SAFETY DATA SHEET (1907/2006)

R0705968

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VERSACLEAN VB BASE BULK

ANNEX

1. OVERVIEW OF EXPOSURE SCENARIOS

Table 1: Overview on exposure scenarios and coverage of substance life cycle

Number (ES)	Short description of exposure scenario	Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
1	Manufacturing of substance	3	3, 8b, 15	-	1
2	Formulation	10	3, 8b, 15	-	2
3	Use as an intermediate	3	3, 8b, 15	-	6a
4	Offshore use in Oilfield formulations	2b	2, 8b, 15	-	4

Table 2: General characteristics for industrial uses

Domain	Industrial	
Exposure Scenarios	1 ; 2 ; 3	
Assessment Method	ECETOC TRA Worker v2.0	
Product characteristics		
Physical state	The substance is a liquid at the process temperatures.	
Vapour pressure	Vapour pressure at 20°C is $8*10^{-8}$ Pa. The substance is regarded as a low volatility substance.	
Concentration of substance	100 %	
Amounts used	Not relevant	
Human factors not influenced by risk management		
The work performed is of light character, resulting in a default respiration volume on 10m3/8h shift.		
Organisational measures to prevent /limit releases, dispersion and exposure		
Not specified		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Personal protective equipment	Yes	• Chemical resistant gloves: 98% • Protective clothing, Safety goggles

2. EXPOSURE SCENARIO 1: MANUFACTURING OF SUBSTANCE

Amidoamines and Imidazolines are produced in indoor factories in a batch process in ventilated facilities.

The maximum reaction temperature and pressure during production is 230°C at atmospheric pressure.

The final product is transferred to a storage tank.

Cleaning of reactors is performed as a closed process, waste is directed to sewage.

Packaging of substance takes place in dedicated equipment to bulk containers, IBC or drums.

Quality control at laboratory may be performed by process operators or laboratory personnel. In the laboratory handling within fume cupboards or equivalent is required.

The substance is corrosive and also a dermal sensitizer. To protect eyes and skin, Personal Protective Equipment (PPE) like goggles, chemical resistant gloves and protective clothing shall be worn.

2.1 Human Health

2.1.1 Description of Exposure scenario ES1

Reference number	ES1
Free short title	Industrial manufacture of chemical substances in chemical syntheses
Systematic title based on use descriptor	Batch manufacture of a chemical where the predominant handling is in a contained manner, e.g. through enclosed transfers, but where some opportunity for contact with chemicals occurs, e.g. through sampling. (PROC 3, 8b)
Processes, tasks, activities covered	1. PROC 3: Industrial manufacture of chemical substances, including cleaning of the equipment. 2. PROC 8b: Transfer of substance or preparation (charging) to vessels/large containers at dedicated facilities. 3. PROC 15: QC Laboratory
Environment characteristic covered	ERC 1: Manufacture of substances
Assessment Method	ECETOC TRA Worker v2.0 TGD Excel

2.1.2 Contributing scenario ES1-CS1: Control of workers exposure for PROC 3

Name of contributing scenario		Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner	
Use descriptor covered		PROC 3	
Processes, tasks activities covered		1. Industrial manufacture of chemical substances 2. Sampling 3. Charging to storage tanks in enclosed system 4. Cleaning of the process equipment in closed systems.	
Other given operational conditions affecting workers exposure			
Location		Indoors	
Frequency and duration of use/exposure			
Duration of exposure		>4	hours/day
Frequency of exposure		≤ 240	days/year
Technical conditions and measures at process level (source) to prevent release			
Enclosed transfers. Sampling with LEV. Spill containment at all input/output points.			
Technical conditions and measures to control dispersion from source towards the worker			
Local exhaust ventilation required	Yes	90% efficiency	

2.1.3 Contributing scenario ES1-CS2: Control of workers exposure for PROC 8b

Free short title	Packaging of chemical substances into bulk transport, IBC containers or drums	
Systematic title based on use descriptor	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities - PROC 8b	
Processes, tasks activities covered	1. Filling of bulk transport 2. Filling of IBC containers 3. Filling of drums	
Assessment Method	ECETOC TRA Worker v2.0	
Frequency and duration of use/exposure		
Duration of exposure	1.:15 -60 2. and 3.: > 4	min/day hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	1: Outdoors; 2 and 3: Indoors	
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	Yes	Indoors: 97% efficiency

2.1.4 Contributing scenario ES1-CS3: Control of workers exposure for PROC 15

Workers related free short title	Use of substances at small scale laboratory (< 1 l or 1 kg present at workplace): *QC laboratory.* Larger laboratories and R+D installations should be treated as industrial processes	
Use descriptor covered	PROC 15	
Frequency and duration of use/exposure		
Duration of exposure	1-4	hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	Indoor	
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	Yes	90% efficiency

2.2 Environment

2.2.1 Contributing Scenario ES1-CS4: controlling environmental exposure for ERC1

AIR: The substance is of low volatility and release to air is considered not to be relevant.

WATER: The main exposure route is via waste water:

1. All industrial surfaces should be hard surfaces, and run-off should be led to waste to avoid contamination of soil.
2. Waste water should be treated by STP. Defaults for dilution and effluent flow are assumed. No application of STP sludge to soil is assumed.

2.3 Exposure estimation

2.3.1 Human Health

Table 3: Estimated exposure for workers – PROC 3

Production, including sampling, transfer to storage tank and cleaning

Route	Exposure concentration (EC)
Long-term dermal	0.000686 mg/kg bw/day
Long-term inhalation	0.190833 mg/m3

Table 4: Estimated exposure for workers – PROC 8b1

Filling of bulk transport

Route	Exposure concentration (EC)
Long-term dermal	0.068571 mg/kg bw/day
Long-term inhalation	0.267167 mg/m3

Table 5: Estimated exposure for workers – PROC 8b2

Packaging to bulk and IBC –Packaging to drums and IBC

Route	Exposure concentration (EC)
dermal	0.006857 mg/kg bw/day
inhalation	0.05725 mg/m3

Table 6: Estimated exposure for workers – PROC 15

QC laboratory

Route	Exposure concentration (EC)
Long-term dermal	0.000343 mg/kg bw/day
Long-term inhalation	0.1145 mg/m3

2.3.2 Environmental exposure

Table 7: Aquatic compartment (including sediment)

Compartments	PEC
Freshwater (bulk) [mg/L]	Not applicable
Freshwater sediment [mg/kg wwt]	Not applicable
Marine water (bulk)) [mg/L]	4.3E-05
Marine water sediment [mg/kg wwt]	0.36

Table 8: Terrestrial compartment

Compartments	PEC
Agricultural soil [mg/kg wwt]	0
Grassland [mg/kg wwt]	0

Table 9: Microbiological activity in sewage treatment systems

Compartments	PEC (mg/l)
STP	Not applicable

3. EXPOSURE SCENARIO 2: FORMULATION

Formulation is carried out in a closed batch process.

Charging is from dedicated storage tanks or IBC containers.

Cleaning of reactors is performed as a closed process.

Packaging of substance takes place in dedicated equipment to bulk containers, IBC or drums..

Quality control at laboratory may be performed by process operators or laboratory personnel. In the laboratory handling within fume cupboards or equivalent is required.

The substance is corrosive and also dermal sensitizer. To protect eyes and skin, Personal Protective Equipment (PPE) like goggles, chemical resistant gloves and protective clothing shall be worn.

3.1 Human Health

3.1.1 Description of Exposure scenario ES 2

Reference number	ES2
Free short title	Industrial formulation
Systematic title based on use descriptor	Batch wise formulation (PROC 3; PROC 8b; PROC 15)
Processes, tasks, activities covered	1. Charging from storage tanks in enclosed system (PROC 3) 2. Charging from IBC containers (PROC 8b) 3. Industrial formulation of mixtures (PROC 3) 4. Sampling (PROC 3) 5. Packaging of formulation at dedicated facility (PROC 8b) 6. Cleaning of the process equipment in closed systems (PROC 3) 7. Disposal of waste product & used containers (PROC 8b) 8. QC laboratory (PROC 15)
Environment characteristic covered	ERC 2: Formulation
Assessment Method	ECETOC TRA Worker v2.0 TGD Excel

3.1.2 Contributing scenario ES2-CS1: Control of workers exposure for PROC 3

Name of contributing scenario	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner	
Use descriptor covered	PROC 3	
Processes, tasks activities covered	1. Charging from storage tanks in enclosed system 2. Industrial formulation of mixtures 3. Sampling 4. Cleaning of the process equipment in closed systems	
Frequency and duration of use/exposure		
Duration of exposure	>4	hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	Indoors	
Technical conditions and measures at process level (source) to prevent release		
Enclosed system. LEV at transfer points.		

Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	Yes	Efficiency: 90%

3.1.3 Contributing scenario ES2-CS2: Control of workers exposure for PROC 8b-1

Free short title	Industrial formulation	
Systematic title based on use descriptor	Transfer of substance or preparation (charging) from vessels/large containers at dedicated facilities. (PROC 8b)	
Processes, tasks activities covered	1. Charging from IBC containers 2. Disposal of waste product & used containers.	
Frequency and duration of use/exposure		
Duration of exposure	1- 4	h/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	Indoors	
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	Yes	Efficiency: 97%

3.1.4 Contributing scenario ES2-CS3: Control of workers exposure for PROC 8b-2

Free short title	Packaging into bulk transport, IBC containers or drums.	
Systematic title based on use descriptor	Transfer of substance or preparation (charging) to vessels/large containers at dedicated facilities. (PROC 8b)	
Processes, tasks activities covered	1. Filling of bulk transport 2. Filling of IBC containers 3. Filling of drums	
Frequency and duration of use/exposure		
Duration of exposure	1.:15 -60 2. and 3.: > 4	min/day hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	1: Outdoors; 2 and 3: Indoor	
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	Yes	Indoors: 97% efficiency

3.1.5 Contributing scenario ES2-CS4: Control of workers exposure for PROC 15

Workers related free short title	Use of substances at small scale laboratory (< 1 l or 1 kg present at workplace). Larger laboratories and R&Dinstallations should be treated as industrial processes	
Use descriptor covered	PROC 15	
Frequency and duration of use/exposure		
Duration of exposure	1-4	hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	Indoor	
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	Yes	Efficiency: 90%

3.2 Environment

3.2.1 Contributing Scenario ES2-CS5: controlling environmental exposure for ERC 2

The main exposure route is via waste water.

All industrial surfaces should be hard surfaces, and run-off should be led to waste.

Vent-gases are assumed to be led via scrubbers and scrubber water should be led to waste.

Exposure to soil is unlikely.

Waste water should be treated in STP. Defaults for dilution and effluent flow are assumed. No application of STP sludge to soil is assumed.

Amounts used	1000 tonnes per year
Release times per year	300 days
Environmental factors not influenced by risk management	River flow rate: 18000 m3/day
Other given operational conditions affecting environmental exposure	release to: air: 0.25%, water: 0.02%, soil: 0.01%; fraction used at main source: 100%; fraction tonnage to region: 100%
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	spERC: ESVOC SpERC 2.2.v1 Use of STP for marine and fresh water; No application of sludge to soil
Conditions and measures related to municipal sewage treatment plant	Sewage treatment plant discharge: 2000000 L/day

3.3 Exposure estimation

3.3.1 Human Health

Table 10: Estimated exposure for workers – PROC 3

Formulation (ES 2) Production, including sampling, transfer to storage tank and cleaning

Route	Exposure concentration (EC)
Long-term dermal	0.000343 mg/kg bw/day
Long-term inhalation	0.190833 mg/m3

Table 11: Estimated exposure for workers – PROC 8b

Formulation (ES 2) Charging, disposal of waste product

Route	Exposure concentration (EC)
Long-term dermal	0.0068571 mg/kg bw/day
Long-term inhalation	0.034 mg/m3

Table 12: Estimated exposure for workers – PROC 8b

Formulation (ES 2) Packaging to bulk

Route	Exposure concentration (EC)
Long-term dermal	0.068571 mg/kg bw/day
Long-term inhalation	0.267167 mg/m3

Table 13: Estimated exposure for workers – PROC 8b

Formulation (ES 2) Packaging to drums and IBC

Route	Exposure concentration (EC)
Long-term dermal	0.006857 mg/kg bw/day
Long-term inhalation	0.05725 mg/m3

Table 14: Estimated exposure for workers – PROC 15 - *QC laboratory*

Route	Exposure concentration (EC)
Long-term dermal	0.000343 mg/kg bw/day
Long-term inhalation	0.1145 mg/m3

3.3.2 Environmental exposure

Table 15: Aquatic compartment (including sediment)

Compartments	PEC
Freshwater (bulk) [mg/L]	7.10E-06
Freshwater sediment [mg/kg wwt]	0.060
Marine water (bulk)) [mg/L]	1.18E-06
Marine water sediment [mg/kg wwt]	0.001

Table 16: Terrestrial compartment

Compartments	PEC
Agricultural soil [mg/kg dwt]	1.15
Grassland [mg/kg dwt]	1.90

Table 17: Microbiological activity in sewage treatment systems

Compartments	PEC (mg/l)
STP	4.54E-7

Table 18: Secondary poisoning / Man via environment

Food source	Exposure concentration (EC) (mg/kg bw/day)
Regional daily dose via inhalatory intake for humans	4.81E-09
Regional total daily intake for humans	1.18E-06
local daily dose via inhalatory intake for humans	5.44E-04
local total daily intake for humans	6.80E-04

4. EXPOSURE SCENARIO 3: USE AS AN INTERMEDIATE

Manufacture is carried out in a closed batch process.

Charging is from dedicated storage tanks or IBC containers.

Cleaning of reactors is performed as a closed process.

Quality control at laboratory may be performed by process operators or laboratory personnel.

In the laboratory handling within fume cupboards or equivalent is required.

The substance is corrosive and also dermal sensitizer. To protect eyes and skin, Personal Protective Equipment (PPE) like goggles, chemical resistant gloves and protective clothing shall be worn.

4.1 Human Health

4.1.1 Description of Exposure scenario ES 3

Reference number	ES 3
Free short title	Use as an intermediate
Systematic title based on use descriptor	Batch wise production (PROC 3; PROC 8b; PROC 15)
Processes, tasks, activities covered	1. Charging from storage tanks in enclosed system (PROC 3) 2. Charging from IBC containers (PROC 8b) 3. Manufacture in a closed batch process (PROC 3) 4. Sampling (PROC 3) 5. Cleaning of the process equipment in closed systems (PROC 3) 6. Disposal of waste product & used containers (PROC 8b) 7 QC laboratory (PROC 15)
Environment characteristic covered	ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates)
Assessment Method	ECETOC TRA Worker v2.0 TGD Excel

4.1.2 Contributing scenario ES3-CS1: Control of workers exposure for PROC 3

Name of contributing scenario		Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner	
Use descriptor covered		PROC 3	
Processes, tasks activities covered		1. Charging from storage tanks in enclosed system 2. Industrial formulation of mixtures 3. Sampling 4. Cleaning of the process equipment in closed systems	
Frequency and duration of use/exposure			
Duration of exposure		>4	hours/day
Frequency of exposure		≤ 240	days/year
Other given operational conditions affecting workers exposure			
Location		Indoors	
Technical conditions and measures at process level (source) to prevent release			
Enclosed system. LEV at transfer points.			
Technical conditions and measures to control dispersion from source towards the worker			
Local exhaust ventilation required	Yes	Efficiency: 90%	

4.1.3 Contributing scenario ES3-CS2: Control of workers exposure for PROC 8b-1

Free short title	Industrial formulation		
Systematic title based on use descriptor	Transfer of substance or preparation (charging) from vessels/large containers at dedicated facilities. (PROC 8b)		
Processes, tasks activities covered	1. Charging from IBC containers 2. Disposal of waste product & used containers.		
Frequency and duration of use/exposure			
Duration of exposure	1- 4		h/day
Frequency of exposure	≤ 240		days/year
Other given operational conditions affecting workers exposure			
Location	Indoors		
Technical conditions and measures at process level (source) to prevent release			
None			
Technical conditions and measures to control dispersion from source towards the worker			
Local exhaust ventilation required	Yes	Efficiency: 97%	

4.1.4 Contributing scenario ES3-CS3: Control of workers exposure for PROC 8b-2

Free short title	Packaging into bulk transport, IBC containers or drums.		
Systematic title based on use descriptor	Transfer of substance or preparation (charging) to vessels/large containers at dedicated facilities. (PROC 8b)		
Processes, tasks activities covered	1. Filling of bulk transport 2. Filling of IBC containers 3. Filling of drums		
Frequency and duration of use/exposure			
Duration of exposure	1.: 15 -60 2. and 3.: > 4		min/day hours/day
Frequency of exposure	≤ 240		days/year
Other given operational conditions affecting workers exposure			
Location	1. Outdoors 2 and 3: Indoor		
Technical conditions and measures at process level (source) to prevent release			
None			
Technical conditions and measures to control dispersion from source towards the worker			
Local exhaust ventilation required	Yes	Indoors: 97% efficiency	

4.1.5 Contributing scenario ES3-CS4: Control of workers exposure for PROC 15

Workers related free short title	Use of substances at small scale laboratory (< 1 l or 1 kg present at workplace). Larger laboratories and R&D installations should be treated as industrial processes		
Use descriptor covered	PROC 15		
Frequency and duration of use/exposure			
Duration of exposure	1-4		hours/day
Frequency of exposure	≤ 240		days/year
Other given operational conditions affecting workers exposure			
Location	Indoor		
Technical conditions and measures at process level (source) to prevent release			
None			
Technical conditions and measures to control dispersion from source towards the worker			
Local exhaust ventilation required	Yes	Efficiency: 90%	

4.2 Environment

4.2.1 Contributing Scenario ES3-CS5: controlling environmental exposure for ERC 6a

The main exposure route is via waste water.

All industrial surfaces should be hard surfaces, and run-off should be led to waste.

Vent-gases are assumed to be led via scrubbers and scrubber water should be led to waste.

Exposure to soil is unlikely.

Waste water should be treated in STP. Defaults for dilution and effluent flow are assumed.

No application of STP sludge to soil is assumed.

Amounts used	1000 tonnes per year
Release times per year	300 days
Environmental factors not influenced by risk management	River flow rate: 18000 m3/day
Other given operational conditions affecting environmental exposure	release to: air: 0%, water: 0.03%, soil: 0.01%; fraction used at main source: 100%; fraction tonnage to region: 100%
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	spERC: ESVOC SpERC 6.1a.v1 Use of STP for marine and fresh water; No application of sludge to soil
Conditions and measures related to municipal sewage treatment plant	Sewage treatment plant discharge: 2000000 L/day

4.3 Exposure estimation

4.3.1 Human Health

Table 19: Estimated exposure for workers – PROC 3

Formulation (ES 2) Production, including sampling, transfer to storage tank and cleaning

Route	Exposure concentration (EC)
Long-term dermal	0.000343 mg/kg bw/day
Long-term inhalation	0.190833 mg/m3

Table 20: Estimated exposure for workers – PROC 8b

Formulation (ES 2) Charging, disposal of waste product

Route	Exposure concentration (EC)
Long-term dermal	0.0068571 mg/kg bw/day
Long-term inhalation	0.034 mg/m3

Table 21: Estimated exposure for workers – PROC 15

QC laboratory

Route	Exposure concentration (EC)
Long-term dermal	0.000343 mg/kg bw/day
Long-term inhalation	0.1145 mg/m3

4.3.2 Environmental exposure

Table 22: Aquatic compartment (including sediment)

Compartments	PEC
Freshwater (bulk) [mg/L]	1.68E-06
Freshwater sediment [mg/kg wwt]	0.014
Marine water (bulk)) [mg/L]	2.25E-07
Marine water sediment [mg/kg wwt]	0.0019

Table 23: Terrestrial compartment

Compartments	PEC
Agricultural soil [mg/kg dwt]	1.11E-8
Grassland [mg/kg dwt]	1.11E-8

Table 24: Microbiological activity in sewage treatment systems

Compartments	PEC (mg/l)
STP	1.22E-06

Table 25: Secondary poisoning / Man via environment

Food source	Exposure concentration (EC) (mg/kg bw/day)
Regional daily dose via inhalatory intake for humans	1.32E-16
Regional total daily intake for humans	2.21E-08
local daily dose via inhalatory intake for humans	7.55E-16
local total daily intake for humans	3.07E-08

5. EXPOSURE SCENARIO 4: OFFSHORE USE IN OILFIELD FORMULATIONS IN CLOSED SYSTEMS (CORROSION INHIBITORS)

The substance is used as a corrosion inhibitor in off-shore production of gas and oil.

Formulated products containing the substance are shipped offshore using offshore tanks which are sealed units with pressure release valves in case of temperature rises and vacuum breakers for temperature decreases. The vacuum breakers are also used for emptying the tanks of their contents and ensure no exposure during the process. The couplings are of the dry type and if there were to be any spillage of the material during the coupling/decoupling process then it is collected in a bund.

Products are applied to the process using a closed injection system. Products are injected at the wellheads or platform risers, topsides or into the subsea or export pipelines.

Some products may also be shipped in drums, and dosed directly from the drum. Empty drums will be disconnected and shipped onshore. Some maintenance work on dosing pumps may occur.

Typical concentration of substance in total fluids is less than 50 ppm.

The overwhelming majority of the substance will be exported with the crude but some may partition to the water phase where it could be re-injected into the formation or discharged overboard.

Quality control at laboratory may be performed. In the laboratory handling within fume cupboards or equivalent is required.

To protect eyes and skin, Personal Protective Equipment (PPE) like goggles, chemical resistant gloves and protective clothing shall be worn.

Table 26: General characteristics for ES 4

Domain	Industrial	
Amounts used	Not relevant	
Product characteristics		
Physical state	The substance is a liquid at the process temperatures.	
Vapour pressure	Vapour pressure at 20°C is $8*10^{-8}$ Pa. The substance is regarded as a low volatility substance.	
Human factors not influenced by risk management		
Not specified.		
Organisational measures to prevent /limit releases, dispersion and exposure		
Not specified.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Personal protective equipment	Yes	protective gloves: 99% Protective clothing, goggles

5.1 Human Health

5.1.1 Description of Exposure scenario ES 4

Reference number	ES 4
Systematic title based on use descriptor	SU 2b; PROC 2, 8b, 15; ERC 4;
Processes, tasks, activities covered	Used in a closed continuous process, with occasional controlled exposure (e.g. sampling).

	Quality control in laboratory.
Environment characteristic covered	Industrial use of processing aids in processes.
Assessment Method	ECETOC TRA Worker v2.0 CHARM manual

5.1.2 Contributing scenario ES4-CS1: Control of workers exposure for PROC 2

Free short title	Use as a process aid in closed system (corrosion inhibitor)	
Systematic title based on use descriptor	PROC 2- Used in a closed continuous process, with occasional controlled exposure (e.g. sampling)	
Processes, tasks activities covered	Sampling, injecting into process	
Product characteristics		
Concentration of substance	0.005 %	
Frequency and duration of use/exposure		
Duration of exposure	1 - 4	hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	Outdoors	
Technical conditions and measures at process level (source) to prevent release		
Closed injection systems.		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	No	

5.1.3 Contributing scenario ES3-CS2: Control of workers exposure for PROC 8b

Workers related free short title	Charging from drums, maintenance work on dosing pump	
Use descriptor covered	PROC 8b	
Product characteristic		
Concentration of substance	<25%	
Frequency and duration of use/exposure		
Duration of exposure	1-4	hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	Outdoor	
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	No	

5.1.4 Contributing scenario ES4-CS3: Control of workers exposure for PROC 15

Workers related free short title	Use of substances at small scale laboratory (< 1 l or 1 kg present at workplace). Larger laboratories and R+D installations should be treated as industrial processes	
Use descriptor covered	PROC 15	
Product characteristic		
Concentration of substance	<25%	
Frequency and duration of use/exposure		
Duration of exposure	1-4	hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting workers exposure		
Location	Indoor	
Technical conditions and measures at process level (source) to prevent release		

None		
Technical conditions and measures to control dispersion from source towards the worker		
Local exhaust ventilation required	Yes	Efficiency: 90%

5.2 Environment

Typical concentration of substance in total fluids is below 25 ppm. The overwhelming majority of the substance will be exported with the crude but some may partition to the water phase where it could be re-injected into the formation or discharged overboard.

5.3 Exposure estimation

5.3.1 Human Health

Table 27: Estimated exposure for workers – PROC 2

Oilfield use (ES 3) Use as a corrosion inhibitor in closed system

Route	Exposure concentration (EC)
Long-term dermal	0.013714 mg/kg bw/day
Long-term inhalation	0.080 mg/m3

Table 28: Estimated exposure for workers – PROC 8b

Oilfield use (ES 3) Charging from drums, maintenance work on dosing pump

Route	Exposure concentration (EC)
Long-term dermal	0068 mg/kg bw/day
Long-term inhalation	0.481 mg/m3

Table 29: Estimated exposure for workers – PROC 15

Oilfield use (ES 3) QC laboratory

Route	Exposure concentration (EC)
Long-term dermal	0.000343 mg/kg bw/day
Long-term inhalation	0.0687 mg/m3

5.3.2 Environmental exposure

5.3.2.1 Aquatic compartment (including sediment)

The exposure concentrations are calculated using the CHARM Manual version 1.4 Feb 2005:
Concentration in produced water is calculated using equation 2a, with a modification of the release factor for Imidazolines. Based on the information in McWillams and Payne (2001) and Gagliardi and Grigson (2003), release fraction for Imidazolines is set to 0.01.

$$C_{pw} = f_r * C_i * F_i / F_{pw}$$

Where
C_{pw} = Concentration of chemical in produced water
F_{pw} = Volume of produced water /day = default 14964 m^3/day
F_i = Total fluid production = default 16966 m^3/day

f_r = fraction released, for Imidazolines =0.01
C_i = Concentration of chemical in total fluid = 50mg/L
This gives C_{pw} = 0.57 mg/L for an oil platform and 0.52 mg/L for a gas platform.

$PEC_{water} = C_{pw} * D_{distance\ 500}$
$D_{distance\ 500} = 0.001$

PEC water= 0.00057 mg/L for an oil platform and 0.00052 mg/L for a gas platform.

Calculation of PEC sediment is based on the following equations in the Charm Manual:

$PEC_{sediment} = C_{pws} * D_{regional} * P_{sw} * (1-d_{s365})$
$D_{regional}$ = regional dilution factor = $F_{pw} / V_p / (r+d_{w1})$
$d_{w1} = 1-10^{\log(1-dwt)/t}$
$d_{s365} = 1-(1 - d_{wt})^{36.5/t}$

where
C_{pws} = Concentration of chemical in produced water
d_{wt} = fraction of chemical degraded in t days = 61% in 60 days multiplied by a factor of 0.7 to compensate for fresh water data instead of marine degradation.
d_{w1} = fraction of chemical degraded in 1 day
d_{s365} = degradation of chemical in sediment in 1 year
P_{sw} = sediment water partitioning coefficient (measured) = 47200 l/kg.

The following default values from the CHARM manual are used:

Variable	Definition	Oil production	Gas production
F_{pw} =	Volume of produced water /day [m^3/day]	14966	49
V_p =	Volume of water per platform [m^3]	$15*10^8$	$4*10^8$
R=	refreshment rate	0.24	0.24

PEC_{sed} =0.036 mg/kg wwt for Oil production platform
PEC_{sed} =0.125 mg/kg wwt for Gas production platform

Table 30: Aquatic compartment (including sediment)

Compartments	PEC
Marine water (Oil production)	0.00057 mg/l
Marine water (Gas production)	0.00052 mg/l
Marine water sediment (Oil production)	0.036 mg/kg wwt
Marine water sediment (Gas production)	0.125 mg/kg wwt