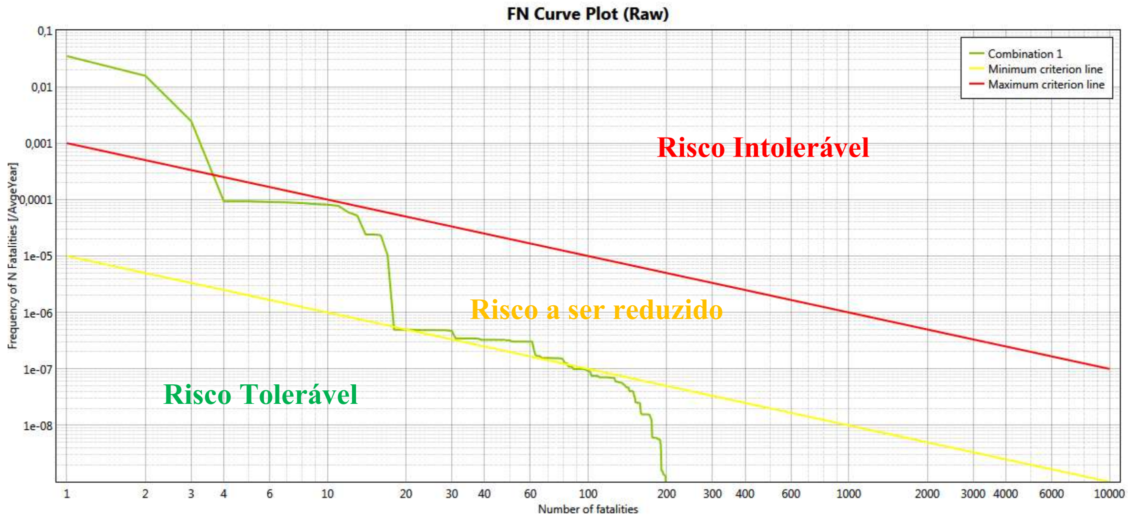

Figura 7.6 - Risco social resultante do cenário 3A

Os riscos decorrentes deste cenário operacional são considerados intoleráveis quando confrontados com critérios de avaliação de riscos individual e social empregados em estudos de análise de riscos tecnológicos, uma vez que o risco individual resultou em curvas com nível de risco de 1,00 x 10^{-3} ano^{-1} a 1,00 x 10^{-5} ano^{-1} fora dos limites da área da revenda de cilindros de GLP e o risco social se situou em grande parte na região de risco intolerável.

Figura 7.7 - Risco locacional (risco individual) resultante do cenário 3B

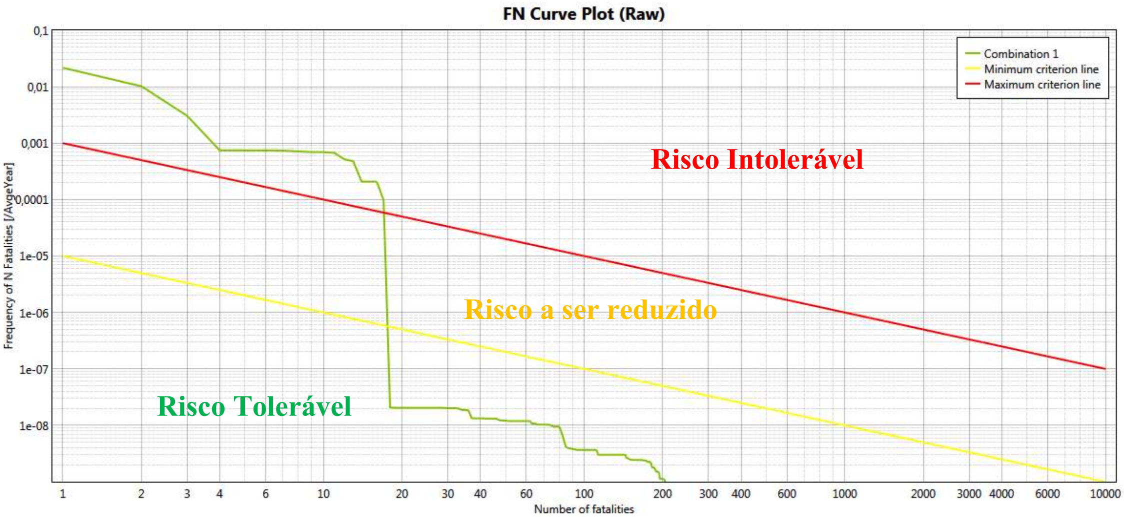

Figura 7.8 - Risco social resultante do cenário 3B

Os riscos decorrentes deste cenário operacional são considerados intoleráveis quando confrontados com critérios de avaliação de riscos individual e social empregados em estudos de análise de riscos tecnológicos, uma vez que o risco individual resultou em curvas com nível de risco de 1,00 x 10^{-3} ano^{-1} a 1,00 x 10^{-5} ano^{-1} fora dos limites da área da revenda de cilindros de GLP e o risco social se situou em grande parte na região de risco intolerável.

É importante destacar que neste cenário operacional o controle de fontes de ignição é possível de ser realizado no interior da área da revenda, com adequação das instalações e conscientização dos colaboradores envolvidos na atividade. No entanto, não é possível de se realizar em área externa, por se tratar de área pública e/ou privada (vizinhos), estando estes normalmente próximos destas instalações.

Neste tipo de estabelecimento há normas e padrões de segurança aplicados atualmente para revendas de cilindros de GLP, os quais terão que ser revisados para inclusão dos sistemas para enchimento dos recipientes transportáveis de GLP.

Neste tipo de atividade a avaliação dos recipientes transportáveis quanto ao padrão de segurança, necessidade de requalificação e/ou descarte dos recipientes ficará a cargo do funcionário do estabelecimento e/ou do proprietário do recipiente transportável, com oneração de alguma das partes quando da necessidade de substituição destes.

Além disto, o controle de exposição da população aos riscos por meio de afastamento é menor, uma vez que estes estabelecimentos estão locados em meio à área urbana dos municípios, com proximidade à vizinhança e vias públicas.

7.4. Cenário 4 – Cenário com engarrafamento de botijões P2, P5 e P13 nas vias públicas, em áreas urbanas dos municípios

A seguir estão apresentados os resultados para o risco locacional (risco individual) e risco de fatalidade imposto a sociedade (risco social) para a operação de revenda de GLP com enchimento de botijões nas vias públicas em área urbana do município.

Figura 7.9 - Risco locacional (risco individual) resultante do cenário 4

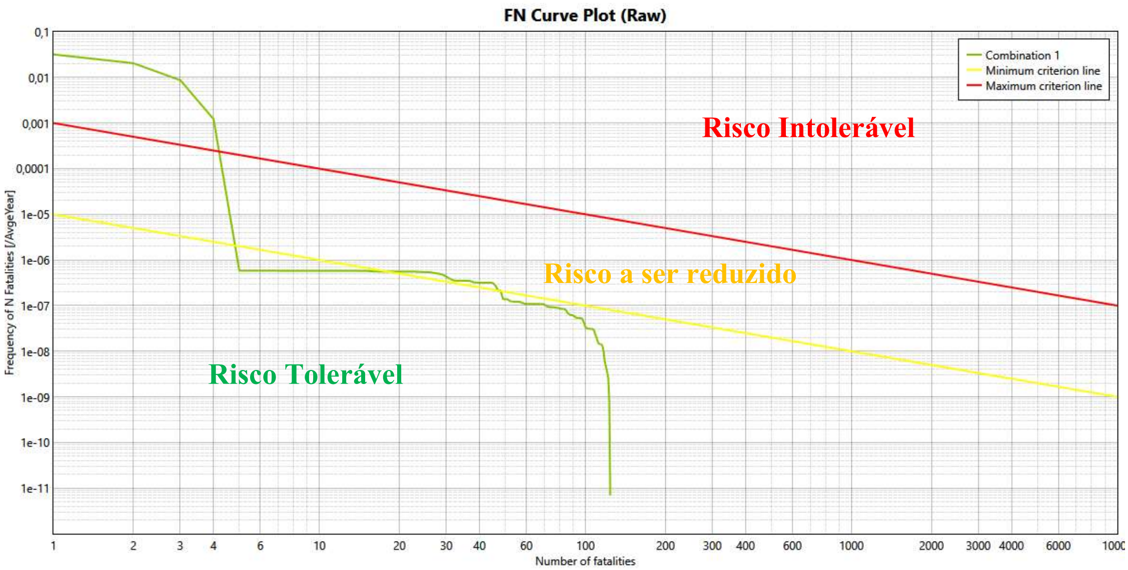

Figura 7.10 - Risco social resultante do cenário 4

Os riscos decorrentes deste cenário são considerados intoleráveis quando confrontados com critérios de avaliação de riscos individual e social empregados em estudos de análise de riscos tecnológicos, uma vez que o risco individual resultou em curvas com nível de risco de 1,00 x 10^{-3} ano^{-1} a 1,00 x 10^{-5} ano^{-1} em meio a comunidade e o risco social se situou em parte na região de risco intolerável.

É importante destacar que neste cenário operacional não há controle de fontes de ignição, uma vez que as operações ocorrerão em meio à via pública, com passagem de veículos e pedestres próximos ao ponto de enchimento dos cilindros transportáveis de GLP.

Para este tipo de cenário operacional atualmente não há normas e/ou padrões de segurança aplicados, sendo necessário a criação destes para possibilitar o enchimento dos recipientes transportáveis de GLP em vias públicas. Um ponto importante a ser considerado na criação destas normas e/ou padrões de segurança é a impossibilidade de se ter um sistema fixo para combate a incêndios e uma equipe de brigada de emergência no local para combate aos cenários acidentais envolvendo vazamento de GLP.

Neste tipo de atividade a avaliação dos recipientes transportáveis quanto ao padrão de segurança, necessidade de requalificação e/ou descarte dos recipientes ficará a cargo do motorista do veículo, ajudante e/ou do proprietário do recipiente transportável, com oneração de alguma das partes quando da necessidade de substituição destes.

Além disto, não há controle de exposição da população aos riscos por meio de afastamento, uma vez que esta atividade ocorrerá em via pública, em meio à população residencial e/ou comercial.

7.5. Cenário 5 – Cenário com engarrafamento de botijões P2, P5 e P13 em revendas de botijões de GLP localizados fora de áreas urbanas dos municípios

A seguir estão apresentados os resultados para o risco locacional (risco individual) da operação de enchimento de botijões GLP em uma revenda de GLP considerada como estando locada fora da área urbana do município. Por não terem sido atingidas áreas com presença de população (residências, comércios, indústrias e/ou vias) não foi obtido resultado de risco de fatalidade imposto á sociedade expresso na forma de risco social.

Figura 7.11 - Risco locacional (risco individual) resultante do cenário 5

Os riscos decorrentes deste cenário operacional são considerados toleráveis quando confrontados com critérios de avaliação de riscos individual e social empregados em estudos de análise de riscos tecnológicos, uma vez que o risco individual resultou em curvas com nível de risco de $1{,}00 \times 10^{-3}$ ano^{-1} a $1{,}00 \times 10^{-5}$ ano^{-1} no interior dos limites da área de revenda de cilindros de GLP. A análise não resultou em risco social.

É importante destacar que neste cenário operacional o controle de fontes de ignição é possível de ser realizado no interior da área da revenda, com adequação das instalações e conscientização dos colaboradores envolvidos na atividade. No entanto, não é possível de se realizar em área externa, por se tratar de área pública. Porém, para este cenário operacional há que se destacar o afastamento destas revendas da área com presença de população.

Neste tipo de estabelecimento há normas e padrões de segurança aplicados atualmente para revendas de cilindros de GLP, os quais terão que ser revisados para inclusão dos sistemas para enchimento dos recipientes transportáveis de GLP.

Neste tipo de atividade a avaliação dos recipientes transportáveis quanto ao padrão de segurança, necessidade de requalificação e/ou descarte dos recipientes ficará a cargo do funcionário do estabelecimento e/ou do proprietário do recipiente transportável, com oneração de alguma das partes quando da necessidade de substituição destes.

O controle de exposição da população aos riscos por meio de afastamento é menor, uma vez que estes estabelecimentos, na condição idealizada, estarão locados próximos à vias públicas para possibilitar o acesso, porém com afastamento de aglomerados populacionais.

8. CONCLUSÕES

Esta análise de riscos objetivou avaliar os riscos decorrentes da adoção do modelo de enchimento fracionado de recipientes transportáveis de GLP por parte de distribuidores e a comercialização de GLP em recipientes de outras marcas.

Para isto foram propostos 4 diferentes cenários operacionais com enchimento fracionado de recipientes transportáveis de GLP os quais foram comparados com os riscos decorrentes da atividade de enchimento de recipientes transportáveis de GLP em unidades engarrafadoras, como é o caso do modelo atualmente em operação no Brasil.

Os resultados dos riscos decorrentes do modelo atualmente em operação no Brasil se mostraram toleráveis, sendo que a população externa exposta consiste em trabalhadores de unidades industriais vizinhas, muitas vezes do mesmo ramo de atividade.

Dentre os cenários operacionais propostos para análise no modelo de enchimento fracionado de recipientes transportáveis de GLP, o único que mostrou ser viável, com tolerabilidade dos riscos, foi o cenário operacional com engarrafamento de botijões P2, P5 e P13 em revendas de botijões de GLP localizados fora de áreas urbanas dos municípios (cenário operacional nº5).

Todos os demais cenários operacionais propostos para análise resultaram em risco intolerável, em decorrência da proximidade com a população (comunidade) presente no entorno destas instalações em áreas urbanas.

Além da tolerabilidade dos riscos há outros fatores que devem ser considerados na avaliação do modelo de enchimento fracionado de recipientes transportáveis de GLP, podendo se destacar:

- a proximidade da população com a fonte de risco, havendo desconhecimento dos riscos relacionados a estas atividades e ao produto por parte da população;
- a dificuldade de isolamento de fontes de ignição em áreas em meio a comunidade, em especial em se tratando de abastecimento de recipientes transportável de GLP em meio a vias públicas com passagem contínua de veículos e pedestres;
- a necessidade de ampliação e/ou criação de normas, padrões de segurança e regulamentos específicos para estas atividades e/ou instalações, somado à necessidade de adequação das instalações a estas;
- a dificuldade de resposta emergencial para o cenário operacional específico de enchimento de cilindros transportáveis de GLP em vias públicas, sem que haja

uma estrutura fixa de combate a incêndios e uma equipe de brigada de emergência no local para atuação emergencial;

- a dificuldade de controle dos cilindros em relação às condições de segurança destes, com possibilidade de oneração do consumidor final.

É necessário que se observe ainda os eventos acidentais ocorridos em países como a Nigéria e Gana que adotaram este modelo de enchimento fracionado de recipientes transportáveis de GLP.

Desta forma, sabendo que dentre os cenários operacionais propostos para análise do modelo de enchimento fracionado de recipientes transportáveis de GLP somente o cenário operacional com engarrafamento de botijões P2, P5 e P13 em revendas de botijões de GLP localizados fora de áreas urbanas dos municípios (cenário operacional nº5) resultou em risco tolerável, ainda assim conclui-se que este é um cenário que deve ser ponderado com cautela, pois embora o risco imposto pela atividade de enchimento seja tolerável há que se considerar o risco decorrente do uso de recipientes transportáveis em condições inseguras por não haver como assegurar a requalificação regular destes.

Além disto, a possibilidade de avanço populacional em direção à área da revenda isolada, devido ao crescimento dos municípios, pode acarretar situação futura análoga ao cenário com engarrafamento de botijões P2, P5 e P13 em revendas de botijões de GLP localizadas no interior de áreas urbanas dos municípios (cenário operacional nº3), com risco intolerável.

Com base no exposto acima conclui-se que o modelo de enchimento de recipientes transportáveis de GLP em bases engarrafadoras, atualmente adotado pelo Brasil, é a opção mais segura em termos de riscos de acidentes tecnológicos, quando comparada à outras opções de modelo de enchimento de recipientes transportáveis de GLP. É importante esclarecer que estas unidades são submetidas a processos de licenciamento nos quais é avaliada a tolerabilidade dos riscos de acidentes tecnológicos.

9. REFERÊNCIAS BIBLIOGRÁFICAS

A seguir são apresentadas as referências bibliográficas empregadas ao longo deste estudo.

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- DNVGL - Phast Risk 8.22 - Process Hazard Analysis Software Tools; London

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A Anotação de Responsabilidade Técnica (ART) do responsável técnico por este relatório encontra-se a seguir.

Anotação de Responsabilidade Técnica - ART
Lei nº 6.496, de 7 de dezembro de 1977
CREA-SP
Conselho Regional de Engenharia e Agronomia do Estado de São Paulo

ART de Obra ou Serviço
28027230191182643

1. Responsável Técnico

MARCOS APARECIDO FRANCO PORTELA
Título Profissional: **Engenheiro de Materiais, Engenheiro de Segurança do Trabalho**
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Empresa Contratada: **AGR ENGENHARIA LTDA.- EPP**
Registro: **0721189-SP**

2. Dados do Contrato

Contratante: **Sindicato Nacional das Empresas Distribuidoras de Gás Liquefeito de Petróleo**
CPF/CNPJ: **44.079.002/0001-93**
Endereço: **Rua DA ASSEMBLÉIA**
Nº: **6**
Complemento: **19º andar**
Bairro: **CENTRO**
Cidade: **Rio de Janeiro**
UF: **RJ**
CEP: **20011-000**
Contrato:
Celebrado em: **12/06/2019**
Vinculada à Art nº:
Valor: R$ **35.900,00**
Tipo de Contratante: **Pessoa Jurídica de Direito Privado**
Ação Institucional:

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Endereço: **Rua FIAÇÃO DA SAÚDE**
Nº: **145**
Complemento: **116**
Bairro: **VILA DA SAÚDE**
Cidade: **São Paulo**
UF: **SP**
CEP: **04144-020**
Data de Início: **12/06/2019**
Previsão de Término: **27/09/2019**
Coordenadas Geográficas:
Finalidade: **Ambiental**
Código:
CPF/CNPJ:

4. Atividade Técnica

				Quantidade	Unidade
Elaboração 1	**Estudo**	**Análise de Risco**	**Quantitativa**	**1,00000**	**ano**

Após a conclusão das atividades técnicas o profissional deverá proceder a baixa desta ART

5. Observações

Elaboração de relatório técnico de Análise de Riscos com avaliação dos novos cenários acidentais potenciais de ocorrência em função no novo cenário operacional previsto pela Tomada Pública de Contribuições TPC Nº 07/2018 na regulamentação da ANP para comercialização de GLP e elaboração de relatório técnico de avaliação.

6. Declarações

Acessibilidade: Declaro que as regras de acessibilidade previstas nas normas técnicas da ABNT, na legislação específica e no Decreto nº 5.296, de 2 de dezembro de 2004, não se aplicam às atividades profissionais acima relacionadas.

7. Entidade de Classe

124 - ATEESP - ASSOCIAÇÃO DOS TÉCNICOS DAS EMPRESAS ENERGÉTICAS DO ESTADO DE SÃO PAULO - ATEESP

8. Assinaturas

Declaro serem verdadeiras as informações acima

São Paulo, 16 **de** Setembro **de** 2019

Local — data

MARCOS APARECIDO FRANCO PORTELA - CPF: 299.288.928-81

Sindicato Nacional das Empresas Distribuidoras de Gás Liquefeito de Petróleo - CPF/CNPJ: 44.079.002/0001-93

9. Informações

- A presente ART encontra-se devidamente quitada conforme dados constantes no rodapé-versão do sistema, certificada pelo *Nosso Número*.

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Impresso em: 15/09/2019 18:09:09

Anexo 1 – Laudo Meteorológico.

LAUDO DE DADOS METEOROLÓGICOS

Neste laudo consta a análise de dados meteorológicos obtidos da codificação METAR, fornecidos pela Infraero através do portal REDEMET (https://www.redemet.aer.mil.br), referente à estação localizada no Aeroporto Ten. Cel. Cesar Bombonato (Aeroporto de Uberlândia), identificada pela sigla SBUL, localizada no município de Uberlândia (MG), às coordenadas 18°52’58” S e 48°13’32” W.

Os dados referem-se ao período de 01 de março de 2016 a 28 de fevereiro de 2019. O período diurno refere-se aos horários entre 07:00 e 18:00 horas e o período noturno entre 19:00 e 06:00 horas. Nas Tabelas 1 e 2, a seguir, são apresentados os padrões de temperatura do ar, umidade relativa, direção e intensidade dos ventos. Estes padrões são considerados representativos para o município de Uberlândia (RS).

Tabela 1 - Dados de temperatura do ar, umidade relativa e velocidade do vento (média por período).

Período	Temperatura do ar	Umidade relativa	Velocidade do vento
Diurno	24,5 °C	54,6%	4,3 m/s
Noturno	20,3 °C	68,8%	3,5 m/s

Tabela 2 - Distribuição da direção dos ventos (por período).

Período	N	NE	E	SE	S	SW	W	NW
Diurno	18,7%	36,1%	20,7%	3,2%	4,7%	4,0%	4,4%	8,2%
Noturno	5,9%	22,0%	42,4%	10,1%	12,0%	3,2%	1,6%	2,8%

São Paulo, 20 de março de 2019.

____

Mariana Lino Gouvêa

Meteorologista - CREA-SP 5069291950

Rua Fidalga, 711 – Vila Madalena – São Paulo, SP – 05432-070
Av. Rio Branco, 1 – 16° Andar – Sala 1601 – Rio de Janeiro, RJ – 20090-003
Tel/Fax 55 11 3095-5050 / 55 21 3550-5310 www.tetratech.com

Anexo 2 – Dados de entrada dos modelos de consequências usados no software Phast Risk versão 8.22.

Input Report

Workspace: Cenário Operacional nº01

Study

Study

Cenário Operacional nº01

Tab	Group	Field	Value	Units
Material	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Toxic parameters	Indoor toxic calculations	Specify the downwind building type	Unselected	
		Building type (downwind building type)	Buildings\Building type	
Dispersion	Distances of interest	Distances of interest		m

Carreta Tanque

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	32000	kg
		Volume inventory	59,6935	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m

	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	59,6935	m3
		Tank vapour volume	0	m3
		Tank liquid volume	59,6935	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm

		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s

	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction

		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10037	m
		North	3926	m

H01

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carreta Tanque

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	1	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	

Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s

H02

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carreta Tanque

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fractio

				n
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Descarga de Carreta Tanque 1

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	2	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	

		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	

		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10037	m
		North	3926	m

H03A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Descarga de Carreta Tanque 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	2	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	

		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H04A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Descarga de Carreta Tanque 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	2	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Descarga de Carreta Tanque 2

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	

		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fractio n
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	2	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	

		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	

Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fractio

				n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10049	m
		North	3929	m

H03B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Descarga de Carreta Tanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	101,6	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	2	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	

		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	

		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio

				n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s

H04B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Descarga de Carreta Tanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	10,16	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	2	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H05B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Descarga de Carreta Tanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	2	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	

	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H06B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Descarga de Carreta Tanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	2	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	

Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Tanque de Armazenamento

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	

		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	

		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10061	m
		North	3932	m

H07

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Armazenamento

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m

		Tank head	3,5	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction

	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H08

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Armazenamento

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge	Model settings	Atmospheric expansion method	DNV GL recommended	

parameters				
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	

		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H09

Fixed duration release

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Armazenamento

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	

Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	

		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H10

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Armazenamento

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Relief valve	
	Pipe dimensions	Pipe internal diameter	127	mm
		Pipe length	1	m
	Hole	Orifice diameter	127	mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Vertical	

		Outdoor release angle	90	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	

		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	

		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Carregamento de Autotanque 1

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m

	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm

		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s

	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction

		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10037	m
		North	3926	m

H11B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m

		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s

	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H12B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	

		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	

	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s

H13A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm

		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H14A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 1

Tab	Group	Field	Value	Units

Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	

		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Carregamento de Autotanque 2

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg

		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar

	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10054	m
		North	3941	m

H05A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	76,2	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	

		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	

Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s

H06A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	7,62	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	

Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H11A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	101,6	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	2	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up	Droplet break-up mechanism -	Use flashing correlation	

	mechanism	instantaneous		
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H12A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	10,16	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	

Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H13B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	76,2	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m

		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio

				n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio

				n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s

H14B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Carregamento de Autotanque 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	7,62	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m

	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	

		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction

Pool fire maximum exposure duration	20	s

Auto Tanque

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	9000	kg
		Volume inventory	16,7888	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m

		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	16,7888	m3
		Tank vapour volume	0	m3
		Tank liquid volume	16,7888	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	

		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	

		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10037	m
		North	3926	m

H15

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Auto Tanque

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	3,5	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	

		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H16

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Auto Tanque

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	

Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Auto Tanque Pernoite

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	9000	kg
		Volume inventory	16,7888	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	

		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	16,7888	m3
		Tank vapour volume	0	m3
		Tank liquid volume	16,7888	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	

		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive	Calculate SEP	

		power		
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10037	m
		North	3926	m

H15

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Auto Tanque Pernoite

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	3,5	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of		

		interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H16

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Auto Tanque Pernoite

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	

		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Engarrafamento 1

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg

		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar

	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10045	m
		North	3960	m

H17A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Engarrafamento 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	101,6	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	

		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	

Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio n

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H18A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Engarrafamento 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	10,16	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	

Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Engarrafamento 2

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge	Model settings	Atmospheric expansion method	DNV GL recommended	

parameters				
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m

	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10054	m
		North	3941	m

H17B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Engarrafamento 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	152,4	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	

		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	

	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	15,24	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm

		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H19

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Engarrafamento 2

Tab	Group	Field	Value	Units

Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	

		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H20

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Engarrafamento 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m

	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	

		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio

				n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Armazenamento P13

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	13	kg
		Volume inventory	0,0242505	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	0,0242505	m3
		Tank vapour volume	0	m3

		Tank liquid volume	0,0242505	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-9999	m
		North	3983	m

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P13

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0,5	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	

Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P13

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion	Explosion method	Explosion method	Multi-Energy: Uniform	

parameters			confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	

	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Fixed duration release

Fixed duration release

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P13

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	

		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction

		Pool fire maximum exposure duration	20	s

Armazenamento P20

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	13	kg
		Volume inventory	0,0242505	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0,9	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m

		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	0,0242505	m3
		Tank vapour volume	0	m3
		Tank liquid volume	0,0242505	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	

		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	

		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-9999	m
		North	3983	m

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P20

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0,9	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	

		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P20

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0,9	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	

Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Fixed duration release

Fixed duration release

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P20

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fractio n
	Release location	Elevation	1	m
		Tank head	0,9	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m

	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2

		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Armazenamento P45

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	45	kg
		Volume inventory	0,083944	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m

		Tank head	1,3	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	0,083944	m3
		Tank vapour volume	0	m3
		Tank liquid volume	0,083944	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	

		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s

Geometry	Geometry	East	-9999	m
		North	3983	m

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P45

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	1,3	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P45

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction

	Release location	Elevation	1	m
		Tank head	1,3	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Fixed duration release

Fixed duration release

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P45

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	1,3	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Linha Ecológica

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	

		Mass inventory	2000	kg
		Volume inventory	3,73084	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	1,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	

		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	3,73084	m3
		Tank vapour volume	0	m3
		Tank liquid volume	3,73084	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	

Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio

				n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	0	m
		North	0	m

H30

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecológica

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	

		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	

		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio

				n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

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Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecológica

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Linha Ecologica / Decantação 1

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg

Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m

	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10061	m
		North	3932	m

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Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	25,4	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	

		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	

	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

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Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	2,54	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm

		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Linha Ecologica / Decantação 2

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units

Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	

Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m

	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	

		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10054	m
		North	3941	m

H34B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	25,4	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	

		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	

		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	

		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H35B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	2,54	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	

		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	

		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio

				n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H36A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	76,2	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H37A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	7,62	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	

	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Linha Ecologica / Decantação 3

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	3,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable	

			liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	

		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10060	m
		North	3956	m

H34A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 3

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm

		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H35A

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 3

Tab	Group	Field	Value	Units

Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	

		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H36B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 3

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m

	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	

		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio

				n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H37B

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Linha Ecologica / Decantação 3

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	3,5	m

	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund,	Terrain and bund	Type of terrain for dispersion	Land	

building and terrain	definition			
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s

	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Tanque de Decantação

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	2000	kg
		Volume inventory	3,73084	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar

		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	1,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	3,73084	m3
		Tank vapour volume	0	m3
		Tank liquid volume	3,73084	m3
		Tank liquid level	0	m
		Maximum vapour release height		m

		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10060	m
		North	3956	m

H38

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Decantação

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	1,5	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	

Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H39

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Decantação

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	1,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m

	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2

		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H40

Fixed duration release

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Decantação

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	1,5	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase	

			change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC

Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H41

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Tanque de Decantação

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Relief valve	
	Pipe dimensions	Pipe internal diameter	19,05	mm
		Pipe length	1	m
	Hole	Orifice diameter	19,05	mm
	Release location	Elevation	1	m
		Tank head	1,5	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Vertical	
		Outdoor release angle	90	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Vapour	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	

		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Coleta de Oleina

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	60000	kg
		Volume inventory	111,925	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	

		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	111,925	m3
		Tank vapour volume	0	m3
		Tank liquid volume	111,925	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	

		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive	Calculate SEP	

		power		
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10054	m
		North	3941	m

H42

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Coleta de Oleina

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m

	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	

	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive	Calculate SEP	

		power		
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H43

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Coleta de Oleina

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg

Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m

	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2

		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Armazenamento P190

Pressure vessel

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	190	kg
		Volume inventory	0,35443	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m

		Tank head	1,3	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	0,35443	m3
		Tank vapour volume	0	m3
		Tank liquid volume	0,35443	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	

		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Geometry	Geometry	East	-9887	m
		North	3943	m

H45

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P190

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	1,3	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H46

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P190

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction

	Release location	Elevation	1	m
		Tank head	1,3	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	

		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H47

Fixed duration release

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P190

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	1,3	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H48

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P190

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	19,05	mm

		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1,3	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m

	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	

		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H49

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P190

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	1,9	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m

		Tank head	1,3	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	

Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	

		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H50

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P190

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	19,05	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1,3	m
	Flow control	Flow controller	None	
		Input option	Not applicable	

		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	

Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	

		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H51

Short pipe

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Armazenamento P190

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	1,9	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1,3	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	

		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	

		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	

		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Depósito de Tintas

Atmospheric storage tank

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	N-PENTANE	
		Specify volume inventory?	Yes	
		Mass inventory	124,449	kg
		Volume inventory	0,2	m3
		Material to track	N-PENTANE	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature and atmospheric pressure	
		Temperature	24,5	degC
		Pressure (gauge)		bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	

Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	0,2	m3
		Tank vapour volume	0	m3
		Tank liquid volume	0,2	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of		

		interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	

		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-9918	m
		North	3987	m

H52

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Depósito de Tintas

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	

		Material to track	N-PENTANE	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H53

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Depósito de Tintas

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	N-PENTANE	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	

Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Depósito de Tintas (Mistura)

Atmospheric storage tank

Cenário Operacional nº01\Study\1 - IF (Uberlandia)

Tab	Group	Field	Value	Units
Material	Material	Material	N-PENTANE	
		Specify volume inventory?	Yes	
		Mass inventory	373,347	kg
		Volume inventory	0,6	m3
		Material to track	N-PENTANE	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature and atmospheric pressure	
		Temperature	24,5	degC
		Pressure (gauge)		bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	

		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	0,6	m3
		Tank vapour volume	0	m3
		Tank liquid volume	0,6	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m

	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction

		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-10023	m
		North	3968	m

H54

Catastrophic rupture

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Depósito de Tintas (Mistura)

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Material	Material	Material characteristics	Flammable only	
		Material to track	N-PENTANE	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	

Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

H55

Leak

Cenário Operacional nº01\Study\1 - IF (Uberlandia)\Depósito de Tintas (Mistura)

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fractio

				n
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Material	Material	Material characteristics	Flammable only	
		Material to track	N-PENTANE	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Input Report

Workspace: Cenário Operacional nº02

Study

Study

Cenário Operacional nº02

Tab	Group	Field	Value	Units
Material	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Toxic parameters	Indoor toxic calculations	Specify the downwind building type	Unselected	
		Building type (downwind building type)	Buildings\Building type	
Dispersion	Distances of interest	Distances of interest		m

Bobtail

Pressure vessel

Cenário Operacional nº02\Study

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	5000	kg
		Volume inventory	9,32711	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Risk	Type of risk effects to	Jet fire modelling for horizontal releases	Horizontal jet only	

	model			
		Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Fraction of ignition probability for immediate ignition	0,3	
		Release type for CLA / UKOOA		
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m

		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	9,32711	m3
		Tank vapour volume	0	m3
		Tank liquid volume	9,32711	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	

		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg

		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-8793	m
		North	3486	m
		Apply location offset	No	

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº02\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	1	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Risk	Event frequency	Event frequency	4,11E-09	/ AvgeYear

	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	

	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº02\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	4,11E-09	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	

	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 100%

Short pipe

Cenário Operacional nº02\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,000288	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 10%

Short pipe

Cenário Operacional nº02\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,00288	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	

		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Input Report

Workspace: Cenário Operacional nº03

Study

Study

Cenário Operacional nº03

Tab	Group	Field	Value	Units
Material	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Toxic parameters	Indoor toxic calculations	Specify the downwind building type	Unselected	
		Building type (downwind building type)	Buildings\Building type	
Dispersion	Distances of interest	Distances of interest		m

Bobtail

Pressure vessel

Cenário Operacional nº03\Study

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	5000	kg
		Volume inventory	9,32711	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Risk	Type of risk effects to	Jet fire modelling for horizontal releases	Horizontal jet only	

	model			
		Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Fraction of ignition probability for immediate ignition	0,3	
		Release type for CLA / UKOOA		
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m

		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	9,32711	m3
		Tank vapour volume	0	m3
		Tank liquid volume	9,32711	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	

		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg

		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-8793	m
		North	3486	m
		Apply location offset	No	

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº03\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	1	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Risk	Event frequency	Event frequency	4,11E-09	/AvgeYear

	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	

	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº03\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	4,11E-09	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	

	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 100%

Short pipe

Cenário Operacional nº03\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,000288	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 10%

Short pipe

Cenário Operacional nº03\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,00288	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	

		Non-ignition probability		fractio n
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fractio n
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fractio n
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fractio n
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Input Report

Workspace: Cenário Operacional nº04

Study

Study

Cenário Operacional nº04

Tab	Group	Field	Value	Units
Material	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Toxic parameters	Indoor toxic calculations	Specify the downwind building type	Unselected	
		Building type (downwind building type)	Buildings\Building type	
Dispersion	Distances of interest	Distances of interest		m

P3000-Ponto1

Pressure vessel

Cenário Operacional nº04\Study

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	3000	kg
		Volume inventory	5,59626	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Risk	Type of risk effects to	Jet fire modelling for horizontal releases	Horizontal jet only	

	model			
		Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Fraction of ignition probability for immediate ignition	0,3	
		Release type for CLA / UKOOA		
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m

		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	5,59626	m3
		Tank vapour volume	0	m3
		Tank liquid volume	5,59626	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	

		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg

		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Radiative fraction for general fires	0,4	fractio n
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-8826	m
		North	3001	m
		Apply location offset	No	

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº04\Study\P3000-Ponto1

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Risk	Event frequency	Event frequency	1,46E-07	/ AvgeY ear

	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	

	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº04\Study\P3000-Ponto1

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	1,46E-07	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	

	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 100%

Short pipe

Cenário Operacional nº04\Study\P3000-Ponto1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	25,4	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,0102	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 10%

Short pipe

Cenário Operacional nº04\Study\P3000-Ponto1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	2,54	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,102	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	

		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

P3000-Ponto2

Pressure vessel

Cenário Operacional nº04\Study

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	

		Mass inventory	3000	kg
		Volume inventory	5,59626	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Risk	Type of risk effects to model	Jet fire modelling for horizontal releases	Horizontal jet only	
		Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Fraction of ignition probability for immediate ignition	0,3	
		Release type for CLA / UKOOA		
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg

Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	5,59626	m3
		Tank vapour volume	0	m3
		Tank liquid volume	5,59626	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m

	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-8656	m
		North	3325	m
		Apply location offset	No	

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº04\Study\P3000-Ponto2

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Risk	Event frequency	Event frequency	1,46E-07	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fractio n
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº04\Study\P3000-Ponto2

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	1,46E-07	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction

		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	

	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 100%

Short pipe

Cenário Operacional nº04\Study\P3000-Ponto2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	25,4	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,0102	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition	Probability of immediate ignition	Stationary - use material	

	probabilities		reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s

	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 10%

Short pipe

Cenário Operacional nº04\Study\P3000-Ponto2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	2,54	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm

	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,102	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	

		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2

		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Enchimento Ponto 1

Pressure vessel

Cenário Operacional nº04\Study

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	13	kg
		Volume inventory	0,0242505	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Risk	Type of risk effects to model	Jet fire modelling for horizontal releases	Horizontal jet only	
		Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction

	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Fraction of ignition probability for immediate ignition	0,3	
		Release type for CLA / UKOOA		
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar

	Inventory data for time-varying releases	Tank volume	0,0242505	m3
		Tank vapour volume	0	m3
		Tank liquid volume	0,0242505	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction

Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-8826	m
		North	3001	m
		Apply location offset	No	

Vazamento P13

Short pipe

Cenário Operacional nº04\Study\Enchimento Ponto 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	25,4	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,0288	/AvgeY

				ear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	

		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Ruptura da Cilindro

Catastrophic rupture

Cenário Operacional nº04\Study\Enchimento Ponto 1

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Risk	Event frequency	Event frequency	5E-06	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	

		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction

	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Furo no Cilindro

Leak

Cenário Operacional nº04\Study\Enchimento Ponto 1

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,0001	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		

Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	

		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	

		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Vazamento em 600 seg

Fixed duration release

Cenário Operacional nº04\Study\Enchimento Ponto 1

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	5E-06	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	

		Conditional explosion probability		fractio n
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Enchimento Ponto 2

Pressure vessel

Cenário Operacional nº04\Study

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	13	kg
		Volume inventory	0,0242505	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Risk	Type of risk effects to model	Jet fire modelling for horizontal releases	Horizontal jet only	
		Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fractio

				n
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Fraction of ignition probability for immediate ignition	0,3	
		Release type for CLA / UKOOA		
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	

		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	0,0242505	m3
		Tank vapour volume	0	m3
		Tank liquid volume	0,0242505	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	
		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	

Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg
		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fractio

				n
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-8656	m
		North	3325	m
		Apply location offset	No	

Vazamento P13

Short pipe

Cenário Operacional nº04\Study\Enchimento Ponto 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	25,4	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	0	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg

Risk	Event frequency	Event frequency	0,0288	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m

	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC

Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Ruptura da Cilindro

Catastrophic rupture

Cenário Operacional nº04\Study\Enchimento Ponto 2

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	0	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Risk	Event frequency	Event frequency	5E-06	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	

		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	

		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Furo no Cilindro

Leak

Cenário Operacional nº04\Study\Enchimento Ponto 2

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	10	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	0,0001	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	

		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Vazamento em 600 seg

Fixed duration release

Cenário Operacional nº04\Study\Enchimento Ponto 2

Tab	Group	Field	Value	Units
Scenario	Scenario	Duration for fixed duration release	600	s
	Hole	Orifice diameter		mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fraction
	Release location	Elevation	1	m
		Tank head	0	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	5E-06	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fractio

				n
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	

		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Input Report

Workspace: Cenário Operacional nº05

Study

Study

Cenário Operacional nº05

Tab	Group	Field	Value	Units
Material	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Toxic parameters	Indoor toxic calculations	Specify the downwind building type	Unselected	
		Building type (downwind building type)	Buildings\Building type	
Dispersion	Distances of interest	Distances of interest		m

Bobtail

Pressure vessel

Cenário Operacional nº05\Study

Tab	Group	Field	Value	Units
Material	Material	Material	GLP	
		Specify volume inventory?	No	
		Mass inventory	5000	kg
		Volume inventory	9,32711	m3
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Specified condition	Temperature/bubble point	
		Temperature	24,5	degC
		Pressure (gauge)	6,09836	bar
		Fluid state	Liquid	
		Liquid mole fraction	1	fraction
	Modelling of mixtures	Multi or pseudo-component modelling	PC modelling	
Risk	Type of risk effects to	Jet fire modelling for horizontal releases	Horizontal jet only	

	model			
		Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Fraction of ignition probability for immediate ignition	0,3	
		Release type for CLA / UKOOA		
Scenario	Pipe dimensions	Pipe length		m
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m

		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Time varying releases	Modelling of time-varying leaks and line ruptures	Vacuum relief valve	Operating	
		Vacuum relief valve set point	0	bar
	Inventory data for time-varying releases	Tank volume	9,32711	m3
		Tank vapour volume	0	m3
		Tank liquid volume	9,32711	m3
		Tank liquid level	0	m
		Maximum vapour release height		m
		Minimum mass inventory	0,1	kg
		Maximum mass inventory	1E+09	kg
	Safety system modelling for time-varying releases	Safety system modelling (isolation and blowdown)	No	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
	Building definition	Release building		
		In-building release?	Outdoor	
		Building wake effect	Roof/lee	
		Wind or release angle from North	0	deg
		Handling of droplets	Trapped	

		Indoor mass modification factor	3	
Explosion parameters	Explosion method (Consequence calculations only)	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Crosswind angle	0	deg

		Horizontal options	Use standard method	
		Correlation	Recommended	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s
Geometry	Geometry	East	-8968	m
		North	3361	m
		Apply location offset	No	

Catastrophic rupture

Catastrophic rupture

Cenário Operacional nº05\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Release location	Elevation	1	m
		Tank head	1	m
	Fireball emissive power	Use vessel burst pressure	No	
		Vessel burst pressure - gauge		bar
Risk	Event frequency	Event frequency	1,05E-09	/AvgeYear

	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
Discharge parameters	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	

	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Leak

Leak

Cenário Operacional nº05\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Hole	Orifice diameter	50,8	mm
		Use specified discharge coefficient?	No	
		Discharge coefficient		fractio n
	Release location	Elevation	1	m
		Tank head	1	m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	1,05E-09	/ AvgeY ear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fractio n
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fractio n
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fractio n
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fractio n
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
		Phase change upstream of orifice?	Disallow liquid phase change only (metastable liquid)	

	Droplet break-up mechanism	Droplet break-up mechanism - continuous	Do not force correlation	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 100%

Short pipe

Cenário Operacional nº05\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	50,8	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	7,35E-05	/ AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	
		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	

	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		
		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/ m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	

		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Mangote 10%

Short pipe

Cenário Operacional nº05\Study\Bobtail

Tab	Group	Field	Value	Units
Scenario	Scenario	Scenario type	Line rupture	
	Pipe dimensions	Pipe internal diameter	5,08	mm
		Pipe length	1	m
	Hole	Orifice diameter		mm
	Release location	Elevation	1	m
		Tank head	1	m
	Flow control	Flow controller	None	
		Input option	Not applicable	
		Fixed flow rate		kg/s
		Pump head		m
	Direction	Outdoor release direction	Horizontal	
		Outdoor release angle	0	deg
Risk	Event frequency	Event frequency	7,35E-05	/AvgeYear
	Type of risk effects to model	Reduce risks for mounded / underground tanks	No	
	Non-ignition probabilities	Specify probability of non-ignition	Calculate non-ignition probability	

		Non-ignition probability		fraction
	Immediate ignition probabilities	Probability of immediate ignition	Stationary - use material reactivity	
		Immediate ignition probability		fraction
	Delayed ignition probabilities	Specify minimum probability of delayed ignition	Calculate minimum probability of delayed ignition	
		Minimum probability of delayed ignition		fraction
		Specify conditional explosion probability	Calculate conditional probability	
		Conditional explosion probability		fraction
	Cox-Lees-Ang and UKOOA ignition modelling	Release type for CLA / UKOOA		
Material	Material	Material characteristics	Flammable only	
		Material to track	GLP	
		Type of risk effects to model	Flammable only	
	Phase	Phase to be released	Liquid	
Discharge parameters	Model settings	Atmospheric expansion method	DNV GL recommended	
	Droplet break-up mechanism	Droplet break-up mechanism - instantaneous	Use flashing correlation	
		Droplet break-up mechanism - continuous	Do not force correlation	
Short pipe	Pipe characteristics	Pipe roughness	0,045	mm
	Frequencies	Frequency of bends in pipe	0	/m
		Frequency of couplings in pipe	0	/m
		Frequency of junctions in pipe	0	/m
	Frequencies of valves	Frequency of excess flow valves	0	/m
		Frequency of non-return valves	0	/m
		Frequency of shut-off valves	0	/m
	Velocity head losses	Excess flow valve velocity head losses	0	
		Non-return valve velocity head losses	0	
		Shut-off valve velocity head losses	0	
Dispersion	Dispersion scope	Concentration of interest		ppm
		Averaging time for concentration of interest		

		Specify user-defined averaging time	No	
		User defined averaging time		s
	Distances of interest	Distances of interest		m
	Averaging time for reports	ERPG [1 hr]	No	
		IDLH [30 mins]	No	
		STEL [15 mins]	No	
Bund, building and terrain	Terrain and bund definition	Type of terrain for dispersion	Land	
		Type of pool substrate and bunds	Concrete, no bund	
Explosion parameters	Explosion method	Explosion method	Multi-Energy: Uniform confined	
	Ignition	Supply late ignition location	No ignition location	
		Location of late ignition		m
	Vapour liquid method	Use explosion mass modification factor	Yes	
		Explosion mass modification factor	3	
Fireball	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/ m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Mass modification factor	3	
		Fireball maximum exposure duration	20	s
	Calculation method	Fireball model	Martinsen time varying	
		TNO model flame temperature	1726,85	degC
Jet fire	Jet fire method	Jet fire method	Cone model	
	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/

				m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Rate modification factor	3	
		Jet fire maximum exposure duration	20	s
	Cone model data	Correlation	Recommended	
		Horizontal options	Use standard method	
		Flame-shape adjustment if grounded	Yes	
	Surface emissive power	Calculation method for surface emissive power	Calculate SEP	
		Flame emissive power		kW/m2
		Emissivity fraction		fraction
Pool fire	Result types to calculate	Calculate probit	No	
		Calculate dose	No	
		Calculate lethality	No	
	Radiation levels	Number of input radiation levels	3	
		Intensity levels	9,85; 19,45; 35	kW/m2
		Probit levels	2,73; 3,72; 7,5	
		Dose levels	1,27E+06; 5,8E+06; 2,51E+07	
		Lethality levels	0,01; 0,1; 0,99	fraction
	Parameters	Radiative fraction for general fires	0,4	fraction
		Pool fire maximum exposure duration	20	s

Anexo 3 – Relatórios das modelagens de consequências.

Consequence Summary Report

Workspace: Cenário Operacional nº01

Study: Study

Summary Basis

Wkhvh#wdeohv#z loo#rqo|#uhsruw#joredo#ydoxhv#vhw#lq#wkh#sdudp hwhuv1#Ydoxhv#wkdw#duh#p rglilhg#lq#wkh#vwxg|#wuhh#z loo# qrw#eh#uhsruwhg1

Wkh#uhsruw#lv#frqwh{w#vhqvlwlyh/#dqg#ilowhuv#xs#wr#wkh#vwxg|#ohyho1#\rx#z loo#qhhg#wr#jhqhudwh#p xowlsoh#vxp p du|# uhsruwv#li#|rx#kdyh#p xowlsoh#vwxglhv#lq#|rxu#z runvsdfh1

Discharge Results (after atmospheric expansion)

<table>
<tr><th>Path</th><th>Scenario</th><th>Weather</th><th>Peak Flowrate [kg/s]</th><th>Temperature [degC]</th><th>Liquid mass fraction in material [fraction]</th><th>Droplet diameter [um]</th><th>Expanded diameter [m]</th><th>Velocity [m/s]</th><th>End time of release [s]</th></tr>
<tr><td>Vwxg|_4#0 LI# +Xehudqgld, _Fduuhwd#Wdqtxh</td><td>K34</td><td>Gld</td><td></td><td>067/97:8</td><td>3/9<<::4</td><td>483/766</td><td></td><td>64/3:45</td><td></td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td></td><td>067/97:8</td><td>3/9<<::4</td><td>483/766</td><td></td><td>64/3:45</td><td></td></tr>
<tr><td></td><td>K35</td><td>Gld</td><td>65/5;79</td><td>067/97:8</td><td>3/9<<:94</td><td>48</4:9</td><td>3/4:896:</td><td>488/65;</td><td><<4/4;6</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>65/5;79</td><td>067/97:8</td><td>3/9<<:94</td><td>48</4:9</td><td>3/4:896:</td><td>488/65;</td><td><<4/4;6</td></tr>
<tr><td>Vwxg|_4#0 LI# +Xehudqgld, _Ghvfdujd#gh# Fduuhwd#Wdqtxh#4</td><td>K36D</td><td>Gld</td><td></77658</td><td>067/97:8</td><td>3/:33:9<</td><td>485/57</td><td>3/3<6<73;</td><td>48;/5<5</td><td>6933</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td></77658</td><td>067/97:8</td><td>3/:33:9<</td><td>485/57</td><td>3/3<6<73;</td><td>48;/5<5</td><td>6933</td></tr>
<tr><td></td><td>K37D</td><td>Gld</td><td>3/39787<:</td><td>067/97:8</td><td>3/:33695</td><td>494/767</td><td>3/33:;3539</td><td>48:/3:7</td><td>6933</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>3/39787<:</td><td>067/97:8</td><td>3/:33695</td><td>494/767</td><td>3/33:;3539</td><td>48:/3:7</td><td>6933</td></tr>
<tr><td>Vwxg|_4#0 LI# +Xehudqgld, _Ghvfdujd#gh# Fduuhwd#Wdqtxh#5</td><td>K36E</td><td>Gld</td><td>6;/8;:</td><td>067/97:8</td><td>3/:33:7<</td><td>484/<:9</td><td>3/4;<<59</td><td>48;/58</td><td>4888/37</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>6;/8;:</td><td>067/97:8</td><td>3/:33:7<</td><td>484/<:9</td><td>3/4;<<59</td><td>48;/58</td><td>4888/37</td></tr>
<tr><td></td><td>K37E</td><td>Gld</td><td>3/6473;9</td><td>067/97:8</td><td>3/:33;</td><td>488/:;8</td><td>3/34:464</td><td>48;/634</td><td>6933</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>3/6473;</td><td>067/97:8</td><td>3/:33;</td><td>488/:;8</td><td>3/34:46</td><td>48;/634</td><td>6933</td></tr>
</table>

			9				4		
	K38E	Gld	6/:688	05;/36<9	3	3	3/3:4<3:	697/736	6933
		Qrlwh	6/:688	05;/36<9	3	3	3/3:4<3:	697/736	6933
	K39E	Gld	6/:688	05;/36<9	3	3	3/3:4<3:	697/736	6933
		Qrlwh	6/:688	05;/36<9	3	3	3/3:4<3:	697/736	6933
Vwxg|_4#0 LI# +Xehudqgld, _Wdqtxh#gh# Dup d}hqdp hqwr	K3:	Gld		067/97:8	3/9<<:<:	483/68<		64/3;86	
		Qrlwh		067/97:8	3/9<<:<:	483/68<		64/3;86	
	K3;	Gld	4/59<:9	067/97:8	3/9<<;65	48;/<96	3/367;38<	488/858	6933
		Qrlwh	4/59<:9	067/97:8	3/9<<;65	48;/<96	3/367;38<	488/858	6933
	K3<	Gld	433	067/97:8	3/9<<;65	48;/<96	3/63;;;5	488/858	933
		Qrlwh	433	067/97:8	3/9<<;65	48;/<96	3/63;;;5	488/858	933
	K43	Gld	56/679<	05</7<:5	3	3	3/4::;5;	69</<:4	589</<8
		Qrlwh	56/679<	05</7<:5	3	3	3/4::;5;	69</<:4	589</<8
Vwxg|_4#0 LI# +Xehudqgld, _Fduuhjdp hqwr#gh# Dxwrwdqtxh#4	K44E	Gld	</;3774	067/97:8	3/:33:5<	484/9;4	3/3<8:858	48;/53:	6933
		Qrlwh	</;3774	067/97:8	3/:33:5<	484/9;4	3/3<8:858	48;/53:	6933
	K45E	Gld	3/3998764	067/97:8	3/:337:	493/6;9	3/33:<4599	48:/6:7	6933
		Qrlwh	3/3998764	067/97:8	3/:337:	493/6;9	3/33:<4599	48:/6:7	6933
	K46D	Gld	6/:688	05;/36<9	3	3	3/3:4<3:	697/736	6933
		Qrlwh	6/:688	05;/36<9	3	3	3/3:4<3:	697/736	6933
	K47D	Gld	3/354338<	053/:88;	3	3	3/338;5;57	655/36<	6933
		Qrlwh	3/354338<	053/:88;	3	3	3/338;5;57	655/36<	6933

Vwxg|_4#0LI# +Xehudqgld, _Fduuhjdp hqwr#gh# Dxwrwdqtxh#5	K38D	Gld	;/737;:	05;/:758	3	3	3/43:5<8	69:/434	6933
		Qrlwh	;/737;:	05;/:758	3	3	3/43:5<8	69:/434	6933
	K39D	Gld	3/389;349	056/:456	3	3	3/33<635:7	66:/785	6933
		Qrlwh	3/389;349	056/:456	3	3	3/33<635:7	66:/785	6933
	K44D	Gld	6;/8;:	067/97:8	3/:33:7<	484/<:9	3/4;<<59	48;/58	4888/37
		Qrlwh	6;/8;:	067/97:8	3/:33:7<	484/<:9	3/4;<<59	48;/58	4888/37
	K45D	Gld	3/6578;:	067/97:8	3/:33;5	487/<35	3/34:743:	48;/6:	6933
		Qrlwh	3/6578;:	067/97:8	3/:33;5	487/<35	3/34:743:	48;/6:	6933
	K46E	Gld	;/737;:	05;/:758	3	3	3/43:5<8	69:/434	6933
		Qrlwh	;/737;:	05;/:758	3	3	3/43:5<8	69:/434	6933
	K47E	Gld	3/389;349	056/:456	3	3	3/33<635:7	66:/785	6933
		Qrlwh	3/389;349	056/:456	3	3	3/33<635:7	66:/785	6933
Vwxg|_4#0LI# +Xehudqgld,_Dxwr# Wdqtxh	K48	Gld		067/97:8	3/9<<:<:	483/68<		64/3;86	
		Qrlwh		067/97:8	3/9<<:<:	483/68<		64/3;86	
	K49	Gld	65/:9:;	067/97:8	3/9<<;65	48;/<96	3/4:9;47	488/858	5:7/99
		Qrlwh	65/:9:;	067/97:8	3/9<<;65	48;/<96	3/4:9;47	488/858	5:7/99
Vwxg|_4#0LI# +Xehudqgld,_Dxwr# Wdqtxh#Shuqrlwh	K48	Gld		067/97:8	3/9<<:<:	483/68<		64/3;86	
		Qrlwh		067/97:8	3/9<<:<:	483/68<		64/3;86	
	K49	Gld	65/:9:;	067/97:8	3/9<<;65	48;/<96	3/4:9;47	488/858	5:7/99
		Qrlwh	65/:9:;	067/97:8	3/9<<;65	48;/<96	3/4:9;47	488/858	5:7/99
Vwxg|_4#0LI# +Xehudqgld,	K4:D	Gld	69/89<:	067/97:8	3/:33;36	485/;:	3/4;7;44	48;/699	4973/;5

_Hqjduudidp hqwr#4

		Qrlwh	69/89<:	067/97:8	3/:33;36	485/;:	3/4;7;44	48;/699	4973/;5
	K4;D	Gld	3/5<<:9;	067/97:8	3/:33:75	48:/3<7	3/349:79:	48;/45<	6933
		Qrlwh	3/5<<:9;	067/97:8	3/:33:75	48:/3<7	3/349:79:	48;/45<	6933
Vwxg|_4#0 LI# +Xehudqgld, _Hqjduudidp hqwr#5	K4:E	Gld	;5/:;87	067/97:8	3/:33;34	485/:;;	3/5:;39:	48;/696	:57/;;6
		Qrlwh	;5/:;87	067/97:8	3/:33;34	485/:;;	3/5:;39:	48;/696	:57/;;6
	K4;E	Gld	3/:589:8	067/97:8	3/:33;49	488/5:;	3/3593678	48;/685	6933
		Qrlwh	3/:589:8	067/97:8	3/:33;49	488/5:;	3/3593678	48;/685	6933
	K4<	Gld	;/<8945	067/97:8	3/:33;56	486/56;	3/3<47764	48;/744	6933
		Qrlwh	;/<8945	067/97:8	3/:33;56	486/56;	3/3<47764	48;/744	6933
	K53	Gld	3/394;	067/97:8	3/:33535	496/4::	3/33:979<<	489/95:	6933
		Qrlwh	3/394;	067/97:8	3/:33535	496/4::	3/33:979<<	489/95:	6933
Vwxg|_4#0 LI# +Xehudqgld, _Dup d}hqdp hqwr# S46	Fdwdvwur sklf# uxswxuh	Gld		067/97:8	3/9<<:99	483/77;		64/39;7	
		Qrlwh		067/97:8	3/9<<:99	483/77;		64/39;7	
	Ohdn	Gld	4/586:5	067/97:8	3/9<<::4	48</479	3/36793::	488/689	43/69<4
		Qrlwh	4/586:5	067/97:8	3/9<<::4	48</479	3/36793::	488/689	43/69<4
	Il{hg# gxudwlrq# uhdndvh	Gld	3/354999:	067/97:8	3/9<<::4	48</479	3/33787<88	488/689	933
		Qrlwh	3/354999:	067/97:8	3/9<<::4	48</479	3/33787<88	488/689	933
Vwxg|_4#0 LI# +Xehudqgld, _Dup d}hqdp hqwr# S53	Fdwdvwur sklf# uxswxuh	Gld		067/97:8	3/9<<::	483/769		64/3:39	
		Qrlwh		067/97:8	3/9<<::	483/769		64/3:39	
	Ohdn	Gld	4/588;:	067/97:8	3/9<<::<	48</455	3/3679677	488/6:<	43/6847

		Qrlwh	4/588;:	067/97:8	3/9<<::<	48</455	3/3679677	488/6:<	43/6847
	Il{hg# gxudwlrq# uhdndvh	Gld	3/354999:	067/97:8	3/9<<::<	48</455	3/33787<48	488/6:<	933
		Qrlwh	3/354999:	067/97:8	3/9<<::<	48</455	3/33787<48	488/6:<	933
Vwxg|_4#0 LI# +Xehuodqgld, _Dup d}hqdp hqwr# S78	Fdwdvwur sklf# uxswxuh	Gld		067/97:8	3/9<<::7	483/757		64/3:5<	
		Qrlwh		067/97:8	3/9<<::7	483/757		64/3:5<	
	Ohdn	Gld	4/58;35	067/97:8	3/9<<;:	48</3<:	3/367994	488/734	68/::38
		Qrlwh	4/58;35	067/97:8	3/9<<;:	48</3<:	3/367994	488/734	68/::38
	Il{hg# gxudwlrq# uhdndvh	Gld	3/3:8	067/97:8	3/9<<;:	48</3<:	3/33;7963:	488/734	933
		Qrlwh	3/3:8	067/97:8	3/9<<;:	48</3<:	3/33;7963:	488/734	933
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfro‰jlfd	K63	Gld	</65584	067/97:8	3/:33:<	485/7<6	3/3<664<;	48;/677	547/984
		Qrlwh	</65584	067/97:8	3/:33:<	485/7<6	3/3<664<;	48;/677	547/984
	K64	Gld	3/396;9;	067/97:8	3/:33665	494/<57	3/33::9654	489/<<	6933
		Qrlwh	3/396;9;	067/97:8	3/:33665	494/<57	3/33::9654	489/<<	6933
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfrorjlfd#2# Ghfdqwd†flr#4	K65	Gld	5/6696;	067/97:8	3/:33:<7	485/685	3/379:47<	48;/68<	6933
		Qrlwh	5/6696;	067/97:8	3/:33:<7	485/685	3/379:47<	48;/68<	6933
	K66	Gld	3/345738;	067/97:8	3/9<<335	4:6/356	3/33679<:<	486/649	6933
		Qrlwh	3/345738;	067/97:8	3/9<<335	4:6/356	3/33679<:<	486/649	6933
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfrorjlfd#2# Ghfdqwd†flr#5	K67E	Gld	5/6696;	067/97:8	3/:33:<7	485/685	3/379:47<	48;/68<	6933
		Qrlwh	5/6696;	067/97:8	3/:33:<7	485/685	3/379:47<	48;/68<	6933

	K68E	Gld	3/34573 8;	067/97:8	3/9<<33 5	4:6/356	3/33679 <:<	486/649	6933
		Qrlwh	3/34573 8;	067/97:8	3/9<<33 5	4:6/356	3/33679 <:<	486/649	6933
	K69D	Gld	;/737;:	05;/:758	3	3	3/43:5< 8	69:/434	6933
		Qrlwh	;/737;:	05;/:758	3	3	3/43:5< 8	69:/434	6933
	K6:D	Gld	3/389;3 49	056/:456	3	3	3/33<63 5:7	66:/785	6933
		Qrlwh	3/389;3 49	056/:456	3	3	3/33<63 5:7	66:/785	6933
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfrorjlfd#2# Ghfdqwd†flr#6	K67D	Gld	</;3774	067/97:8	3/:33:5 <	484/9;4	3/3<8:8 58	48;/53:	6933
		Qrlwh	</;3774	067/97:8	3/:33:5 <	484/9;4	3/3<8:8 58	48;/53:	6933
	K68D	Gld	3/39987 64	067/97:8	3/:337:	493/6;9	3/33:<4 599	48:/6:7	6933
		Qrlwh	3/39987 64	067/97:8	3/:337:	493/6;9	3/33:<4 599	48:/6:7	6933
	K69E	Gld	6/:688	05;/36<9	3	3	3/3:4<3 :	697/736	6933
		Qrlwh	6/:688	05;/36<9	3	3	3/3:4<3 :	697/736	6933
	K6:E	Gld	3/35433 8<	053/:88;	3	3	3/338;5 ;57	655/36<	6933
		Qrlwh	3/35433 8<	053/:88;	3	3	3/338;5 ;57	655/36<	6933
Vwxg|_4#0 LI# +Xehuodqgld, _Wdqtxh#gh# Ghfdqwd†flr	K6;	Gld		067/97:8	3/9<<:: 9	483/74;		64/3:7	
		Qrlwh		067/97:8	3/9<<:: 9	483/74;		64/3:7	
	K6<	Gld	4/58<3<	067/97:8	3/9<<:< 4	48</3;8	3/3679: 76	488/745	48;;/78
		Qrlwh	4/58<3<	067/97:8	3/9<<:< 4	48</3;8	3/3679: 76	488/745	48;;/78
	K73	Gld	6/66666	067/97:8	3/9<<:< 4	48</3;8	3/38974 ;4	488/745	933
		Qrlwh	6/66666	067/97:8	3/9<<:< 4	48</3;8	3/38974 ;4	488/745	933
	K74	Gld	3/7;;6< 7	059/<555	3	3	3/35963 :	68:/:6:	6933

		Qrlwh	3/7;;6<7	059/<555	3	3	3/35963:	68:/:6:	6933
Vwxg|_4#0 LI# +Xehudqgld,_Frdnwd# gh#R dnlqd	K75	Gld	;/<8945	067/97:8	3/:33;56	486/56;	3/3<47764	48;/744	6933
		Qrlwh	;/<8945	067/97:8	3/:33;56	486/56;	3/3<47764	48;/744	6933
	K76	Gld	3/394;	067/97:8	3/:33535	496/4::	3/33:979<<	489/95:	6933
		Qrlwh	3/394;	067/97:8	3/:33535	496/4::	3/33:979<<	489/95:	6933
Vwxg|_4#0 LI# +Xehudqgld, _Dup d}hqdp hqwr# S4<3	K78	Gld		067/97:8	3/9<<::7	483/757		64/3:5<	
		Qrlwh		067/97:8	3/9<<::7	483/757		64/3:5<	
	K79	Gld	4/58;35	067/97:8	3/9<<:;:	48</3<:	3/367994	488/734	484/364
		Qrlwh	4/58;35	067/97:8	3/9<<:;:	48</3<:	3/367994	488/734	484/364
	K7:	Gld	3/64999:	067/97:8	3/9<<:;:	48</3<:	3/34:6<	488/734	933
		Qrlwh	3/64999:	067/97:8	3/9<<:;:	48</3<:	3/34:6<	488/734	933
	K7;	Gld	4/53:74	067/97:8	3/:33;75	486/<6:	3/3668:39	48;/778	48:/7;;
		Qrlwh	4/53:74	067/97:8	3/:33;75	486/<6:	3/3668:39	48;/778	48:/7;;
	K7<	Gld	3/338:5687	067/97:8	3/9<:735	4;8/:4	3/3356<;85	47;/;38	6933
		Qrlwh	3/338:5687	067/97:8	3/9<:735	4;8/:4	3/3356<;85	47;/;38	6933
	K83	Gld	4/53:74	067/97:8	3/:33;75	486/<6:	3/3668:39	48;/778	48:/7;;
		Qrlwh	4/53:74	067/97:8	3/:33;75	486/<6:	3/3668:39	48;/778	48:/7;;
	K84	Gld	3/338:5687	067/97:8	3/9<:735	4;8/:4	3/3356<;85	47;/;38	6933
		Qrlwh	3/338:5687	067/97:8	3/9<:735	4;8/:4	3/3356<;85	47;/;38	6933
Vwxg|_4#0 LI# +Xehudqgld, _Ghs%vlwr#gh#Wlqwdv	K85	Gld		57/8	4	43333		3	
		Qrlwh		57/8	4	43333		3	

	K86	Gld	3/46954 4	57/7<::	4	:963/65	3/33::7 8<:	7/97857	<46/97<
		Qrlwh	3/46954 4	57/7<::	4	:854/85	3/33::7 8<:	7/97857	<46/97<
Vwxg|_4#0 LI# +Xehudqgld, _Ghs%vlwr#gh#Wlqwdv# +P lvwxud,	K87	Gld		57/8	4	43333		3	
		Qrlwh		57/8	4	43333		3	
	K88	Gld	3/46954 4	57/7<::	4	:963/65	3/33::7 8<:	7/97857	5:73/<8
		Qrlwh	3/46954 4	57/7<::	4	:854/85	3/33::7 8<:	7/97857	5:73/<8

Dispersion Results

Input dispersion parameters

Fruh#dyhudjlqj#wlph	4;/:8	v
Iodppdeoh#dyhudjlqj#wlph	4;/:8	v
Wr{lf#dyhudjlqj#wlph	933	v
Khljkw#ri#lqwhuhvw	3	p

Distance downwind to defined concentrations

Wkh#uhsruwhg#frqfhqwudwlrq#ri#lqwhuhvw#lv#ghilqhg#dw#wkh#vfhqdulr

Path	Scenario	Weather	Distance to UFL [m]	Distance to LFL [m]	Distance to LFL fraction [m]
Vwxg|_4#0 LI#+Xehuodqgld, _Fduhwd#Wdqtxh	K34	Gld	;5/:8<4	648/7<5	753/9:4
		Qrlwh	:3/5776	63;/657	747/5;7
	K35	Gld	q2d	464/75<	549/5::
		Qrlwh	q2d	463/<68	569/934
Vwxg|_4#0 LI#+Xehuodqgld, _Ghvfdujd#gh#Fduhwd#Wdqtxh#4	K36D	Gld	q2d	86/986	444/555
		Qrlwh	q2d	8;/7;:4	454/<4<
	K37D	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Ghvfdujd#gh#Fduhwd#Wdqtxh#5	K36E	Gld	q2d	477/<3;	569/<76
		Qrlwh	q2d	476/796	58</3;9
	K37E	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K38E	Gld	q2d	q2d	69/;35;
		Qrlwh	q2d	q2d	74/3997
	K39E	Gld	q2d	q2d	69/;35;
		Qrlwh	q2d	q2d	74/3997
Vwxg|_4#0 LI#+Xehuodqgld, _Wdqtxh#gh#Dupd}hqdphqwr	K3:	Gld	446/557	6<3/:9<	848/;:
		Qrlwh	<</7:<:	6<6/738	858/447
	K3;	Gld	q2d	q2d	4:/<746
		Qrlwh	q2d	q2d	63/659<

	K3<	Gld	5;/7:77	57:/4<8	6;3/788
		Qrlwh	63/9<9:	575/6:<	756/93<
	K43	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Fduuhjdp hqwr#gh#Dxwrwdqtxh#4	K44E	Gld	q2d	88/74:6	446/8<<
		Qrlwh	q2d	93/474	457/88<
	K45E	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K46D	Gld	q2d	q2d	69/;35;
		Qrlwh	q2d	q2d	74/3997
	K47D	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Fduuhjdp hqwr#gh#Dxwrwdqtxh#5	K38D	Gld	q2d	57/8;9<	:5/66<5
		Qrlwh	q2d	5:/979	:7/8:85
	K39D	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K44D	Gld	q2d	477/<3;	569/<76
		Qrlwh	q2d	476/796	58</3;9
	K45D	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K46E	Gld	q2d	57/8;9<	:5/66<5
		Qrlwh	q2d	5:/979	:7/8:85
	K47E	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld,_Dxwr# Wdqtxh	K48	Gld	6</:337	537/837	5:;/75:
		Qrlwh	65/58;	4;</566	58;/59<
	K49	Gld	q2d	465/858	54:/<5
		Qrlwh	q2d	464/<8;	56;/747
Vwxg|_4#0 LI#+Xehudqgld,_Dxwr# Wdqtxh#Shuqrlwh	K48	Gld	6</:337	537/837	5:;/75:
		Qrlwh	65/58;	4;</566	58;/59<
	K49	Gld	q2d	465/858	54:/<5
		Qrlwh	q2d	464/<8;	56;/747

<table>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Hqjduudidp hqwr#4</td><td>K4:D</td><td>Gld</td><td>q2d</td><td>473/5;:</td><td>563/875</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>46</398</td><td>584/<;<</td></tr>
<tr><td></td><td>K4;D</td><td>Gld</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Hqjduudidp hqwr#5</td><td>K4:E</td><td>Gld</td><td>56/9<45</td><td>555/46;</td><td>679/<;</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>58/<374</td><td>54:/6<6</td><td>6;6/9;9</td></tr>
<tr><td></td><td>K4;E</td><td>Gld</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>44/9::6</td></tr>
<tr><td></td><td>K4<</td><td>Gld</td><td>q2d</td><td>84/544:</td><td>43:/;67</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>89/56;</td><td>44;/66:</td></tr>
<tr><td></td><td>K53</td><td>Gld</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dup d}hqdp hqwr#S46</td><td>Fdwdvwursklf#
uxswxuh</td><td>Gld</td><td>4/868:4</td><td>8/347;;</td><td>47/676:</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>4/8546;</td><td>6/;835;</td><td>43/59</td></tr>
<tr><td></td><td>Ohdn</td><td>Gld</td><td>q2d</td><td>q2d</td><td>4:/8:;8</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>5;/:946</td></tr>
<tr><td></td><td>Il{hg#gxudwlrq#
uhdndvh</td><td>Gld</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dup d}hqdp hqwr#S53</td><td>Fdwdvwursklf#
uxswxuh</td><td>Gld</td><td>4/868:4</td><td>8/3478:</td><td>47/675</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>4/85474</td><td>6/;8347</td><td>43/58;;</td></tr>
<tr><td></td><td>Ohdn</td><td>Gld</td><td>q2d</td><td>q2d</td><td>4:/95:4</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>5;/:<:7</td></tr>
<tr><td></td><td>Il{hg#gxudwlrq#
uhdndvh</td><td>Gld</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dup d}hqdp hqwr#S78</td><td>Fdwdvwursklf#
uxswxuh</td><td>Gld</td><td>5/9865;</td><td></4;<58</td><td>63/4375</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>5/8<77;</td><td>:/59945</td><td>56/7566</td></tr>
<tr><td></td><td>Ohdn</td><td>Gld</td><td>q2d</td><td>q2d</td><td>4:/9:89</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>63/394:</td></tr>
<tr><td></td><td>Il{hg#gxudwlrq#
uhdndvh</td><td>Gld</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>q2d</td><td>q2d</td><td>q2d</td></tr>
</table>

Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfro‰jlfd	K63	Gld	q2d	86/3787	443/745
		Qrlwh	q2d	8:/<677	454/389
	K64	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdtflr#4	K65	Gld	q2d	q2d	76/<;84
		Qrlwh	q2d	q2d	83/3<74
	K66	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdtflr#5	K67E	Gld	q2d	q2d	76/<;84
		Qrlwh	q2d	q2d	83/3<74
	K68E	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K69D	Gld	q2d	57/8;9<	:5/66<5
		Qrlwh	q2d	5:/979	:7/8:85
	K6:D	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdtflr#6	K67D	Gld	q2d	88/74:6	446/8<<
		Qrlwh	q2d	93/474	457/88<
	K68D	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K69E	Gld	q2d	q2d	69/;35;
		Qrlwh	q2d	q2d	74/3997
	K6:E	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Wdqtxh#gh#Ghfdqwdtflr	K6;	Gld	44/9::7	444/757	495/98
		Qrlwh	43/46;6	433/479	478/565
	K6<	Gld	q2d	q2d	4:/9<<9
		Qrlwh	q2d	q2d	63/3;94
	K73	Gld	q2d	48/::58	8;/:;4<
		Qrlwh	q2d	56/5<37	97/<64:
	K74	Gld	q2d	q2d	q2d

		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld,_Frdnwd# gh#Rdnlqd	K75	Gld	q2d	84/544:	43:/;67
		Qrlwh	q2d	89/56;	44;/66:
	K76	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Dup d}hqdp hqwr#S4<3	K78	Gld	7/88796	5:/;;45	94/:34<
		Qrlwh	7/73:;8	56/786:	84/<365
	K79	Gld	q2d	q2d	4:/9:89
		Qrlwh	q2d	q2d	63/394:
	K7:	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K7;	Gld	q2d	q2d	49/5596
		Qrlwh	q2d	q2d	5;/6584
	K7<	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
	K83	Gld	q2d	q2d	49/5596
		Qrlwh	q2d	q2d	5;/6584
	K84	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Ghs%vlwr#gh#Wlqwdv	K85	Gld	;/84898	58/63;4	68/::65
		Qrlwh	</86869	53/57;8	5:/4<6<
	K86	Gld	q2d	q2d	q2d
		Qrlwh	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Ghs%vlwr#gh#Wlqwdv#+P lvwxud,	K87	Gld	45/<7;<	66/:53<	7:/3;;;
		Qrlwh	45/99;9	58/<38;	67/65:<
	K88	Gld	q2d	03/346:37	7/49:4;
		Qrlwh	q2d	4/8;378	;/9:97:

Jet Fire Results

Distance downwind to defined radiation levels

Wkh#uhsruwhg#udgldwlrqv#duh#ghilqhg#lq#wkh#sdudp hwhuv

Path	Scenario	Weather	Flame length [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Vwxg|_4#0 LI#+X ehudqgld, _Fduhwd#Wdqtxh	K35	Gld	83/::;8	<3/5<:9	::/397;	9:/<<4:
		Qrlwh	86/:;9<	<5/95<9	:</7;8:	:3/7696
Vwxg|_4#0 LI#+X ehudqgld, _Ghvfdujd#gh#Fduhwd# Wdqtxh#4	K36D	Gld	5</<436	84/:34<	77/5699	6</3:6<
		Qrlwh	64/9;57	86/3:67	78/98;6	73/834
	K37D	Gld	6/754:8	8/453:8	7/5<664	6/8:;7<
		Qrlwh	6/9577:	8/5:<<6	7/78686	6/93999
Vwxg|_4#0 LI#+X ehudqgld, _Ghvfdujd#gh#Fduhwd# Wdqtxh#5	K36E	Gld	87/98;7	<:/8;<5	;6/5:9	:6/7::;
		Qrlwh	8:/;<9:	433/3<<	;8/;;;6	:9/4447
	K37E	Gld	9/;7758	44/396<	</84<3;	;/6<8<<
		Qrlwh	:/57<:7	44/6:85	</;6686	;/:3;::
	K38E	Gld	56/789;	5</9;6;	59/595	56/6;47
		Qrlwh	55/;54<	5</5356	58/8;46	55/9<8;
	K39E	Gld	56/789;	5</9;6;	59/595	56/6;47
		Qrlwh	55/;54<	5</5356	58/8;46	55/9<8;
Vwxg|_4#0 LI#+X ehudqgld, _Wdqtxh#gh#Dup d}hqdp hqwr	K3;	Gld	45/947;	53/<44<	4:/<84:	48/;8<:
		Qrlwh	46/6955	54/7;<	4;/875	49/7798
	K3<	Gld	;5/4<34	483/48;	45:/;;4	445/:3<
		Qrlwh	;:/38<8	486/<64	464/;47	449/9;<
	K43	Gld	68/447<	5</337	;/6;5<7	q2d
		Qrlwh	69/<969	57/<3;6	q2d	q2d
Vwxg|_4#0 LI#+X ehudqgld, _Fduhjdp hqwr#gh# Dxwrwdqtxh#4	K44E	Gld	63/6<<	85/8<39	77/<<68	6</:746

		Qrlwh	65/5	86/<;7;	79/76;9	74/4<55
	K45E	Gld	6/7999	8/4<<;;	7/69685	6/9:7<<
		Qrlwh	6/9:4<;	8/69445	7/8596<	6/994<;
	K46D	Gld	56/789;	5</9;6;	59/595	56/6;47
		Qrlwh	55/;54<	5</5356	58/8;46	55/9<8;
	K47D	Gld	5/5;4:9	q2d	q2d	q2d
		Qrlwh	5/59;7;	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Fduuhjdp hqwr#gh# Dxwrwdqtxh#5	K38D	Gld	65/:<88	76/87;:	6;/6<8;	66/8<38
		Qrlwh	64/<43<	75/<59	6:/7;69	65/:335
	K39D	Gld	6/8445	q2d	q2d	q2d
		Qrlwh	6/7;689	q2d	q2d	q2d
	K44D	Gld	87/98;7	<:/8;<5	;6/5:9	:6/7::;
		Qrlwh	8:/;<9:	433/3<<	;8/;;;6	:9/4447
	K45D	Gld	9/<75;7	44/55<:	</98:66	;/85564
		Qrlwh	:/6874:	44/8789	</<:<:5	;/;6<;9
	K46E	Gld	65/:<88	76/87;:	6;/6<8;	66/8<38
		Qrlwh	64/<43<	75/<59	6:/7;69	65/:335
	K47E	Gld	6/8445	q2d	q2d	q2d
		Qrlwh	6/7;689	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Dxwr#Wdqtxh	K49	Gld	84/3<5<	<3/;;:8	::/89:4	9;/7684
		Qrlwh	87/44<<	<6/566<	;3/3364	:3/;<7<
Vwxg|_4#0 LI#+Xehudqgld, _Dxwr#Wdqtxh#Shuqrlwh		Gld	84/3<5<	<3/;;:8	::/89:4	9;/7684
		Qrlwh	87/44<<	<6/566<	;3/3364	:3/;<7<
Vwxg|_4#0 LI#+Xehudqgld, _Hqjduudidp hqwr#4	K4:D	Gld	86/7475	<8/5795	;4/5;8;	:4/:58:
		Qrlwh	89/8:;:	<:/9<<7	;6/;667	:7/5<;9
	K4;D	Gld	9/:3:68	43/;668	</6535<	;/55377
		Qrlwh	:/437:6	44/46;:	</96364	;/8598<
Vwxg|_4#0 LI#+Xehudqgld, _Hqjduudidp hqwr#5	K4:E	Gld	:8/9:39	46:/8;6	44:/569	436/69<
		Qrlwh	;3/486:	474/38:	453/;89	43:/36
	K4;E	Gld	</;948:	49/4;34	46/<37	45/5;54
		Qrlwh	43/778;	49/95<<	47/6988	45/:74

	K4<	Gld	5</567	83/7:66	76/4<34	6;/4844
		Qrlwh	63/<99	84/;466	77/8:<5	6</8786
	K53	Gld	6/68;96	8/33<9<	7/4<665	6/676;
		Qrlwh	6/88:95	8/498<8	7/6887;	6/863<<
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S46	Ohdn	Gld	45/87:;	53/:<88	4:/;84<	48/::45
		Qrlwh	46/5<45	54/69<7	4;/76<	49/687;
	Il{hg# gxudwlrq# uhdndvh	Gld	5/448;7	5/;5:98	4/<<;75	q2d
		Qrlwh	5/5744<	5/<55;<	5/439;:	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S53	Ohdn	Gld	45/889;	53/;445	4:/;986	48/:;64
		Qrlwh	46/633:	54/6;87	4;/785<	49/69:4
	Il{hg# gxudwlrq# uhdndvh	Gld	5/448::	5/;5:89	4/<<;66	q2d
		Qrlwh	5/57445	5/<55:<	5/439:<	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S78	Ohdn	Gld	45/898;	53/;59;	4:/;:;:	48/:<7<
		Qrlwh	46/6435	54/7348	4;/799:	49/6:<7
	Il{hg# gxudwlrq# uhdndvh	Gld	6/996:8	8/883;4	7/99:59	6/<<9;<
		Qrlwh	6/;;3;4	8/:5336	7/;7456	7/4:759
Vwxg|_4#0 LI#+Xehuodqgld, _Olqkd#Hfrd‰jlfd	K63	Gld	5</:77	84/6<<8	76/<:<5	6;/;7:
		Qrlwh	64/8395	85/:966	78/6<5;	73/599
	K64	Gld	6/73946	8/3<65:	7/59;94	6/6<:8
		Qrlwh	6/93:<6	8/584:6	7/75;4<	6/8;:96
Vwxg|_4#0 LI#+Xehuodqgld, _Olqkd#Hfrorjlfd#2# Ghfdqwdtflr#4	K65	Gld	49/6:<5	5:/7;74	56/8:7<	53/;64:
		Qrlwh	4:/67<9	5;/568<	57/67:8	54/938<
	K66	Gld	4/9894;	4/;783;	q2d	q2d
		Qrlwh	4/:876	4/;<76<	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Olqkd#Hfrorjlfd#2# Ghfdqwdtflr#5	K67E	Gld	49/6:<5	5:/7;74	56/8:7<	53/;64:
		Qrlwh	4:/67<9	5;/568<	57/67:8	54/938<

	K68E	Gld	4/9894;	4/;783;	q2d	q2d
		Qrlwh	4/:876	4/;<76<	q2d	q2d
	K69D	Gld	65/:<88	76/87;:	6;/6<8;	66/8<38
		Qrlwh	64/<43<	75/<59	6:/7;69	65/:335
	K6:D	Gld	6/8445	q2d	q2d	q2d
		Qrlwh	6/7;689	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Olqkd#Hfrorjlfd#2# Ghfdqwd†flr#6	K67D	Gld	63/6<<	85/8<39	77/<<68	6</:746
		Qrlwh	65/5	86/<;7;	79/76;9	74/4<55
	K68D	Gld	6/7999	8/4<<;;	7/69685	6/9:7<<
		Qrlwh	6/9:4<;	8/69445	7/8596<	6/994<;
	K69E	Gld	56/789;	5</9;6;	59/595	56/6;47
		Qrlwh	55/;54<	5</5356	58/8;46	55/9<8;
	K6:E	Gld	5/5;4:9	q2d	q2d	q2d
		Qrlwh	5/59;7;	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Wdqtxh#gh#Ghfdqwd†flr	K6<	Gld	45/8:36	53/;679	4:/;;87	48/;33<
		Qrlwh	46/648	54/73<8	4;/7:69	49/6;89
	K73	Gld	4</4887	65/6:87	5:/:7:	57/8458
		Qrlwh	53/5<36	66/5859	5;/9857	58/7488
	K74	Gld	9/7875;	q2d	q2d	q2d
		Qrlwh	9/:<648	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehuodqgld, _Frdnwd#gh#Rdnlqd	K75	Gld	5</567	83/7:66	76/4<34	6;/4844
		Qrlwh	63/<99	84/;466	77/8:<5	6</8786
	K76	Gld	6/68;96	8/33<9<	7/4<665	6/676;
		Qrlwh	6/88:95	8/498<8	7/6887;	6/863<<
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S4<3	K79	Gld	45/898;	53/;59;	4:/;:;:	48/:<7<
		Qrlwh	46/6435	54/7348	4;/799:	49/6:<7
	K7:	Gld	9/;<57:	44/47	</8;537	;/77<
		Qrlwh	:/633;4	44/7868	</;<<;8	;/:96::
	K7;	Gld	45/6367	53/6:<8	4:/7<<<	48/797:
		Qrlwh	46/3656	53/<754	4;/3:89	49/369;
	K7<	Gld	4/4;3<6	q2d	q2d	q2d

		Qrlwh	4/583;<	q2d	q2d	q2d
	K83	Gld	45/6367	53/6:<8	4:/7<<<	48/797:
		Qrlwh	46/3656	53/<754	4;/3:89	49/369;
	K84	Gld	4/4;3<6	q2d	q2d	q2d
		Qrlwh	4/583;<	q2d	q2d	q2d
Vwxg|_4#0 LI#+Xehudqgld, _Ghs%vlwr#gh#Wlqwdv	K86	Gld	6/:6;46	7/;<459	7/44776	6/6:4;;
		Qrlwh	6/<9;4;	8/4354<	7/638;<	6/:9;47
Vwxg|_4#0 LI#+Xehudqgld, _Ghs%vlwr#gh#Wlqwdv# +Plvwxud,	K88	Gld	6/:6;46	7/;<459	7/44776	6/6:4;;
		Qrlwh	6/<9;4;	8/4354<	7/638;<	6/:9;47

Early Pool Fire Results

Distance downwind to defined radiation levels

Wkh#uhsruwhg#udgldwlrqv#duh#ghilqhg#lq#wkh#sdudp hwhuv

<table>
<tr><th>Path</th><th>Scenario</th><th>Weather</th><th>Pool diameter [m]</th><th>Distance downwind to intensity level 1 (9,85 kW/m2) [m]</th><th>Distance downwind to intensity level 2 (19,45 kW/m2) [m]</th><th>Distance downwind to intensity level 3 (35 kW/m2) [m]</th></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Ghs%vlwr#gh#Wlqwdv</td><td>K86</td><td>Gld</td><td>4/4:476</td><td>;/;7495</td><td>:/43<:9</td><td>7/7::68</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>4/4;93;</td><td>;/7593<</td><td>9/8963<</td><td>7/43999</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Ghs%vlwr#gh#Wlqwdv#
+P lvwxud,</td><td>K88</td><td>Gld</td><td>4/4:476</td><td>;/;7495</td><td>:/43<:9</td><td>7/7::68</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>4/4;93;</td><td>;/7593<</td><td>9/8963<</td><td>7/43999</td></tr>
</table>

Late Pool Fire Results

Distance downwind to defined radiation levels

Wkh#uhsruwhg#udgldwlrqv#duh#ghilqhg#lq#wkh#sdudp hwhuv

<table>
<tr><th>Path</th><th>Scenario</th><th>Weather</th><th>Pool diameter [m]</th><th>Distance downwind to intensity level 1 (9,85 kW/m2) [m]</th><th>Distance downwind to intensity level 2 (19,45 kW/m2) [m]</th><th>Distance downwind to intensity level 3 (35 kW/m2) [m]</th></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Fduuhwd#Wdqtxh</td><td>K34</td><td>Gld</td><td>8</65<5</td><td>4;7/<8;</td><td>475/48<</td><td>446/<<6</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>93/539;</td><td>4;8/4<:</td><td>475/37:</td><td>445/667</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Wdqtxh#gh#Dup d}hqdp hqwr</td><td>K3:</td><td>Gld</td><td>;5/<7:;</td><td>57;/5<6</td><td>4<3/7<6</td><td>485/:48</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>;7/49;:</td><td>57</337</td><td>4<3/:89</td><td>484/357</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dxwr#Wdqtxh</td><td>K48</td><td>Gld</td><td>5</79<7</td><td><:/;649</td><td>:8/4964</td><td>8</:686</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>5</::49</td><td><:/7;6</td><td>:7/9;8:</td><td>8;/6;66</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dxwr#Wdqtxh#Shuqrlwh</td><td></td><td>Gld</td><td>5</79<7</td><td><:/;649</td><td>:8/4964</td><td>8</:686</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>5</::49</td><td><:/7;6</td><td>:7/9;8:</td><td>8;/6;66</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dup d}hqdp hqwr#S46</td><td>Fdwdvwurskl f#
uxswxuh</td><td>Gld</td><td>3/<4<<<6</td><td>7/45;;</td><td>5/896:5</td><td>4/87994</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>3/<4<944</td><td>7/334<<</td><td>5/73<<8</td><td>4/84565</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dup d}hqdp hqwr#S53</td><td></td><td>Gld</td><td>3/<4<<;;</td><td>7/45;:;</td><td>5/896:</td><td>4/87994</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>3/<4<93:</td><td>7/334<:</td><td>5/73<<7</td><td>4/84565</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dup d}hqdp hqwr#S78</td><td></td><td>Gld</td><td>4/<8737</td><td>;/9;6;5</td><td>9/:37<9</td><td>6/73;;4</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>4/<86<</td><td>;/83:85</td><td>9/6:;<8</td><td>6/593;;</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Wdqtxh#gh#Ghfdqwd†flr</td><td>K6;</td><td>Gld</td><td>46/:9<:</td><td>7</9678</td><td>6;/6;89</td><td>63/3696</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>46/;984</td><td>7</463:</td><td>6:/;499</td><td>5;/<<8:</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Dup d}hqdp hqwr#S4<3</td><td>K78</td><td>Gld</td><td>7/586:<</td><td>4:/8474</td><td>46/:3;:</td><td>;/;63::</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>7/59386</td><td>4:/43;9</td><td>46/5:7</td><td>;/763;5</td></tr>
<tr><td>Vwxg|_4#0 LI#+Xehudqgld,
_Ghs%vlwr#gh#Wlqwdv</td><td>K85</td><td>Gld</td><td>9/;57::</td><td>55/8:<9</td><td>46/5<;4</td><td>:/48::5</td></tr>
<tr><td></td><td></td><td>Qrlwh</td><td>9/;8435</td><td>54/9557</td><td>45/:5:8</td><td>9/<:;86</td></tr>
</table>

	K86	Gld	7/73<:<	4</5778	46/55;;	:/7557;
		Qrlwh	7/97::8	4;/;84;	45/84	:/38<49
Vwxg|_4#0 LI#+Xehudqgld, _Ghs%vlwr#gh#Wlqwdv# +P lvwxud,	K87	Gld	44/:;;:	58/75;4	4:/48:6	46/596<
		Qrlwh	44/;<36	57/<59<	49/:7<7	45/;73;
	K88	Gld	8/67944	54/6898	46/<6;9	:/:439:
		Qrlwh	8/:749<	54/384:	46/558:	:/69:84

Fireball Results

Distance downwind to defined radiation levels

Wkh#uhsruwhg#udgldwlrqv#duh#ghilqhg#lq#wkh#sdudp hwhuv

Path	Scenario	Weather	Fireball diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Vwxg|_4#0 LI#+Xehudqggld, _Fduuhwd#Wdqtxh	K34	Gld	4::/;5<	6:4/557	598/4;4	4<8/5;6
		Qrlwh	4::/;5<	6:4/749	598/63<	4<8/6:7
Vwxg|_4#0 LI#+Xehudqggld, _Wdqtxh#gh#Dup d}hqdp hqwr	K3:	Gld	54</5:9	795/99:	664/4<:	577/79;
		Qrlwh	54</5:9	795/<55	664/69:	577/8;;
Vwxg|_4#0 LI#+Xehudqggld, _Dxwr#Wdqtxh	K48	Gld	449/83;	56;/67:	49</8<4	457/65:
		Qrlwh	449/83;	56;/789	49</997	457/6:;
Vwxg|_4#0 LI#+Xehudqggld, _Dxwr#Wdqtxh#Shuqrlwh		Gld	449/83;	56;/67:	49</8<4	457/65:
		Qrlwh	449/83;	56;/789	49</997	457/6:;
Vwxg|_4#0 LI#+Xehudqggld, _Dup d}hqdp hqwr#S46	Fdwdvwurskfl# uxswxuh	Gld	46/4:38	56/3397	49/35<6	44/68;4
		Qrlwh	46/4:38	56/3449	49/365:	44/6937
	Ohdn	Gld	46/4:37	56/3465	49/3677	44/6956
		Qrlwh	46/4:37	56/34;8	49/36:;	44/6978
Vwxg|_4#0 LI#+Xehudqggld, _Dup d}hqdp hqwr#S53	Fdwdvwurskfl# uxswxuh	Gld	46/4:38	56/344<	49/3667	44/6947
		Qrlwh	46/4:38	56/34:4	49/369;	44/696:
	Ohdn	Gld	46/4:36	56/3574	49/3759	44/69;<
		Qrlwh	46/4:36	56/35<7	49/379	44/6:45
Vwxg|_4#0 LI#+Xehudqggld, _Dup d}hqdp hqwr#S78	Fdwdvwurskfl# uxswxuh	Gld	4</<56	69/3788	58/554;	4:/<;8:
		Qrlwh	4</<56	69/3884	58/55:<	4:/<;<<
Vwxg|_4#0 LI#+Xehudqggld, _Wdqtxh#gh#Ghfdqwdflr	K6;	Gld	:3/8:44	46</<:7	<</3<<:	:5/568:
		Qrlwh	:3/8:44	473/35<	<</4694	:5/5945
Vwxg|_4#0 LI#+Xehudqggld, _Dup d}hqdp hqwr#S4<3	K78	Gld	65/534	93/796;	75/83:<	63/879:

		Qrlwh	65/534	93/7;58	75/8534	63/8885

Flash Fire Results

Distance downwind to defined concentrations

Wkh#uhsruwhg#OIO#dqg#OIO#iudfwlrq#duh#ghilqhg#lq#wkh#uhvshfwlyh#p dwhuldo#surshuw|

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Vwxg|_4#0 LI#+Xehuodqgld,_Fduuhwd# Wdqtxh	K34	Gd	648/7<5	753/9:4
		Qrlwh	63;/657	747/5;7
	K35	Gd	464/75<	549/5::
		Qrlwh	463/<68	569/934
Vwxg|_4#0 LI#+Xehuodqgld,_Ghvfdujd#gh# Fduuhwd#Wdqtxh#4	K36D	Gd	86/986	444/555
		Qrlwh	8;/7;:4	454/<4<
	K37D	Gd		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Ghvfdujd#gh# Fduuhwd#Wdqtxh#5	K36E	Gd	477/<3;	569/<76
		Qrlwh	476/796	58</3;9
	K37E	Gd		
		Qrlwh		
	K38E	Gd		69/;35;
		Qrlwh		74/3997
	K39E	Gd		69/;35;
		Qrlwh		74/3997
Vwxg|_4#0 LI#+Xehuodqgld,_Wdqtxh#gh# Dup d}hqdp hqwr	K3:	Gd	6<3/:9<	848/;:
		Qrlwh	6<6/738	858/447
	K3;	Gd		4:/<746
		Qrlwh		63/659<
	K3<	Gd	57:/4<8	6;3/788
		Qrlwh	575/6:<	756/93<
	K43	Gd		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld, _Fduhjdp hqwr#gh#Dxwrwdqtxh#4	K44E	Gd	88/74:6	446/8<<

		Qrlwh	93/474	457/88<
	K45E	Gld		
		Qrlwh		
	K46D	Gld		69/;35;
		Qrlwh		74/3997
	K47D	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehudqgld, _Fduuhjdp hqwr#gh#Dxwrwdqtxh#5	K38D	Gld	57/8;9<	:5/66<5
		Qrlwh	5:/979	:7/8:85
	K39D	Gld		
		Qrlwh		
	K44D	Gld	477/<3;	569/<76
		Qrlwh	476/796	58</3;9
	K45D	Gld		
		Qrlwh		
	K46E	Gld	57/8;9<	:5/66<5
		Qrlwh	5:/979	:7/8:85
	K47E	Gld		
		Qrlwh		
Vwxg|_4#0#LI#+Xehudqgld,_Dxwr#Wdqtxh	K48	Gld	537/837	5:;/75:
		Qrlwh	4;</566	58;/59<
	K49	Gld	465/858	54:/<5
		Qrlwh	464/<8;	56;/747
Vwxg|_4#0 LI#+Xehudqgld,_Dxwr#Wdqtxh# Shuqrlwh	K48	Gld	537/837	5:;/75:
		Qrlwh	4;</566	58;/59<
	K49	Gld	465/858	54:/<5
		Qrlwh	464/<8;	56;/747
Vwxg|_4#0 LI#+Xehudqgld, _Hqjduudidp hqwr#4	K4:D	Gld	473/5;:	563/875
		Qrlwh	46</398	584/<;<
	K4;D	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehudqgld, _Hqjduudidp hqwr#5	K4:E	Gld	555/46;	679/<;

		Qrlwh	54:/6<6	6;6/9;9
	K4;E	Gld		
		Qrlwh		44/9::6
	K4<	Gld	84/544:	43:/;67
		Qrlwh	89/56;	44;/66:
	K53	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S46	Fdwdvwurskl f# uxswxuh	Gld	8/347;;	47/676:
		Qrlwh	6/;835;	43/59
	Ohdn	Gld		4:/8:;8
		Qrlwh		5;/:946
	Il{hg#gxudwlrq# uhdndvh	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S53	Fdwdvwurskl f# uxswxuh	Gld	8/3478:	47/675
		Qrlwh	6/;8347	43/58;;
	Ohdn	Gld		4:/95:4
		Qrlwh		5;/:<:7
	Il{hg#gxudwlrq# uhdndvh	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S78	Fdwdvwurskl f# uxswxuh	Gld	</4;<58	63/4375
		Qrlwh	:/59945	56/7566
	Ohdn	Gld		4:/9:89
		Qrlwh		63/394:
	Il{hg#gxudwlrq# uhdndvh	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfro‰jlfd	K63	Gld	86/3787	443/745
		Qrlwh	8:/<677	454/389
	K64	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdflr#4	K65	Gld		76/<;84

		Qrlwh		83/3<74
	K66	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdflr#5	K67E	Gld		76/<;84
		Qrlwh		83/3<74
	K68E	Gld		
		Qrlwh		
	K69D	Gld	57/8;9<	:5/66<5
		Qrlwh	5:/979	:7/8:85
	K6:D	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdflr#6	K67D	Gld	88/74:6	446/8<<
		Qrlwh	93/474	457/88<
	K68D	Gld		
		Qrlwh		
	K69E	Gld		69/;35;
		Qrlwh		74/3997
	K6:E	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Wdqtxh#gh# Ghfdqwdflr	K6;	Gld	444/757	495/98
		Qrlwh	433/479	478/565
	K6<	Gld		4:/9<<9
		Qrlwh		63/3;94
	K73	Gld	48/::58	8;/:;4<
		Qrlwh	56/5<37	97/<64:
	K74	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Frdnwd#gh# Rdlqd	K75	Gld	84/544:	43:/;67
		Qrlwh	89/56;	44;/66:
	K76	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,	K78	Gld	5:/;;45	94/:34<

_Dup d}hqdp hqwr#S4<3

		Qrlwh	56/786:	84/<365
	K79	Gld		4:/9:89
		Qrlwh		63/394:
	K7:	Gld		
		Qrlwh		
	K7;	Gld		49/5596
		Qrlwh		5;/6584
	K7<	Gld		
		Qrlwh		
	K83	Gld		49/5596
		Qrlwh		5;/6584
	K84	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Ghs%vlwr#gh# Wlqwdv	K85	Gld	58/63;4	68/::65
		Qrlwh	53/57;8	5:/4<6<
	K86	Gld		
		Qrlwh		
Vwxg|_4#0 LI#+Xehuodqgld,_Ghs%vlwr#gh# Wlqwdv#+P lvwxud,	K87	Gld	66/:53<	7:/3;;;
		Qrlwh	58/<38;	67/65:<
	K88	Gld	03/346:37	7/49:4;
		Qrlwh	4/8;378	;/9:97:

Maximum distance to LFL fraction at any height

Path	Scenario	Weather	Max flash fire distance [m]	Height of the max flash fire distance [m]	Time [s]
Vwxg|_4#0 LI#+Xehuodqgld, _Fduuhwd#Wdqtxh	K34	Gld	74;/5;	3	;8/;767
		Qrlwh	73</996	3	439/76;
	K35	Gld	549/564	3	;7/:78:
		Qrlwh	569/69:	3	53</37;
Vwxg|_4#0 LI#+Xehuodqgld, _Ghvfdujd#gh#Fduuhwd#Wdqtxh#4	K36D	Gld	443/::8	3	:4/95;:

		Qrlwh	454/87<	3	544/48
	K37D	Gld	6/;994;	3/<:7<:9	4/<4:<8
		Qrlwh	6/9<335	3/<:9<;<	4/<4:<7
Vwxg|_4#0 LI#+Xehuodqgld, _Ghvfdujd#gh#Fduuhwd#Wdqtxh#5	K36E	Gld	569/:<9	3	449/8;4
		Qrlwh	58</3:;	3	638/7<<
	K37E	Gld	;/38;;8	3/<4::44	4/<4:<;
		Qrlwh	</5<595	3/;7<<78	:/84799
	K38E	Gld	74/:3;4	3/;56;;<	:/848:5
		Qrlwh	76/59:6	3/;33446	56/;834
	K39E	Gld	74/:3;4	3/;56;;<	:/848:5
		Qrlwh	76/59:6	3/;33446	56/;834
Vwxg|_4#0 LI#+Xehuodqgld, _Wdqtxh#gh#Dup d}hqdp hqwr	K3:	Gld	83</:5	3	<4/7:7<
		Qrlwh	84:/45<	3	485/839
	K3;	Gld	59/<645	3/93546:	:/848;6
		Qrlwh	64/384	3/6394<9	56/;856
	K3<	Gld	6:</<56	3	448/5:4
		Qrlwh	756/795	3	633
	K43	Gld	:/:7374	58/36:	9/:675<
		Qrlwh	:/:7;76	59/9995	9/:6767
Vwxg|_4#0 LI#+Xehuodqgld, _Fduuhjdp hqwr#gh#Dxwrwdqtxh#4	K44E	Gld	446/796	3	:4/966:
		Qrlwh	457/878	3	544/488
	K45E	Gld	6/;<:69	3/<:579<	4/<4:<8
		Qrlwh	6/;9394	3/<:7487	4/<4:<8
	K46D	Gld	74/:3;4	3/;56;;<	:/848:5
		Qrlwh	76/59:6	3/;33446	56/;834
	K47D	Gld	5/39<8:	3/<<967<	4/<4:<6
		Qrlwh	5/47:6;	3/<;:8::	4/<4:<6
Vwxg|_4#0 LI#+Xehuodqgld, _Fduuhjdp hqwr#gh#Dxwrwdqtxh#5	K38D	Gld	:8/847<	3/996;<9	56/;89<
		Qrlwh	:7/:<95	3/83563<	56/;88:
	K39D	Gld	6/54;95	3/<<::;<	4/<4:<7
		Qrlwh	6/665:<	3/<;8434	4/<4:<6
	K44D	Gld	569/:<9	3	449/8;4

		Qrlwh	58</3:;	3	638/7<<
	K45D	Gld	;/533:7	3/<4557;	4/<4:<;
		Qrlwh	</7;847	3/;75;6<	:/84799
	K46E	Gld	:8/847<	3/996;<9	56/;89<
		Qrlwh	:7/:<95	3/83563<	56/;88:
	K47E	Gld	6/54;95	3/<<::;<	4/<4:<7
		Qrlwh	6/665:<	3/<;8434	4/<4:<6
Vwxg|_4#0 LI#+Xehuodqgld,_Dxwr# Wdqtxh	K48	Gld	5:8/<9<	3	88/9938
		Qrlwh	58:/5;8	3	:7/;:<:
	K49	Gld	54:/;<4	3	8</;5:
		Qrlwh	56;/54:	3	497/:<9
Vwxg|_4#0 LI#+Xehuodqgld,_Dxwr# Wdqtxh#Shuqrlwh	K48	Gld	5:8/<9<	3	88/9938
		Qrlwh	58:/5;8	3	:7/;:<:
	K49	Gld	54:/;<4	3	8</;5:
		Qrlwh	56;/54:	3	497/:<9
Vwxg|_4#0 LI#+Xehuodqgld, _Hqjduudidp hqwr#4	K4:D	Gld	563/53;	3	454/3:7
		Qrlwh	584/<;4	3	64</4;;
	K4;D	Gld	:/;:499	3/<585<6	4/<4:<;
		Qrlwh	;/<:464	3/;9373<	:/84795
Vwxg|_4#0 LI#+Xehuodqgld, _Hqjduudidp hqwr#5	K4:E	Gld	679/76:	3	495/:;7
		Qrlwh	6;6/7;<	3	6;9/;8:
	K4;E	Gld	48/9<99	3/:97<67	:/84839
		Qrlwh	4;/<439	3/89<698	56/;7;7
	K4<	Gld	43:/:47	3	:4/954:
		Qrlwh	44;/57:	3	544/48
	K53	Gld	6/;5587	3/<:;867	4/<4:<8
		Qrlwh	6/986<9	3/<;435:	4/<4:<7
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S46	Fdwdvwurslf# uxswxuh	Gld	46/385;	3	6/57;7<
		Qrlwh	</95:4;	3	6/7856:
	Ohdn	Gld	59/9579	3/93436<	9/55479
		Qrlwh	5</6<99	3/638:37	44/:8<8

	Il{hg#gxudwlrq# uhdndvh	Gld	5/84;<6	3/<<857;	4/58<<7
		Qrlwh	5/86<5:	3/<:;566	4/58<<7
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S53	Fdwdvwurskl f# uxswxuh	Gld	46/3859	3	6/57;94
		Qrlwh	</959:6	3	6/7856:
	Ohdn	Gld	59/9994	3/9344;;	9/543;4
		Qrlwh	5</74;6	3/638::	44/:656
	Il{hg#gxudwlrq# uhdndvh	Gld	5/84<66	3/<<858;	4/58<<7
		Qrlwh	5/86<55	3/<:;574	4/58<<7
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S78	Fdwdvwurskl f# uxswxuh	Gld	5</<9:4	3	:/97:;;
		Qrlwh	56/5598	3	;/93<;4
	Ohdn	Gld	59/:3:4	3/934669	9/3<49:
		Qrlwh	63/;878	3/638;69	4:/;;86
	Il{hg#gxudwlrq# uhdndvh	Gld	7/4774	3/<<4385	4/58<<<
		Qrlwh	6/<;64:	3/<<5678	4/58<<;
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfro‰jlfd	K63	Gld	443/367	3	5;/837:
		Qrlwh	453/:6<	3	43:/659
	K64	Gld	6/;8847	3/<:8;89	4/<4:<8
		Qrlwh	6/9;44	3/<::<<	4/<4:<7
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdflr#4	K65	Gld	78/3939	3/595<77	56/;898
		Qrlwh	83/3:78	3/399843:	:4/8855
	K66	Gld	5/33<4;	3/<<9::7	4/<4:<7
		Qrlwh	5/34<;9	3/<;68<5	4/<4:<6
Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwdflr#5	K67E	Gld	78/3939	3/595<77	56/;898
		Qrlwh	83/3:78	3/399843:	:4/8855
	K68E	Gld	5/33<4;	3/<<9::7	4/<4:<7
		Qrlwh	5/34<;9	3/<;68<5	4/<4:<6
	K69D	Gld	:8/847<	3/996;<9	56/;89<
		Qrlwh	:7/:<95	3/83563<	56/;88:
	K6:D	Gld	6/54;95	3/<<::;<	4/<4:<7
		Qrlwh	6/665:<	3/<;8434	4/<4:<6

Vwxg|_4#0 LI#+Xehuodqgld,_Olqkd# Hfrorjlfd#2#Ghfdqwd†flr#6	K67D	Gld	446/796	3	:4/966:
		Qrlwh	457/878	3	544/488
	K68D	Gld	6/;<:69	3/<:579<	4/<4:<8
		Qrlwh	6/;9394	3/<:7487	4/<4:<8
	K69E	Gld	74/:3;4	3/;56;;<	:/848:5
		Qrlwh	76/59:6	3/;33446	56/;834
	K6:E	Gld	5/39<8:	3/<<967<	4/<4:<6
		Qrlwh	5/47:6;	3/<;:8::	4/<4:<6
Vwxg|_4#0 LI#+Xehuodqgld, _Wdqtxh#gh#Ghfdqwd†flr	K6;	Gld	493/5<7	3	66/6936
		Qrlwh	475/<99	3	7</8<<7
	K6<	Gld	59/:5:9	3/934739	49/845
		Qrlwh	63/;:57	3/638;:	77/7;76
	K73	Gld	8;/8<36	3/39<5;48	58/55;
		Qrlwh	97/:3<:	3	8;/7947
	K74	Gld	4/448:7	7/::7<;	4/<4:<8
		Qrlwh	4/39;:6	8/79736	4/<4:<9
Vwxg|_4#0 LI#+Xehuodqgld,_Frdhwd# gh#Rdlqd	K75	Gld	43:/:47	3	:4/954:
		Qrlwh	44;/57:	3	544/48
	K76	Gld	6/;5587	3/<:;867	4/<4:<8
		Qrlwh	6/986<9	3/<;435:	4/<4:<7
Vwxg|_4#0 LI#+Xehuodqgld, _Dup d}hqdp hqwr#S4<3	K78	Gld	8;/<689	3	46/3:89
		Qrlwh	84/3595	3	49/;368
	K79	Gld	59/:3:4	3/934669	44/3596
		Qrlwh	63/;878	3/638;69	54/77;:
	K7:	Gld	;/44939	3/<47494	7/43;47
		Qrlwh	</6;89;	3/;76::9	7/43;7
	K7;	Gld	58/5879	3/8<:579	44/636;
		Qrlwh	5</966<	3/63755	55/43:
	K7<	Gld	4/784;8	4/3338<	4/<4:<6
		Qrlwh	4/7;::;	3/<<4558	4/<4:<6
	K83	Gld	58/5879	3/8<:579	44/636;
		Qrlwh	5</966<	3/63755	55/43:

	K84	Gld	4/784;8	4/3338<	4/<4:<6
		Qrlwh	4/7;::;	3/<<4558	4/<4:<6
Vwxg|_4#0LI#+Xehuodqgld, _Ghs%vlwr#gh#Wlqwdv	K85	Gld	68/4564	3	44/5;86
		Qrlwh	5:/3;;6	3	46/5<9;
	K86	Gld	5/47375	3/9:<79;	7/:8:;:
		Qrlwh	5/5895;	3/96;579	7/:8:;:
Vwxg|_4#0LI#+Xehuodqgld, _Ghs%vlwr#gh#Wlqwdv#+Plvwxud,	K87	Gld	6</:479	3	43/58<
		Qrlwh	65/4696	3	45/69;
	K88	Gld	7/<<;77	3/66::<7	46<3/;4
		Qrlwh	;/:3;<6	3/3748647	4865/49

Explosion Results

Explosion scenarios for worst-case maximum downwind distance to defined overpressures. The worst-case explosion will be modelled in the risk calculations if ignition conditions are present at the time for the scenario.

Wkh#uhsruwhg#ryhusuhvvxuhv#duh#ghilqhg#lq#wkh#h{sorvlrq#sdudp hwhuv

Path	Scenario	Weather	Overpressure level [bar]	Maximum distance [m]	Diameter [m]
Vwxg|_4#0 LI#+Xehudqgld, _Fduuhwd#Wdqtxh	K34	Gld	3/4 3/6 3/6	89:/7:; 7:5/::9 7:5/::9	747/<89 458/885 458/885
		Qrlwh	3/4 3/6 3/6	8::/<:5 79;/8; 79;/8;	788/<77 48:/48< 48:/48<
	K35	Gld	3/4 3/6 3/6	599/::: 569/478 569/478	446/887 85/5<34 85/5<34
		Qrlwh	3/4 3/6 3/6	5<5/399 58;/8;4 58;/8;4	457/466 8:/4949 8:/4949
Vwxg|_4#0 LI#+Xehudqgld, _Ghvfdujd#gh#Fduuhwd#Wdqtxh#4	K36D	Gld	3/4 3/6 3/6	46:/:39 455/:8; 455/:8;	88/7458 58/849; 58/849;
		Qrlwh	3/4 3/6 3/6	483/46: 466/;:; 466/;:;	93/5:76 5:/:889 5:/:889
Vwxg|_4#0 LI#+Xehudqgld, _Ghvfdujd#gh#Fduuhwd#Wdqtxh#5	K36E	Gld	3/4 3/6 3/6	5<5/544 58;/97: 58;/97:	457/754 8:/5<77 8:/5<77
		Qrlwh	3/4 3/6 3/6	64:/8<; 5;4/45; 5;4/45;	468/4<8 95/588: 95/588:
	K38E	Gld	3/4 3/6 3/6	83/378: 77/958< 77/958<	53/3<47 </584;5 </584;5
		Qrlwh	3/4 3/6 3/6	83/::46 77/<934 77/<934	54/875: </<5346 </<5346
	K39E	Gld	3/4 3/6 3/6	83/378: 77/958< 77/958<	53/3<47 </584;5 </584;5
		Qrlwh	3/4 3/6 3/6	83/::46 77/<934 77/<934	54/875: </<5346 </<5346
Vwxg|_4#0 LI#+Xehudqgld, _Wdqtxh#gh#Dup d}hqdp hqwr	K3:	Gld	3/4 3/6 3/6	:33/73: 8;9/3<9 8;9/3<9	7;3/;47 4:5/4<6 4:5/4<6
		Qrlwh	3/4 3/6	:5:/9:7 8<6/438	868/67; 4;9/54

			3/6	8<6/438	4;9/54
	K3;	Gld	3/4 3/6 3/6	5:/994< 56/85;5 56/85;5	48/656; :/3897 :/3897
		Qrlwh	3/4 3/6 3/6	6;/7;65 66/<397 66/<397	49/<996 :/;45:: :/;45::
	K3<	Gld	3/4 3/6 3/6	7:8/74< 74;/877 74;/877	543/;6< <:/3;;8 <:/3;;8
		Qrlwh	3/4 3/6 3/6	866/75 7:5/55< 7:5/55<	559/;74 437/78: 437/78:
Vwxg|_4#0 LI#+Xehuodqgld, _Fduhjdp hqwr#gh#Dxwrwdqtxh#4	K44E	Gld	3/4 3/6 3/6	46;/677 456/385 456/385	89/9;;; 59/4378 59/4378
		Qrlwh	3/4 3/6 3/6	483/;66 467/4<; 467/4<;	94/999; 5;/6<9; 5;/6<9;
	K46D	Gld	3/4 3/6 3/6	83/378: 77/958< 77/958<	53/3<47 </584;5 </584;5
		Qrlwh	3/4 3/6 3/6	83/::46 77/<934 77/<934	54/875: </<5346 </<5346
Vwxg|_4#0 LI#+Xehuodqgld, _Fduhjdp hqwr#gh#Dxwrwdqtxh#5	K38D	Gld	3/4 3/6 3/6	;9/:588 ::/:34< ::/:34<	66/783< 48/736: 48/736:
		Qrlwh	3/4 3/6 3/6	;:/:3;5 :;/4877 :;/4877	68/7496 49/63;; 49/63;;
	K44D	Gld	3/4 3/6 3/6	5<5/544 58;/97: 58;/97:	457/754 8:/5<77 8:/5<77
		Qrlwh	3/4 3/6 3/6	64:/8<; 5;4/45; 5;4/45;	468/4<8 95/588: 95/588:
	K46E	Gld	3/4 3/6 3/6	;9/:588 ::/:34< ::/:34<	66/783< 48/736: 48/736:
		Qrlwh	3/4 3/6 3/6	;:/:3;5 :;/4877 :;/4877	68/7496 49/63;; 49/63;;
Vwxg|_4#0 LI#+Xehuodqgld,_Dxwr# Wdqtxh	K48	Gld	3/4 3/6 3/6	699/46< 637/:39 637/:39	5:5/5:< 9</745< 9</745<
		Qrlwh	3/4 3/6 3/6	697/<39 5<4/8<9 5<4/8<9	5;</;45 436/4<5 436/4<5

	K49	Gld	3/4 3/6 3/6	59:/557 569/684 569/684	447/77; 85/:35 85/:35
		Qrlwh	3/4 3/6 3/6	5<5/869 58;/:<: 58;/:<:	458/3:6 8:/8<78 8:/8<78
Vwxg|_4#0 LI#+Xehudqgld,_Dxwr# Wdqtxh#Shuqrlwh	K48	Gld	3/4 3/6 3/6	699/46< 637/:39 637/:39	5:5/5:< 9</745< 9</745<
		Qrlwh	3/4 3/6 3/6	697/<39 5<4/8<9 5<4/8<9	5;</;45 436/4<5 436/4<5
	K49	Gld	3/4 3/6 3/6	59:/557 569/684 569/684	447/77; 85/:35 85/:35
		Qrlwh	3/4 3/6 3/6	5<5/869 58;/:<: 58;/:<:	458/3:6 8:/8<78 8:/8<78
Vwxg|_4#0 LI#+Xehudqgld, _Hqjduudidp hqwr#4	K4:D	Gld	3/4 3/6 3/6	5<3/645 58:/::6 58:/::6	453/958 88/8795 88/8795
		Qrlwh	3/4 3/6 3/6	648/9:7 5;3/575 5;3/575	464/67: 93/7;6: 93/7;6:
Vwxg|_4#0 LI#+Xehudqgld, _Hqjduudidp hqwr#5	K4:E	Gld	3/4 3/6 3/6	767/858 6;6/85; 6;6/85;	4;</38 ;:/3885 ;:/3885
		Qrlwh	3/4 3/6 3/6	7;4/:57 759/;76 759/;76	536/77< <6/9;8: <6/9;8:
	K4;E	Gld	3/4 3/6 3/6	48/:384 45/95:4 45/95:4	44/7435 8/5875: 8/5875:
		Qrlwh	3/4 3/6 3/6	49/4834 45/;65 45/;65	45/6335 8/9974 8/9974
	K4<	Gld	3/4 3/6 3/6	459/:<< 445/674 445/674	86/8<:; 57/9;44 57/9;44
		Qrlwh	3/4 3/6 3/6	46</57 456/798 456/798	8;/7:<< 59/<5<6 59/<5<6
Vwxg|_4#0 LI#+Xehudqgld, _Dup d}hqdp hqwr#S46	Fdwdvwursklf# uxswxuh	Gld	3/4 3/6 3/6	Qr#kd}dug Qr#kd}dug Qr#kd}dug	3 3 3
	Ohdn		3/4 3/6 3/6	5:/9456 56/8387 56/8387	48/5579 :/343:8 :/343:8
		Qrlwh	3/4 3/6	5;/7567 56/;:;;	49/;79: :/:8::

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uxswxuh</td><td>Gld</td><td>3/4
3/6
3/6</td><td>Qr#kd}dug
Qr#kd}dug
Qr#kd}dug</td><td>3
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3/6
3/6</td><td>95/8<99
88/;339
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3/6
3/6</td><td>46;/677
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456/385</td><td>89/9;;;
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59/4378</td></tr>
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		Qrlwh	3/4 3/6 3/6	483/;66 467/4<; 467/4<;	94/999; 5;/6<9; 5;/6<9;
	K69E	Gld	3/4 3/6 3/6	83/378: 77/958< 77/958<	53/3<47 </584;5 </584;5
		Qrlwh	3/4 3/6 3/6	83/::46 77/<934 77/<934	54/875: </<5346 </<5346
Vwxg|_4#0 LI#+Xehuodqgld,_Wdqtxh#gh#Ghfdqwdflr	K6;	Gld	3/4 3/6 3/6	4<</759 4:6/7: 4:6/7:	46;/;85 59/<6<: 59/<6<:
		Qrlwh	3/4 3/6 3/6	4<7/844 48;/484 48;/484	47</354 89/6345 89/6345
	K6<	Gld	3/4 3/6 3/6	5:/96;; 56/84:9 56/84:9	48/5::9 :/36846 :/36846
		Qrlwh	3/4 3/6 3/6	6;/78 66/;<44 66/;<44	49/< :/:;557 :/:;557
	K73	Gld	3/4 3/6 3/6	97/689< 89/9444 89/9444	5;/:46: 46/5556 46/5556
		Qrlwh	3/4 3/6 3/6	:9/447; 9:/753: 9:/753:	65/55<: 47/;747 47/;747
Vwxg|_4#0 LI#+Xehuodqgld,_Frdwd#gh#Rdnlqd	K75	Gld	3/4 3/6 3/6	459/:<< 445/674 445/674	86/8<:; 57/9;44 57/9;44
		Qrlwh	3/4 3/6 3/6	46</57 456/798 456/798	8;/7:<< 59/<5<6 59/<5<6
Vwxg|_4#0 LI#+Xehuodqgld,_Dupd}hqdphqwr#S4<3	K78	Gld	3/4 3/6 3/6	96/9545 89/5:57 89/5:57	5:/5757 45/877; 45/877;
		Qrlwh	3/4 3/6 3/6	96/<74; 89/75 89/75	5:/;;6: 45/;734 45/;734
	K79	Gld	3/4 3/6 3/6	5:/9656 56/8479 56/8479	48/597: :/35<4< :/35<4<
		Qrlwh	3/4 3/6 3/6	6;/7778 66/;;;9 66/;;;9	49/;;< :/:::48 :/:::48
	K7;	Gld	3/4 3/6 3/6	5:/73:9 56/7444 56/7444	47/;485 9/;5555 9/;5555
		Qrlwh	3/4 3/6	5;/498; 56/:936	49/6649 :/8538

			3/6	56/:936	:/8538
	K83	Gld	3/4 3/6 3/6	5:/73:9 56/7444 56/7444	47/;485 9/;5555 9/;5555
		Qrlwh	3/4 3/6 3/6	5;/498; 56/:936 56/:936	49/6649 :/8538 :/8538
Vwxg|_4#0 LI#+Xehudqgld, _Ghs%vlwr#gh#Wlqwdv	K85	Gld	3/4 3/6 3/6	6:/739< 66/743; 66/743;	47/;46; 9/;5489 9/;5489
		Qrlwh	3/4 3/6 3/6	68/;689 5:/5<54 5:/5<54	64/9:46 47/8;75 47/8;75
Vwxg|_4#0 LI#+Xehudqgld, _Ghs%vlwr#gh#Wlqwdv#+P lvwxud,	K87	Gld	3/4 3/6 3/6	84/<887 73/4435 73/4435	76/<43; 53/5537 53/5537
		Qrlwh	3/4 3/6 3/6	79/3:95 6:/735< 6:/735<	65/4858 47/;38; 47/;38;

Supplementary data for worst-case explosion scenarios

Path	Scenario	Weather	Overpressure level [bar]	Explosion flammable mass [kg]	Ignition time [s]	Ignition source [m]	Cloud centre [m]	Explosion centre [m]
Vwxg|_4#0 LI# +Xehudqgld,_Fduuhwd# Wdqtxh	K34	Gld	3/4 3/6 3/6	9<78/:< 4<:3/65 4<:3/65	83/679< ::/5:9; ::/5:9;	693 743 743	48:/4<: ;</689; ;</689;	693 743 743
		Qrlwh	3/4 3/6 3/6	<547/36 6;97/74 6;97/74	96/45 ;9/65;8 ;9/65;8	683 6<3 6<3	465/378 463/;;9 463/;;9	683 6<3 6<3
	K35	Gld	3/4 3/6 3/6	475/66; 475/66; 475/66;	9;/;:<: 9;/;:<: 9;/;:<:	543 543 543	94/3994 94/3994 94/3994	543 543 543
		Qrlwh	3/4 3/6 3/6	4;8/<75 4;8/<75 4;8/<75	465/4:< 465/4:< 465/4:<	563 563 563	97/88:6 97/88:6 97/88:6	563 563 563
Vwxg|_4#0 LI# +Xehudqgld,_Ghvfdujd# gh#Fduuhwd#Wdqtxh#4	K36D	Gld	3/4 3/6 3/6	49/8735 49/8735 49/8735	7</9<39 7</9<39 7</9<39	443 443 443	59/6:76 59/6:76 59/6:76	443 443 443
		Qrlwh	3/4 3/6 3/6	54/5;9< 54/5;9< 54/5;9<	9;/:6<; 9;/:6<; 9;/:6<;	453 453 453	5;/56;; 5;/56;; 5;/56;;	453 453 453
Vwxg|_4#0 LI# +Xehudqgld,_Ghvfdujd# gh#Fduuhwd#Wdqtxh#5	K36E	Gld	3/4 3/6 3/6	4;:/57 4;:/57 4;:/57	:3/78<; :3/78<; :3/78<;	563 563 563	9:/;877 9:/;877 9:/;877	563 563 563
		Qrlwh	3/4	573/548	43</:77	583	:3/9334	583

			3/6 3/6	573/548 573/548	43</:77 43</:77	583 583	:3/9334 :3/9334	583 583
	K38E	Gld	3/4 3/6 3/6	3/:;;6<: 3/:;;6<: 3/:;;6<:	9/;84;4 9/;84;4 9/;84;4	73 73 73	;/438:5 ;/438:5 ;/438:5	73 73 73
		Qrlwh	3/4 3/6 3/6	3/<:4;;8 3/<:4;;8 3/<:4;;8	:/76:<8 :/76:<8 :/76:<8	73 73 73	;/;7:7 ;/;7:7 ;/;7:7	73 73 73
	K39E	Gld	3/4 3/6 3/6	3/:;;6<: 3/:;;6<: 3/:;;6<:	9/;84;4 9/;84;4 9/;84;4	73 73 73	;/438:5 ;/438:5 ;/438:5	73 73 73
		Qrlwh	3/4 3/6 3/6	3/<:4;;8 3/<:4;;8 3/<:4;;8	:/76:<8 :/76:<8 :/76:<8	73 73 73	;/;7:7 ;/;7:7 ;/;7:7	73 73 73
Vwxg|_4#0LI# +Xehudqgld,_Wdqtxh# gh#Dup d}hqdp hqwr	K3:	Gld	3/4 3/6 3/6	43;38/9 83;5/;7 83;5/;7	99/7777 ;9/3;86 ;9/3;86	793 833 833	4;5/;:8 <4/953< <4/953<	793 833 833
		Qrlwh	3/4 3/6 3/6	47<48/4 975:/<5 975:/<5	;7/9:35 43;/;47 43;/;47	793 833 833	4;3/496 556/34< 556/34<	793 833 833
	K3;	Gld	3/4 3/6 3/6	3/67<:<8 3/67<:<8 3/67<:<8	6/86695 6/86695 6/86695	53 53 53	8/<34:: 8/<34:: 8/<34::	53 53 53
		Qrlwh	3/4 3/6 3/6	3/7:7:97 3/7:7:97 3/7:7:97	4</<;;7 4</<;;7 4</<;;7	63 63 63	9/9869: 9/9869: 9/9869:	63 63 63
	K3<	Gld	3/4 3/6 3/6	<44/435 <44/435 <44/435	439/5<7 439/5<7 439/5<7	6:3 6:3 6:3	44</<89 44</<89 44</<89	6:3 6:3 6:3
		Qrlwh	3/4 3/6 3/6	4467/: 4467/: 4467/:	5;6/745 5;6/745 5;6/745	753 753 753	454/;68 454/;68 454/;68	753 753 753
Vwxg|_4#0LI# +Xehudqgld, _Fduuhjdp hqwr#gh# Dxwrwdqtxh#4	K44E	Gld	3/4 3/6 3/6	4:/:3<8 4:/:3<8 4:/:3<8	56/86<: 56/86<: 56/86<:	443 443 443	5:/3;96 5:/3;96 5:/3;96	443 443 443
		Qrlwh	3/4 3/6 3/6	55/:<99 55/:<99 55/:<99	97/546< 97/546< 97/546<	453 453 453	5</35:4 5</35:4 5</35:4	453 453 453
	K46D	Gld	3/4 3/6 3/6	3/:;;6<: 3/:;;6<: 3/:;;6<:	9/;84;4 9/;84;4 9/;84;4	73 73 73	;/438:5 ;/438:5 ;/438:5	73 73 73
		Qrlwh	3/4 3/6 3/6	3/<:4;;8 3/<:4;;8 3/<:4;;8	:/76:<8 :/76:<8 :/76:<8	73 73 73	;/;7:7 ;/;7:7 ;/;7:7	73 73 73
Vwxg|_4#0LI# +Xehudqgld, _Fduuhjdp hqwr#gh# Dxwrwdqtxh#5	K38D	Gld	3/4 3/6 3/6	6/96;99 6/96;99 6/96;99	44/:;9< 44/:;9< 44/:;9<	:3 :3 :3	47/7;3< 47/7;3< 47/7;3<	:3 :3 :3
		Qrlwh	3/4	7/64;78	4;/<956	:3	48/5;6<	:3

			3/6	7/64;78	4;/<956	:3	48/5;6<	:3
			3/6	7/64;78	4;/<956	:3	48/5;6<	:3
	K44D	Gld	3/4	4;::/57	:3/78<;	563	9:/;877	563
			3/6	4;::/57	:3/78<;	563	9:/;877	563
			3/6	4;::/57	:3/78<;	563	9:/;877	563
		Qrlwh	3/4	573/548	43</:77	583	:3/9334	583
			3/6	573/548	43</:77	583	:3/9334	583
			3/6	573/548	43</:77	583	:3/9334	583
	K46E	Gld	3/4	6/96;99	44/:;9<	:3	47/7;3<	:3
			3/6	6/96;99	44/:;9<	:3	47/7;3<	:3
			3/6	6/96;99	44/:;9<	:3	47/7;3<	:3
		Qrlwh	3/4	7/64;78	4;/<956	:3	48/5;6<	:3
			3/6	7/64;78	4;/<956	:3	48/5;6<	:3
			3/6	7/64;78	4;/<956	:3	48/5;6<	:3
Vwxg|_4#0 LI#	K48	Gld	3/4	4<95/5:	66/;976	563	436/975	563
+Xehudqgld,_Dxwr#			3/6	665/<87	84/<776	5:3	7;/46<8	5:3
Wdqtxh			3/6	665/<87	84/<776	5:3	7;/46<8	5:3
		Qrlwh	3/4	5699/5;	76/4:5;	553	;:/9685	553
			3/6	43<6/<9	88/48:8	573	443/<97	573
			3/6	43<6/<9	88/48:8	573	443/<97	573
	K49	Gld	3/4	478/:5<	86/9:94	543	94/8;77	543
			3/6	478/:5<	86/9:94	543	94/8;77	543
			3/6	478/:5<	86/9:94	543	94/8;77	543
		Qrlwh	3/4	4<3/4<;	449/67	563	98/3<8	563
			3/6	4<3/4<;	449/67	563	98/3<8	563
			3/6	4<3/4<;	449/67	563	98/3<8	563
Vwxg|_4#0 LI#	K48	Gld	3/4	4<95/5:	66/;976	563	436/975	563
+Xehudqgld,_Dxwr#			3/6	665/<87	84/<776	5:3	7;/46<8	5:3
Wdqtxh#Shuqrlwh			3/6	665/<87	84/<776	5:3	7;/46<8	5:3
		Qrlwh	3/4	5699/5;	76/4:5;	553	;:/9685	553
			3/6	43<6/<9	88/48:8	573	443/<97	573
			3/6	43<6/<9	88/48:8	573	443/<97	573
	K49	Gld	3/4	478/:5<	86/9:94	543	94/8;77	543
			3/6	478/:5<	86/9:94	543	94/8;77	543
			3/6	478/:5<	86/9:94	543	94/8;77	543
		Qrlwh	3/4	4<3/4<;	449/67	563	98/3<8	563
			3/6	4<3/4<;	449/67	563	98/3<8	563
			3/6	4<3/4<;	449/67	563	98/3<8	563
Vwxg|_4#0 LI#	K4:D	Gld	3/4	4:3/94<	44;/:<8	563	98/7;6;	563
+Xehudqgld,			3/6	4:3/94<	44;/:<8	563	98/7;6;	563
_Hqjduudidp hqwr#4			3/6	4:3/94<	44;/:<8	563	98/7;6;	563
		Qrlwh	3/4	553/5;5	478/44:	583	9;/9336	583
			3/6	553/5;5	478/44:	583	9;/9336	583
			3/6	553/5;5	478/44:	583	9;/9336	583
Vwxg|_4#0 LI#	K4:E	Gld	3/4	989/;55	<</7579	673	43:/7:9	673
+Xehudqgld,			3/6	989/;55	<</7579	673	43:/7:9	673
_Hqjduudidp hqwr#5			3/6	989/;55	<</7579	673	43:/7:9	673
		Qrlwh	3/4	;4;/95	568/9;5	6;3	43</444	6;3
			3/6	;4;/95	568/9;5	6;3	43</444	6;3
			3/6	;4;/95	568/9;5	6;3	43</444	6;3

	K4;E	Gld	3/4 3/6 3/6	3/477744 3/477744 3/477744	4/<4;39 4/<4;39 4/<4;39	43 43 43	7/688:6 7/688:6 7/688:6	43 43 43
		Qrlwh	3/4 3/6 3/6	3/4;3<3: 3/4;3<3: 3/4;3<3:	4/<4;4 4/<4;4 4/<4;4	43 43 43	7/:338: 7/:338: 7/:338:	43 43 43
	K4<	Gld	3/4 3/6 3/6	47/<9:: 47/<9:: 47/<9::	54/5:84 54/5:84 54/5:84	433 433 433	58/58;4 58/58;4 58/58;4	433 433 433
		Qrlwh	3/4 3/6 3/6	4</774; 4</774; 4</774;	87/;:69 87/;:69 87/;:69	443 443 443	5:/64<9 5:/64<9 5:/64<9	443 443 443
Vwxg|_4#0 LI# +Xehuodqgld, _Dup d}hqdp hqwr#S46	Fdwdvwurs klf# uxswxuh	Gld	3/4 3/6 3/6	3	3 3 3	Qr#kd}dug Qr#kd}dug Qr#kd}dug	Qr#kd}dug Qr#kd}dug Qr#kd}dug	3 3 3
	Ohdn		3/4 3/6 3/6	3/67637< 3/67637< 3/67637<	5/9<:5 5/9<:5 5/9<:5	53 53 53	8/;8887 8/;8887 8/;8887	53 53 53
		Qrlwh	3/4 3/6 3/6	3/797:<9 3/797:<9 3/797:<9	6/79978 6/79978 6/79978	53 53 53	9/95:7: 9/95:7: 9/95:7:	53 53 53
Vwxg|_4#0 LI# +Xehuodqgld, _Dup d}hqdp hqwr#S53	Fdwdvwurs klf# uxswxuh	Gld	3/4 3/6 3/6	3	3 3 3	Qr#kd}dug Qr#kd}dug Qr#kd}dug	Qr#kd}dug Qr#kd}dug Qr#kd}dug	3 3 3
	Ohdn		3/4 3/6 3/6	3/676<:7 3/676<:7 3/676<:7	5/9<63; 5/9<63; 5/9<63;	53 53 53	8/;944: 8/;944: 8/;944:	53 53 53
		Qrlwh	3/4 3/6 3/6	3/79943< 3/79943< 3/79943<	6/78<<8 6/78<<8 6/78<<8	53 53 53	9/9676< 9/9676< 9/9676<	53 53 53
Vwxg|_4#0 LI# +Xehuodqgld, _Dup d}hqdp hqwr#S78	Fdwdvwurs klf# uxswxuh	Gld	3/4 3/6 3/6	:/388:5 3/3356;7 66 3/3356;7 66	4/3<<66 6/;55:5 6/;55:5	43 53 53	6/;6486 3/344849 9 3/344849 9	43 53 53
		Qrlwh	3/4 3/6 3/6	3/3:8678 : 3/3:8678 : 3/3:8678 :	8/;7765 8/;7765 8/;7765	53 53 53	3/:556:5 3/:556:5 3/:556:5	53 53 53
	Ohdn	Gld	3/4 3/6 3/6	3/678;69 3/678;69 3/678;69	5/::57: 5/::57: 5/::57:	53 53 53	8/;956< 8/;956< 8/;956<	53 53 53
		Qrlwh	3/4 3/6 3/6	3/79:<69 3/79:<69 3/79:<69	47/:<99 47/:<99 47/:<99	63 63 63	9/95745 9/95745 9/95745	63 63 63
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfro‰jlfd	K63	Gld	3/4 3/6 3/6	49/46;6 49/46;6 49/46;6	5;/7:<8 5;/7:<8 5;/7:<8	443 443 443	59/457 59/457 59/457	443 443 443

		Qrlwh	3/4 3/6 3/6	53/;54< 53/;54< 53/;54<	<9/387: <9/387: <9/387:	453 453 453	5;/34;5 5;/34;5 5;/34;5	453 453 453
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfrorjlfd#2# Ghfdqwdwlrq#4	K65	Gld	3/4 3/6 3/6	4/3<8<: 4/3<8<: 4/3<8<:	:/3793; :/3793; :/3793;	73 73 73	</3:955 </3:955 </3:955	73 73 73
		Qrlwh	3/4 3/6 3/6	4/8877 4/8877 4/8877	9;/4<<9 9;/4<<9 9;/4<<9	83 83 83	43/8:;4 43/8:;4 43/8:;4	83 83 83
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfrorjlfd#2# Ghfdqwdwlrq#5	K67E	Gld	3/4 3/6 3/6	4/3<8<: 4/3<8<: 4/3<8<:	:/3793; :/3793; :/3793;	73 73 73	</3:955 </3:955 </3:955	73 73 73
		Qrlwh	3/4 3/6 3/6	4/8877 4/8877 4/8877	9;/4<<9 9;/4<<9 9;/4<<9	83 83 83	43/8:;4 43/8:;4 43/8:;4	83 83 83
	K69D	Gld	3/4 3/6 3/6	6/96;99 6/96;99 6/96;99	44/:;9< 44/:;9< 44/:;9<	:3 :3 :3	47/7;3< 47/7;3< 47/7;3<	:3 :3 :3
		Qrlwh	3/4 3/6 3/6	7/64;78 7/64;78 7/64;78	4;/<956 4;/<956 4;/<956	:3 :3 :3	48/5;6< 48/5;6< 48/5;6<	:3 :3 :3
Vwxg|_4#0 LI# +Xehuodqgld,_Olqkd# Hfrorjlfd#2# Ghfdqwdwlrq#6	K67D	Gld	3/4 3/6 3/6	4:/:3<8 4:/:3<8 4:/:3<8	56/86<: 56/86<: 56/86<:	443 443 443	5:/3;96 5:/3;96 5:/3;96	443 443 443
		Qrlwh	3/4 3/6 3/6	55/:<99 55/:<99 55/:<99	97/546< 97/546< 97/546<	453 453 453	5</35:4 5</35:4 5</35:4	453 453 453
	K69E	Gld	3/4 3/6 3/6	3/:;;6<: 3/:;;6<: 3/:;;6<:	9/;84;4 9/;84;4 9/;84;4	73 73 73	;/438:5 ;/438:5 ;/438:5	73 73 73
		Qrlwh	3/4 3/6 3/6	3/<:4;;8 3/<:4;;8 3/<:4;;8	:/76:<8 :/76:<8 :/76:<8	73 73 73	;/;7:7 ;/;7:7 ;/;7:7	73 73 73
Vwxg|_4#0 LI# +Xehuodqgld,_Wdqtxh# gh#Ghfdqwdwlrq	K6;	Gld	3/4 3/6 3/6	593/574 4</7978 4</7978	53/:3:5 66/546; 66/546;	463 493 493	94/87<; 46/9<6; 46/9<6;	463 493 493
		Qrlwh	3/4 3/6 3/6	654/:39 4::/9: 4::/9:	58/:958 64/6736 64/6736	453 463 463	88/6:44 88/5:46 88/5:46	453 463 463
	K6<	Gld	3/4 3/6 3/6	3/679974 3/679974 3/679974	6/5;4;9 6/5;4;9 6/5;4;9	53 53 53	8/;:986 8/;:986 8/;:986	53 53 53
		Qrlwh	3/4 3/6 3/6	3/79<554 3/79<554 3/79<554	48/593; 48/593; 48/593;	63 63 63	9/95678 9/95678 9/95678	63 63 63

	K73	Gld	3/4	5/63469	;/<7:34	83	45/436	83
			3/6	5/63469	;/<7:34	83	45/436	83
			3/6	5/63469	;/<7:34	83	45/436	83
		Qrlwh	3/4	6/5878	56/84;<	93	46/<635	93
			3/6	6/5878	56/84;<	93	46/<635	93
			3/6	6/5878	56/84;<	93	46/<635	93
Vwxg|_4#0 LI# +Xehudqgld,_Frdnwd# gh#Rdnlqd	K75	Gld	3/4	47/<9::	54/5:84	433	58/58;4	433
			3/6	47/<9::	54/5:84	433	58/58;4	433
			3/6	47/<9::	54/5:84	433	58/58;4	433
		Qrlwh	3/4	4</774;	87/;:69	443	5:/64<9	443
			3/6	4</774;	87/;:69	443	5:/64<9	443
			3/6	4</774;	87/;:69	443	5:/64<9	443
Vwxg|_4#0 LI# +Xehudqgld, _Dup d}hqdp hqwr# S4<3	K78	Gld	3/4	4/<9874	</86<<:	83	9/36349	83
			3/6	4/<9874	</86<<:	83	9/36349	83
			3/6	4/<9874	</86<<:	83	9/36349	83
		Qrlwh	3/4	5/43:7<	48/<799	83	8/89:38	83
			3/6	5/43:7<	48/<799	83	8/89:38	83
			3/6	5/43:7<	48/<799	83	8/89:38	83
	K79	Gld	3/4	3/678:96	5/:85;4	53	8/;:9:7	53
			3/6	3/678:96	5/:85;4	53	8/;:9:7	53
			3/6	3/678:96	5/:85;4	53	8/;:9:7	53
		Qrlwh	3/4	3/79;634	49/697:	63	9/95;:6	63
			3/6	3/79;634	49/697:	63	9/95;:6	63
			3/6	3/79;634	49/697:	63	9/95;:6	63
	K7;	Gld	3/4	3/649445	5/;;;46	53	8/9<:<6	53
			3/6	3/649445	5/;;;46	53	8/9<:<6	53
			3/6	3/649445	5/;;;46	53	8/9<:<6	53
		Qrlwh	3/4	3/756785	6/;5498	53	9/75<:	53
			3/6	3/756785	6/;5498	53	9/75<:	53
			3/6	3/756785	6/;5498	53	9/75<:	53
	K83	Gld	3/4	3/649445	5/;;;46	53	8/9<:<6	53
			3/6	3/649445	5/;;;46	53	8/9<:<6	53
			3/6	3/649445	5/;;;46	53	8/9<:<6	53
		Qrlwh	3/4	3/756785	6/;5498	53	9/75<:	53
			3/6	3/756785	6/;5498	53	9/75<:	53
			3/6	3/756785	6/;5498	53	9/75<:	53
Vwxg|_4#0 LI# +Xehudqgld,_Ghs%vlwr# gh#Wlqwdv	K85	Gld	3/4	3/65497	:/<:;98	63	49/3999	63
			3/6	3/65497	:/<:;98	63	49/3999	63
			3/6	3/65497	:/<:;98	63	49/3999	63
		Qrlwh	3/4	6/4764;	9/4;59;	53	43/:847	53
			3/6	6/4764;	9/4;59;	53	43/:847	53
			3/6	6/4764;	9/4;59;	53	43/:847	53
Vwxg|_4#0 LI# +Xehudqgld,_Ghs%vlwr# gh#Wlqwdv#+P lvwxud,	K87	Gld	3/4	;/6:9<9	9/9967<	63	4:/<975	63
			3/6	;/6:9<9	9/9967<	63	4:/<975	63
			3/6	;/6:9<9	9/9967<	63	4:/<975	63
		Qrlwh	3/4	6/5;;96	43/9<<	63	44/::9;	63
			3/6	6/5;;96	43/9<<	63	44/::9;	63
			3/6	6/5;;96	43/9<<	63	44/::9;	63

Consequence Summary Report

Workspace: Cenário Operacional nº02

Study: Study

Summary Basis

These tables will only report global values set in the parameters. Values that are modified in the study tree will not be reported.

The report is context sensitive, and filters up to the study level. You willl need to generate multiple summary reports if you have multiple studies in your workspace.

Discharge Results (after atmospheric expansion)

Path	Scenario	Weather	Peak Flowrate [kg/s]	Temperature [degC]	Liquid mass fraction in material [fraction]	Droplet diameter [um]	Expanded diameter [m]	Velocity [m/s]	End time of release [s]
Study\Bobtail	Catastrophic rupture	Dia		-34,6475	0,699771	150,433		31,0712	
	Leak	Dia	32,4234	-34,6475	0,699781	159,115	0,175977	155,384	154,209
	Mangote 100%	Dia	9,20118	-34,6475	0,700806	152,742	0,0926977	158,379	543,527
	Mangote 10%	Dia	0,0631822	-34,6475	0,700296	162,38	0,00772441	156,887	3600

Dispersion Results

Input dispersion parameters

Core averaging time	18,75	s
Flammable averaging time	18,75	s
Toxic averaging time	600	s
Height of interest	0	m

Distance downwind to defined concentrations

The reported concentration of interest is defined at the scenario

Path	Scenario	Weather	Distance to UFL [m]	Distance to LFL [m]	Distance to LFL fraction [m]
Study\Bobtail	Catastrophic rupture	Dia	19,554	162,985	226,714
	Leak	Dia	n/a	131,729	216,775
	Mangote 100%	Dia	n/a	52,4366	109,557
	Mangote 10%	Dia	n/a	n/a	n/a

Jet Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Flame length [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Leak	Dia	50,8692	90,4676	77,2096	68,1194
	Mangote 100%	Dia	29,576	51,0944	43,7192	38,6178
	Mangote 10%	Dia	3,39041	5,0656	4,2437	3,3799

Early Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Late Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Pool diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Catastrophic rupture	Dia	21,8487	74,8871	57,6591	45,6317

Fireball Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Fireball diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Catastrophic rupture	Dia	95,7802	193,438	137,365	100,458

Flash Fire Results

Distance downwind to defined concentrations

The reported LFL and LFL fraction are defined in the respective material property

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Study\Bobtail	Catastrophic rupture	Dia	162,985	226,714
	Leak	Dia	131,729	216,775
	Mangote 100%	Dia	52,4366	109,557
	Mangote 10%	Dia		

Maximum distance to LFL fraction at any height

Path	Scenario	Weather	Max flash fire distance [m]	Height of the max flash fire distance [m]	Time [s]
Study\Bobtail	Catastrophic rupture	Dia	220,475	0	53,0463
	Leak	Dia	216,741	0	77,1047
	Mangote 100%	Dia	109,251	0	54,7554
	Mangote 10%	Dia	3,84412	0,976743	1,91795

Explosion Results

Explosion scenarios for worst-case maximum downwind distance to defined overpressures. The worst-case explosion will be modelled in the risk calculations if ignition conditions are present at the time for the scenario.

The reported overpressures are defined in the explosion parameters

Path	Scenario	Weather	Overpressure level [bar]	Maximum distance [m]	Diameter [m]
Study\Bobtail	Catastrophic rupture	Dia	0,1 0,3 0,3	291,595 242,345 242,345	203,19 64,6893 64,6893
	Leak		0,1 0,3 0,3	266,878 236,192 236,192	113,756 52,3831 52,3831
	Mangote 100%		0,1 0,3 0,3	127,26 112,553 112,553	54,5195 25,1056 25,1056

Supplementary data for worst-case explosion scenarios

Path	Scenario	Weather	Overpressure level [bar]	Explosion flammable mass [kg]	Ignition time [s]	Ignition source [m]	Cloud centre [m]	Explosion centre [m]
Study\Bobtail	Catastrophic rupture	Dia	0,1 0,3 0,3	815,495 269,501 269,501	29,7971 37,7707 37,7707	190 210 210	87,8942 42,4567 42,4567	190 210 210
	Leak		0,1 0,3 0,3	143,099 143,099 143,099	60,2026 60,2026 60,2026	210 210 210	61,1604 61,1604 61,1604	210 210 210
	Mangote 100%		0,1 0,3 0,3	15,7533 15,7533 15,7533	20,3498 20,3498 20,3498	100 100 100	25,7512 25,7512 25,7512	100 100 100

Consecuence Summary Report

Workspace: Cenário Operacional nº03

Study: Study

Summary Basis

These tables will only report global values set in the parameters. Values that are modified in the study tree will not be reported.

The report is context sensitive, and filters up to the study level. You willl need to generate multiple summary reports if you have multiple studies in your workspace.

Discharge Results (after atmospheric expansion)

Path	Scenario	Weather	Peak Flowrate [kg/s]	Temperature [degC]	Liquid mass fraction in material [fraction]	Droplet diameter [um]	Expanded diameter [m]	Velocity [m/s]	End time of release [s]
Study\Bobtail	Catastrophic rupture	Dia		-34,6475	0,699771	150,433		31,0712	
	Leak	Dia	32,4234	-34,6475	0,699781	159,115	0,175977	155,384	154,209
	Mangote 100%	Dia	9,20118	-34,6475	0,700806	152,742	0,0926977	158,379	543,527
	Mangote 10%	Dia	0,0631822	-34,6475	0,700296	162,38	0,00772441	156,887	3600

Dispersion Results

Input dispersion parameters

Core averaging time	18,75	s
Flammable averaging time	18,75	s
Toxic averaging time	600	s
Height of interest	0	m

Distance downwind to defined concentrations

The reported concentration of interest is defined at the scenario

Path	Scenario	Weather	Distance to UFL [m]	Distance to LFL [m]	Distance to LFL fraction [m]
Study\Bobtail	Catastrophic rupture	Dia	19,554	162,985	226,714
	Leak	Dia	n/a	131,729	216,775
	Mangote 100%	Dia	n/a	52,4366	109,557
	Mangote 10%	Dia	n/a	n/a	n/a

Jet Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Flame length [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Leak	Dia	50,8692	90,4676	77,2096	68,1194
	Mangote 100%	Dia	29,576	51,0944	43,7192	38,6178
	Mangote 10%	Dia	3,39041	5,0656	4,2437	3,3799

Early Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Late Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Pool diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Catastrophic rupture	Dia	21,8487	74,8871	57,6591	45,6317

Fireball Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Fireball diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Catastrophic rupture	Dia	95,7802	193,438	137,365	100,458

Flash Fire Results

Distance downwind to defined concentrations

The reported LFL and LFL fraction are defined in the respective material property

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Study\Bobtail	Catastrophic rupture	Dia	162,985	226,714
	Leak	Dia	131,729	216,775
	Mangote 100%	Dia	52,4366	109,557
	Mangote 10%	Dia		

Maximum distance to LFL fraction at any height

Path	Scenario	Weather	Max flash fire distance [m]	Height of the max flash fire distance [m]	Time [s]
Study\Bobtail	Catastrophic rupture	Dia	220,475	0	53,0463
	Leak	Dia	216,741	0	77,1047
	Mangote 100%	Dia	109,251	0	54,7554
	Mangote 10%	Dia	3,84412	0,976743	1,91795

Explosion Results

Explosion scenarios for worst-case maximum downwind distance to defined overpressures. The worst-case explosion will be modelled in the risk calculations if ignition conditions are present at the time for the scenario.

The reported overpressures are defined in the explosion parameters

Path	Scenario	Weather	Overpressure level [bar]	Maximum distance [m]	Diameter [m]
Study\Bobtail	Catastrophic rupture	Dia	0,1 0,3 0,3	291,595 242,345 242,345	203,19 64,6893 64,6893
	Leak		0,1 0,3 0,3	266,878 236,192 236,192	113,756 52,3831 52,3831
	Mangote 100%		0,1 0,3 0,3	127,26 112,553 112,553	54,5195 25,1056 25,1056

Supplementary data for worst-case explosion scenarios

Path	Scenario	Weather	Overpressure level [bar]	Explosion flammable mass [kg]	Ignition time [s]	Ignition source [m]	Cloud centre [m]	Explosion centre [m]
Study\Bobtail	Catastrophic rupture	Dia	0,1 0,3 0,3	815,495 269,501 269,501	29,7971 37,7707 37,7707	190 210 210	87,8942 42,4567 42,4567	190 210 210
	Leak		0,1 0,3 0,3	143,099 143,099 143,099	60,2026 60,2026 60,2026	210 210 210	61,1604 61,1604 61,1604	210 210 210
	Mangote 100%		0,1 0,3 0,3	15,7533 15,7533 15,7533	20,3498 20,3498 20,3498	100 100 100	25,7512 25,7512 25,7512	100 100 100

Consequence Summary Report

Workspace: Cenário Operacional nº04

Study: Study

Summary Basis

These tables will only report global values set in the parameters. Values that are modified in the study tree will not be reported.

The report is context sensitive, and filters up to the study level. You willl need to generate multiple summary reports if you have multiple studies in your workspace.

Discharge Results (after atmospheric expansion)

Path	Scenario	Weather	Peak Flowrate [kg/s]	Temperature [degC]	Liquid mass fraction in material [fraction]	Droplet diameter [um]	Expanded diameter [m]	Velocity [m/s]	End time of release [s]
Study\P3000-Ponto1	Catastrophic rupture	Dia		-34,6475	0,699761	150,462		31,0656	
	Leak	Dia	32,2847	-34,6475	0,699761	159,176	0,175637	155,328	92,9234
	Mangote 100%	Dia	2,14208	-34,6475	0,700842	154,065	0,0447148	158,444	1400,63
	Mangote 10%	Dia	0,0115634	-34,6475	0,698477	177,395	0,00336898	151,846	3600
Study\P3000-Ponto2	Catastrophic rupture	Dia		-34,6475	0,699761	150,462		31,0656	
	Leak	Dia	32,2847	-34,6475	0,699761	159,176	0,175637	155,328	92,9234
	Mangote 100%	Dia	2,14208	-34,6475	0,700842	154,065	0,0447148	158,444	1400,63
	Mangote 10%	Dia	0,0115634	-34,6475	0,698477	177,395	0,00336898	151,846	3600
Study\Enchimento Ponto 1	Vazamento P13	Dia	2,14208	-34,6475	0,700842	154,065	0,0447148	158,444	6,19567
	Ruptura da Cilindro	Dia		-34,6475	0,699761	150,462		31,0656	
	Furo no Cilindro	Dia	1,25103	-34,6475	0,699761	159,176	0,0345743	155,328	10,3914
	Vazamento em 600 seg	Dia	0,0216667	-34,6475	0,699761	159,176	0,00455003	155,328	600

Study\Enchimento Ponto 2	Vazamen to P13	Dia	2,14208	-34,6475	0,70084 2	154,065	0,04471 48	158,444	6,19567
	Ruptura da Cilindro	Dia		-34,6475	0,69976 1	150,462		31,0656	
	Furo no Cilindro	Dia	1,25103	-34,6475	0,69976 1	159,176	0,03457 43	155,328	10,3914
	Vazamen to em 600 seg	Dia	0,02166 67	-34,6475	0,69976 1	159,176	0,00455 003	155,328	600

Dispersion Results

Input dispersion parameters

Core averaging time	18,75	s
Flammable averaging time	18,75	s
Toxic averaging time	600	s
Height of interest	0	m

Distance downwind to defined concentrations

The reported concentration of interest is defined at the scenario

Path	Scenario	Weather	Distance to UFL [m]	Distance to LFL [m]	Distance to LFL fraction [m]
Study\P3000-Ponto1	Catastrophic rupture	Dia	13,6075	132,426	188,774
	Leak	Dia	n/a	131,429	216,277
	Mangote 100%	Dia	n/a	n/a	40,1069
	Mangote 10%	Dia	n/a	n/a	n/a
Study\P3000-Ponto2	Catastrophic rupture	Dia	13,6075	132,426	188,774
	Leak	Dia	n/a	131,429	216,277
	Mangote 100%	Dia	n/a	n/a	40,1069
	Mangote 10%	Dia	n/a	n/a	n/a
Study\Enchimento Ponto 1	Vazamento P13	Dia	n/a	n/a	39,991
	Ruptura da Cilindro	Dia	1,53572	5,01527	14,3458
	Furo no Cilindro	Dia	n/a	n/a	17,5174
	Vazamento em 600 seg	Dia	n/a	n/a	n/a
Study\Enchimento Ponto 2	Vazamento P13	Dia	n/a	n/a	39,991
	Ruptura da Cilindro	Dia	1,53572	5,01527	14,3458
	Furo no Cilindro	Dia	n/a	n/a	17,5174
	Vazamento em 600 seg	Dia	n/a	n/a	n/a

Jet Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Flame length [m]	Distance downwind to intensity level 1 (9,85 kW/ m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\P3000-Ponto1	Leak	Dia	50,7785	90,2976	77,0649	67,9917
	Mangote 100%	Dia	15,7739	26,4223	22,6676	20,0297
	Mangote 10%	Dia	1,60863	1,63399	n/a	n/a
Study\P3000-Ponto2	Leak	Dia	50,7785	90,2976	77,0649	67,9917
	Mangote 100%	Dia	15,7739	26,4223	22,6676	20,0297
	Mangote 10%	Dia	1,60863	1,63399	n/a	n/a
Study\Enchimento Ponto 1	Vazamento P13	Dia	15,7739	26,4223	22,6676	20,0297
	Furo no Cilindro	Dia	12,5365	20,7759	17,8351	15,7562
	Vazamento em 600 seg	Dia	2,11593	2,82777	1,99852	n/a
Study\Enchimento Ponto 2	Vazamento P13	Dia	15,7739	26,4223	22,6676	20,0297
	Furo no Cilindro	Dia	12,5365	20,7759	17,8351	15,7562
	Vazamento em 600 seg	Dia	2,11593	2,82777	1,99852	n/a

Early Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Late Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Pool diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\P3000-Ponto1	Catastrophic rupture	Dia	16,9045	59,5744	45,9766	36,1911
Study\P3000-Ponto2		Dia	16,9045	59,5744	45,9766	36,1911
Study\Enchimento Ponto 1	Ruptura da Cilindro	Dia	0,920024	4,12894	2,56383	1,54662
Study\Enchimento Ponto 2		Dia	0,920024	4,12894	2,56383	1,54662

Fireball Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Fireball diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\P3000-Ponto1	Catastrophic rupture	Dia	80,7851	161,425	114,45	83,5343
Study\P3000-Ponto2		Dia	80,7851	161,425	114,45	83,5343
Study\Enchimento Ponto 1	Vazamento P13	Dia	13,2458	23,1316	16,1172	11,421
	Ruptura da Cilindro	Dia	13,1706	22,9995	16,0242	11,354
	Furo no Cilindro	Dia	13,1706	22,9995	16,0242	11,354
Study\Enchimento Ponto 2	Vazamento P13	Dia	13,2458	23,1316	16,1172	11,421
	Ruptura da Cilindro	Dia	13,1706	22,9995	16,0242	11,354
	Furo no Cilindro	Dia	13,1706	22,9995	16,0242	11,354

Flash Fire Results

Distance downwind to defined concentrations

The reported LFL and LFL fraction are defined in the respective material property

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Study\P3000-Ponto1	Catastrophic rupture	Dia	132,426	188,774
	Leak	Dia	131,429	216,277
	Mangote 100%	Dia		40,1069
	Mangote 10%	Dia		
Study\P3000-Ponto2	Catastrophic rupture	Dia	132,426	188,774
	Leak	Dia	131,429	216,277
	Mangote 100%	Dia		40,1069
	Mangote 10%	Dia		
Study\Enchimento Ponto 1	Vazamento P13	Dia		39,991
	Ruptura da Cilindro	Dia	5,01527	14,3458
	Furo no Cilindro	Dia		17,5174
	Vazamento em 600 seg	Dia		
Study\Enchimento Ponto 2	Vazamento P13	Dia		39,991
	Ruptura da Cilindro	Dia	5,01527	14,3458
	Furo no Cilindro	Dia		17,5174
	Vazamento em 600 seg	Dia		

Maximum distance to LFL fraction at any height

Path	Scenario	Weather	Max flash fire distance [m]	Height of the max flash fire distance [m]	Time [s]
Study\P3000-Ponto1	Catastrophic rupture	Dia	186,633	0	43,1405
	Leak	Dia	216,231	0	65,0464
	Mangote 100%	Dia	42,0334	0,324565	15,6035
	Mangote 10%	Dia	1,9532	0,999514	1,91794

Study\P3000-Ponto2	Catastrophic rupture	Dia	186,633	0	43,1405
	Leak	Dia	216,231	0	65,0464
	Mangote 100%	Dia	42,0334	0,324565	15,6035
	Mangote 10%	Dia	1,9532	0,999514	1,91794
Study\Enchimento Ponto 1	Vazamento P13	Dia	41,8136	0,324565	9,64124
	Ruptura da Cilindro	Dia	13,053	0	3,24834
	Furo no Cilindro	Dia	26,5707	0,600853	6,23485
	Vazamento em 600 seg	Dia	2,519	0,995241	1,25994
Study\Enchimento Ponto 2	Vazamento P13	Dia	41,8136	0,324565	9,64124
	Ruptura da Cilindro	Dia	13,053	0	3,24834
	Furo no Cilindro	Dia	26,5707	0,600853	6,23485
	Vazamento em 600 seg	Dia	2,519	0,995241	1,25994

Explosion Results

Explosion scenarios for worst-case maximum downwind distance to defined overpressures. The worst-case explosion will be modelled in the risk calculations if ignition conditions are present at the time for the scenario.

The reported overpressures are defined in the explosion parameters

Path	Scenario	Weather	Overpressure level [bar]	Maximum distance [m]	Diameter [m]
Study\P3000-Ponto1	Catastrophic rupture	Dia	0,1 0,3 0,3	236,216 198,133 198,133	172,433 56,2656 56,2656
	Leak		0,1 0,3 0,3	266,799 236,155 236,155	113,598 52,3103 52,3103
	Mangote 100%		0,1 0,3 0,3	50,5524 44,8592 44,8592	21,1048 9,71847 9,71847
Study\P3000-Ponto2	Catastrophic rupture		0,1 0,3 0,3	236,216 198,133 198,133	172,433 56,2656 56,2656
	Leak		0,1 0,3 0,3	266,799 236,155 236,155	113,598 52,3103 52,3103
	Mangote 100%		0,1 0,3 0,3	50,5524 44,8592 44,8592	21,1048 9,71847 9,71847
Study\Enchimento Ponto 1	Vazamento P13		0,1 0,3 0,3	43,7255 41,7156 41,7156	7,45105 3,43111 3,43111
	Ruptura da Cilindro		0,1 0,3 0,3	No hazard No hazard No hazard	0 0 0
	Furo no Cilindro		0,1 0,3 0,3	27,6037 23,5014 23,5014	15,2075 7,00286 7,00286
Study\Enchimento Ponto 2	Vazamento P13		0,1 0,3 0,3	43,7255 41,7156 41,7156	7,45105 3,43111 3,43111
	Ruptura da Cilindro		0,1 0,3 0,3	No hazard No hazard No hazard	0 0 0
	Furo no Cilindro		0,1 0,3 0,3	27,6037 23,5014 23,5014	15,2075 7,00286 7,00286

Supplementary data for worst-case explosion scenarios

Path	Scenario	Weather	Overpressure	Explosion	Ignition time [s]	Ignition source	Cloud centre	Explosion centre

			level [bar]	flammable mass [kg]		[m]	[m]	[m]
Study\P3000-Ponto1	Catastrop hic rupture	Dia	0,1 0,3 0,3	498,399 177,334 177,334	23,1885 30,2457 30,2457	150 170 170	70,7765 41,7147 41,7147	150 170 170
	Leak		0,1 0,3 0,3	142,503 142,503 142,503	45,0039 45,0039 45,0039	210 210 210	61,1287 61,1287 61,1287	210 210 210
	Mangote 100%		0,1 0,3 0,3	0,913812 0,913812 0,913812	12,7271 12,7271 12,7271	40 40 40	8,48002 8,48002 8,48002	40 40 40
Study\P3000-Ponto2	Catastrop hic rupture		0,1 0,3 0,3	498,399 177,334 177,334	23,1885 30,2457 30,2457	150 170 170	70,7765 41,7147 41,7147	150 170 170
	Leak		0,1 0,3 0,3	142,503 142,503 142,503	45,0039 45,0039 45,0039	210 210 210	61,1287 61,1287 61,1287	210 210 210
	Mangote 100%		0,1 0,3 0,3	0,913812 0,913812 0,913812	12,7271 12,7271 12,7271	40 40 40	8,48002 8,48002 8,48002	40 40 40
Study\Enchimento Ponto 1	Vazament o P13		0,1 0,3 0,3	0,040213 2 0,040213 2 0,040213 2	7,76564 7,76564 7,76564	40 40 40	3,94622 3,94622 3,94622	40 40 40
	Ruptura da Cilindro		0,1 0,3 0,3	0	0 0 0	No hazard No hazard No hazard	No hazard No hazard No hazard	0 0 0
	Furo no Cilindro		0,1 0,3 0,3	0,341892 0,341892 0,341892	2,70248 2,70248 2,70248	20 20 20	5,84849 5,84849 5,84849	20 20 20
Study\Enchimento Ponto 2	Vazament o P13		0,1 0,3 0,3	0,040213 2 0,040213 2 0,040213 2	7,76564 7,76564 7,76564	40 40 40	3,94622 3,94622 3,94622	40 40 40
	Ruptura da Cilindro		0,1 0,3 0,3	0	0 0 0	No hazard No hazard No hazard	No hazard No hazard No hazard	0 0 0
	Furo no Cilindro		0,1 0,3 0,3	0,341892 0,341892 0,341892	2,70248 2,70248 2,70248	20 20 20	5,84849 5,84849 5,84849	20 20 20

Consequence Summary Report

Workspace: Cenário Operacional nº05

Study: Study

Summary Basis

These tables will only report global values set in the parameters. Values that are modified in the study tree will not be reported.

The report is context sensitive, and filters up to the study level. You willl need to generate multiple summary reports if you have multiple studies in your workspace.

Discharge Results (after atmospheric expansion)

Path	Scenario	Weather	Peak Flowrate [kg/s]	Temperature [degC]	Liquid mass fraction in material [fraction]	Droplet diameter [um]	Expanded diameter [m]	Velocity [m/s]	End time of release [s]
Study\Bobtail	Catastrophic rupture	Dia		-34,6475	0,699771	150,433		31,0712	
	Leak	Dia	32,4234	-34,6475	0,699781	159,115	0,175977	155,384	154,209
	Mangote 100%	Dia	9,20118	-34,6475	0,700806	152,742	0,0926977	158,379	543,527
	Mangote 10%	Dia	0,0631822	-34,6475	0,700296	162,38	0,00772441	156,887	3600

Dispersion Results

Input dispersion parameters

Core averaging time	18,75	s
Flammable averaging time	18,75	s
Toxic averaging time	600	s
Height of interest	0	m

Distance downwind to defined concentrations

The reported concentration of interest is defined at the scenario

Path	Scenario	Weather	Distance to UFL [m]	Distance to LFL [m]	Distance to LFL fraction [m]
Study\Bobtail	Catastrophic rupture	Dia	19,554	162,985	226,714
	Leak	Dia	n/a	131,729	216,775
	Mangote 100%	Dia	n/a	52,4366	109,557
	Mangote 10%	Dia	n/a	n/a	n/a

Jet Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Flame length [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Leak	Dia	50,8692	90,4676	77,2096	68,1194
	Mangote 100%	Dia	29,576	51,0944	43,7192	38,6178
	Mangote 10%	Dia	3,39041	5,0656	4,2437	3,3799

Early Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Late Pool Fire Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Pool diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Catastrophic rupture	Dia	21,8487	74,8871	57,6591	45,6317

Fireball Results

Distance downwind to defined radiation levels

The reported radiations are defined in the parameters

Path	Scenario	Weather	Fireball diameter [m]	Distance downwind to intensity level 1 (9,85 kW/m2) [m]	Distance downwind to intensity level 2 (19,45 kW/m2) [m]	Distance downwind to intensity level 3 (35 kW/m2) [m]
Study\Bobtail	Catastrophic rupture	Dia	95,7802	193,438	137,365	100,458

Flash Fire Results

Distance downwind to defined concentrations

The reported LFL and LFL fraction are defined in the respective material property

Path	Scenario	Weather	Distance downwind to LFL [m]	Distance downwind to LFL Fraction [m]
Study\Bobtail	Catastrophic rupture	Dia	162,985	226,714
	Leak	Dia	131,729	216,775
	Mangote 100%	Dia	52,4366	109,557
	Mangote 10%	Dia		

Maximum distance to LFL fraction at any height

Path	Scenario	Weather	Max flash fire distance [m]	Height of the max flash fire distance [m]	Time [s]
Study\Bobtail	Catastrophic rupture	Dia	220,475	0	53,0463
	Leak	Dia	216,741	0	77,1047
	Mangote 100%	Dia	109,251	0	54,7554
	Mangote 10%	Dia	3,84412	0,976743	1,91795

Explosion Results

Explosion scenarios for worst-case maximum downwind distance to defined overpressures. The worst-case explosion will be modelled in the risk calculations if ignition conditions are present at the time for the scenario.

The reported overpressures are defined in the explosion parameters

Path	Scenario	Weather	Overpressure level [bar]	Maximum distance [m]	Diameter [m]
Study\Bobtail	Catastrophic rupture	Dia	0,1 0,3 0,3	291,595 242,345 242,345	203,19 64,6893 64,6893
	Leak		0,1 0,3 0,3	266,878 236,192 236,192	113,756 52,3831 52,3831
	Mangote 100%		0,1 0,3 0,3	127,26 112,553 112,553	54,5195 25,1056 25,1056

Supplementary data for worst-case explosion scenarios

Path	Scenario	Weather	Overpressure level [bar]	Explosion flammable mass [kg]	Ignition time [s]	Ignition source [m]	Cloud centre [m]	Explosion centre [m]
Study\Bobtail	Catastrophic rupture	Dia	0,1 0,3 0,3	815,495 269,501 269,501	29,7971 37,7707 37,7707	190 210 210	87,8942 42,4567 42,4567	190 210 210
	Leak		0,1 0,3 0,3	143,099 143,099 143,099	60,2026 60,2026 60,2026	210 210 210	61,1604 61,1604 61,1604	210 210 210
	Mangote 100%		0,1 0,3 0,3	15,7533 15,7533 15,7533	20,3498 20,3498 20,3498	100 100 100	25,7512 25,7512 25,7512	100 100 100