
SAFETY DATA SHEET

Annex II

Exposure scenario

Substance Name: 2,2'-oxydiethanol

EC Number: 203-872-2

CAS Number: 111-46-6

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1. EXPOSURE ASSESSMENT

General remarks

Environment

In the chemical safety assessment performed according to Article 14(3) in connection with Annex I section 3 (Environmental Hazard Assessment) and section 4 (PBT/ vPvB Assessment) no hazard was identified. Also, according to Annex VI of Directive 67/548/EEC, there is no environmental classification for diethylene glycol. Article 14 (4) of REACH, however, establishes that exposure assessment and risk characterisation according to Annex I are to be carried out in the CSA/CSR for substances (> 10 mt/y), classified as hazardous or as PBT/vPvB. Annex I, section 5.0 requires to cover any exposure that may relate to the “hazards identified” in the hazard assessment (section 1 to 4). The hazards addressed in Annex I are not limited to hazards that lead to a classification under CLP (see Guidance Document A, footnote 7).

The aquatic toxicity of the five short chain ethylene glycols (mono-, di-, tri-, tetra- and pentaethylene glycol) were evaluated as a single category. Data on the acute toxicity are available for all three trophic levels (fish, aquatic invertebrates and algae). In the majority of tests no effect was observed, even at concentrations beyond 100 mg/L. All the available data indicate that the members of the category should exhibit low toxicity. Therefore all category members can be evaluated as not harmful to aquatic life.

In addition, diethylene glycol has a low Kow of 0.0339, is not expected to bioaccumulate, and is readily biodegradable. Thus, environmental classification of diethylene glycol for acute or chronic aquatic hazards is not indicated.

The environmental assessment was performed using the latest available version of ECETOC TRA. Each scenario was assessed using an Environmental Release Category (ERC) in a Tier I assessment. If the assessment resulted in a risk characterisation ratio greater than 1.0, then a Specific Environmental Release Category (SpERC) approach was used in the ECETOC TRA tool.

Tonnages used in the estimation of exposures and risks represent industry-wide tonnages or maximum passing tonnages for the sake of conservatism. Tonnages of 200,000 per year have their basis in manufacturing volume, where the value of 200,000 tonnes represents an estimate of the industry-wide use of diethylene glycol in the manufacture of polymers. This was the worst case tonnage of any use; therefore, utilizing this tonnage results in a conservative assessment for all uses. Tonnages other than 200,000 tonnes per year represent the maximum tonnage that would pass (referred to as the “maximum passing tonnage”) for a particular scenario, as determined using the latest version of ECETOC TRA available at the time of this assessment. This approach leads to a worst case assessment since actual tonnages are expected to be much lower than the values used in the assessment.

Human health – Worker

Short-term exposure: 2,2'-oxydiethanol is not classified regarding acute inhalative or dermal toxicity.

Thus, short-term exposure (peak exposure) has not been assessed.

Exposure estimation for PROCs using the ECETOC TRA worker v2.0:

In case the ECETOC TRA worker v2.0 has been used for the calculation of PROCs the following modifications has been applied:

LEV: The LEV exposure modifying factors for dermal exposure implemented in the

ECETOC TRA v2.0 are not considered

Gloves: Implemented as an additional RMM. The following effectiveness values are assumed: Use of suitable gloves: 80%; Use of suitable gloves in combination with basic employee training: 90%; Use of suitable gloves in combination with specific activity training: 95%; Use of suitable gloves in combination with intensive management supervision controls: 98%

Short description of all exposure scenarios

Table 1: Short description of all exposure scenarios with their use descriptors and life cycle stage

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
1	Manufacturing substance of				X				3	1, 2, 3, 4, 8a, 8b, 15		1
2	Use as Intermediate				X				3	1, 2, 3, 4, 5, 8a, 8b, 9, 15		6a
3	Use as Process chemical				X				3	1, 2, 3,		4

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
										4, 5, 8a, 8b, 9, 13, 14, 15		
4	Distribution of substance				X				3	1, 2, 3, 4, 8a, 8b, 9, 15		1
5	Formulation and (re)packing of substances and mixtures				X				3	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15		2
6	Production of polymers				X				3	1, 2, 3, 4, 5, 6, 8a, 8b, 9, 15		6c
7	Use in Paints/Coatings				X				3	1,		4

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
	(industrial)									2, 3, 4, 5, 7, 8a, 8b, 10, 13, 15		
8	Use in Paints/ Coatings /Adhesives/ Sealants/ Foams/ Polymers / filled Polymers (professional)					X			22	1, 2, 3, 4, 5, 8a, 8b, 9, 10, 11, 13, 14, 15, 19		8d
9	Use in Paints/ Coatings / Surface treatment products (Consumer use)	9a, 15, 18, 23, 31, 34					X		21			8d
10	Use in Cleaning agents (industrial)				X				3	1, 2, 3, 4, 7, 8a, 8b, 10,		4

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
										13		
11	Use in Cleaning agents (professional)					X			22	1, 2, 3, 4, 8a, 8b, 10, 11, 13		8a
12	Use in Cleaning agents (Consumer use)	35					X		21			8a
13	Use in Biocidal products (Consumer use)	8					X		21			8d
14	Use in Lubricants (industrial)				X				3	1, 2, 3, 4, 7, 8a, 8b, 9, 10, 13, 17, 18		4
15	Use in Metal-working fluids (industrial)				X				3	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 17		4

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
16	Use in Metal-working fluids (professional)					X			22	1, 2, 3, 5, 8a, 8b, 9, 10, 11, 13, 17		8a
17	Use in/as Functional fluids (industrial)				X				3	1, 2, 3, 4, 8a, 8b, 9		7
18	Use in/as Functional fluids (professional)					X			22	1, 2, 3, 4, 8a, 9, 20		9b
19	Use in Heat transfer and Hydraulic fluids (Consumer)	16, 17					X		21			9b
20	Use in/as De-icing/Anti-icing applications/agents (professional)					X			22	1, 2, 8a, 8b, 11		8d
21	Use in/as De-icing/Anti-icing applications/agents (Consumer use)	4					X		21			8d

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
22	Use in laboratories (industrial and professional)				X	X			3, 22	15		8a
23	Use in Adhesives and Sealants (Consumer)	1					X		21			8c
24	Production of Polymers, filled polymers, foams, coatings, adhesives, sealants				X				3	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 14, 15		6c
25	Production of rigid foam	32					X		21			8f

1.1 Manufacturing of substance

1.1.1 Exposure Scenario 1

General Remarks

The relevant operational conditions (OCs) used for calculation of environmental exposure are mentioned under paragraph 1.1.2.4.

Table 2: Description of ES 1

Reference Number	1
1.1.1.1 Title	
Free short title	Manufacturing of substance
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 8a, 8b and 15; ERC 1
1.1.1.2 Operational conditions and Risk management measures	

1.1.1.2.1 Control of workers exposure for PROC 1		
Name of contributing scenario	Use in closed process, no likelihood of exposure	
Use descriptor covered	PROC 1	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	High	
Concentration of substance	100	%
Vapour pressure of the substance	257	hPa
(Vapour pressure corresponds to temperatures of ca. 200 °C)		
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (240 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
1.1.1.2.2 Control of workers exposure for PROC 2		
Name of contributing scenario	Use in closed, continuous process with occasional controlled exposure	
Use descriptor covered	PROC 2	
Assessment Method	ECETOC TRA Worker v2.0 with modifications	

			(see 1. General remarks)
Product characteristic			
Physical state	liquid		
Fugacity	high		
Concentration of substance	100	%	
Vapour pressure of the substance	257	hPa	
(Vapour pressure corresponds to temperatures of ca. 200 °C)			
Amounts used			
Not relevant			
Frequency and duration of use/exposure			
Duration of exposure	> 4	hours/day	
Frequency of exposure	≤ 240	days/year	
Human factors not influenced by risk management			
Exposed skin surface	Palm of both hands (480 cm ²)		
Other given operational conditions affecting workers exposure			
Location	Indoor		
Domain	Industrial		
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	Effectiveness: 90%	
Organisational measures to prevent /limit releases, dispersion and exposure			
Not relevant in ECETOC TRA			
Conditions and measures related to personal protection, hygiene and health evaluation			
Respiratory protection required	No		
1.1.1.2.2.3 Control of workers exposure for PROC 3 and 4			
Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where opportunity for exposure arises.		
Use descriptor covered	PROC 3 and 4		
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)		
Product characteristic			

Physical state	Liquid			
Fugacity	Low			
Concentration of substance	100	%		
Vapour pressure of the substance	0.008	hPa		
Amounts used				
Not relevant				
Frequency and duration of use/exposure				
Duration of exposure	> 4	hours/day		
Frequency of exposure	≤ 240	days/year		
Human factors not influenced by risk management				
Exposed skin surface	Palm of one hand (240 cm²): PROC 3			
	Palm of both hands (480 cm²): PROC 4			
Other given operational conditions affecting workers exposure				
Location	Indoor			
Domain	Industrial			
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			
Organisational measures to prevent /limit releases, dispersion and exposure				
Not relevant in ECETOC TRA				
Conditions and measures related to personal protection, hygiene and health evaluation				
Respiratory protection required	No			
1.1.1.2.4 Control of workers exposure for PROC 8a				
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities			
Use descriptor covered	PROC 8a			
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)			
Product characteristic				
Physical state	Liquid			
Fugacity	Low			
Concentration of substance	100	%		
Vapour pressure of the substance	0.008	hPa		
Amounts used				
Not relevant				

Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	Effectiveness 90%
In case no LEV is present, a suitable respiratory protection with adequate effectiveness is required		
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
1.1.1.2.5 Control of workers exposure for PROC 8b		
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at dedicated facilities	
Use descriptor covered	PROC 8b	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of both hands (480 cm ²)	

Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
1.1.1.2.6 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 in-stallations should be treated as industrial processes	
Use descriptor covered	PROC 15	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm one both hand (240 cm²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes.)

1.1.2 Exposure Estimation

1.1.2.1. Workers exposure

Table 3: Estimated exposure for workers – PROC 1

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	0.04	mg/m ³	NA
Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA

NA = Not applicable

Table 4: Estimated exposure for workers – PROC 2

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	1.37	mg/kg bw/d	NA

NA = Not applicable

Table 5 Estimated exposure for workers – PROC 3

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	13.27	mg/m ³	NA
Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA

NA = Not applicable

Table 6: Estimated exposure for workers – PROC 4

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	6.86	mg/kg bw/d	NA

NA = Not applicable

Table 7: Estimated exposure for workers – PROC 8a

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	4.42	mg/m ³	NA
Long-term exposure, systemic, dermal	13.71	mg/kg bw/d	NA

NA = Not applicable

Table 8: Estimated exposure for workers – PROC 8b

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA

Long-term exposure, systemic, dermal	6.86	mg/kg bw/d	NA
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NA = Not applicable

Table 9: Estimated exposure for workers – PROC 15

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA

NA = Not applicable

1.1.2.2. Consumer exposure

Not applicable

1.1.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.1.2.4. Environmental exposure

Table 10: Environmental Exposure Scenarion ES1-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES1-E1
Contributing scenario	Manufacturing Of Substance
Environmental Release Category	ERC1
Specific ERC	ESVOC 1
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	26,206 (maximum passing tonnage)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	1
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	87,353

Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	300 - ESVOC 1
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%)	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ESI-E1
Narrative	Release fraction derived from SpERC (ESVOC 1)
Release fraction to air from process	1.00E-06
Release fraction to wastewater from process	1.00E-02
Release fraction to soil from process (regional only)	1.00E-04
Local release to air (kg/d)	8.74E-02
Local release to sewage (kg/d)	8.74E+02

Local release to soil (kg/d)	8.74E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	87,354
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> <i>m_{spERC}</i>: Substance use rate in spERC <i>E_{ER,spERC}</i>: Efficacy of RMM in spERC <i>F_{release,,spERC}</i>: Initial release fraction in spERC <i>DF_{spERC}</i>: dilution factor of STP effluent in river </p> <p> <i>m_{site}</i>: Substance use rate at site <i>E_{ER,site}</i>: Efficacy of RMM at site <i>F_{release,,site}</i>: Initial release fraction at site <i>DF_{site}</i>: dilution factor of STP effluent in river </p>	

1.1.2.4.1. Predicted exposure concentrations in the STP and in aquatic compartments (freshwater, seawater and sediment)

Table 11: Predicted exposure concentrations in the STP and in aquatic compartments (freshwater, seawater and sediment)

Local Concentration, Compartment: STP and aquatic	unit	ES1-E1
Local PEC in surface water during emission episode (dissolved)	mg/L	5.529E+00
Annual average local PEC in surface water (dissolved)	mg/L	4.544E+00
Local PEC in fresh water sediment during emission episode	mg/kg dwt	2.090E+01
Local PEC in sea water during emission	mg/L	5.529E-01

episode		
Annual average local PEC in sea water (dissolved)	mg/L	4.544E-01
Local PEC in marine sediment during emission episode	mg/kg dwt	2.090E+00
PEC for microorganisms in STP	mg/L	5.528E+01
Comments		

1.1.2.4.2. Predicted exposure concentration in soils

Table 12: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES1-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.995E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	5.291E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.637E-02
Comments		

1.1.2.4.3. Predicted exposure concentration in the atmospheric compartment

Table 13: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES1-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.996E-11
Comments		

1.1.2.4.4. Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.2. Use as Intermediate

1.2.1 Exposure Scenario 2

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.2.2.4.

Table 14: Description of ES 2

Reference Number	2	
1.2.1.1 Title		
Free short title	Use as Intermediate	
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 8a, 8b, 9 and 15; ERC 6a	
1.2.1.2 Operational conditions and Risk management measures		
1.2.1.2.1 Control of workers exposure for PROC 1		
Workers related free short title	Use in closed process, no likelihood of exposure	
Use descriptor covered	PROC 1	
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (240 cm²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	

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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
1.2.1.2.2 Control of workers exposure for PROC 2		
Workers related free short title	Use in closed, continuous process with occasional controlled exposure	
Use descriptor covered	PROC 2	
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of both hands (480 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
1.2.1.2.3 Control of workers exposure for PROC 3 and 4		
Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where opportunity for exposure arises.	
Use descriptor covered	PROC 3 and 4	
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2		
1.2.1.2.4 Control of workers exposure for PROC 5		
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).	
Use descriptor covered	PROC 5	
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%

Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of both hands (480 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves with specific activity training	Yes	Effectiveness: 90%
1.2.1.2.5 Control of workers exposure for PROC 8a		
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.	
Use descriptor covered	PROC 8a	
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2		
1.2.1.2.6 Control of workers exposure for PROC 8b and 9		
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Transfer of substance or preparation into small	

	containers (dedicated filling line, including weighing)
Use descriptor covered	PROC 8b and 9
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.2.1.2.7 Control of workers exposure for PROC 15	
Workers related free short title	Use as laboratory reagent
Use descriptor covered	PROC 15
Processes, tasks, activities covered	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.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles
(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.2.2 Exposure Estimation

1.2.2.1. Workers exposure

For the estimated exposure for workers / PROC 3 see Table 5
For the estimated exposure for workers / PROC 4 see Table 6
For the estimated exposure for workers / PROC 8a see Table 7
For the estimated exposure for workers / PROC 8b see Table 8
For the estimated exposure for workers / PROC 15 see Table 9

Table 15: Estimated exposure for workers – PROC 1

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	0.04	mg/m ³	NA
Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA

NA = Not applicable

Table 16: Estimated exposure for workers – PROC 2

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	4.42	mg/m ³	NA
Long-term exposure, systemic, dermal	1.37	mg/kg bw/d	NA

NA = Not applicable

Table 17: Estimated exposure for workers – PROC 5

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	1.37	mg/kg bw/d	NA

NA = Not applicable

Table 18: Estimated exposure for workers – PROC 9

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	6.86	mg/kg bw/d	NA

NA = Not applicable

1.2.2.2. Consumer exposure

Not applicable

1.2.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

9.2.2.4. Environmental exposure

The environmental exposure scenario is evaluated below. Exposure has been estimated using the version of the ECETOC TRA Integrated Tool current at the time of preparation of this document. The environmental assessment was performed using the SpERC ESVOC 2, described as "Use as a isolated intermediate not under strictly controlled conditions" (Cefic SpERC Overview Table, April 2010). Given its description as relating to use as an intermediate, this SpERC was selected as the most appropriate for evaluating this particular exposure scenario.

Table 19: Environmental Exposure Scenario ES2-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES2-E1
Contributing scenario	Use As Intermediate
Environmental Release Category	ERC6a
Specific ERC	ESVOC 2
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1

Fraction of main source to local environment	0.075
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	50,000
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	300 - ESVOC 2
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	

Identifier	ES2-E1
Narrative	Release fraction derived from SpERC (ESVOC 2)
Release fraction to air from process	0.00E+00

Release fraction to wastewater from process	1.00E-02
Release fraction to soil from process (regional only)	1.00E-03
Local release to air (kg/d)	0.00E+00
Local release to sewage (kg/d)	5.00E+02
Local release to soil (kg/d)	5.00E+01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	87,175
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.2.2.4.1 Predicted exposure concentrations in the STP and in aquatic compartments (freshwater, seawater and sediment)

Table 20: Predicted exposure concentration in the STP and in aquatic compartments (freshwater, seawater and sediment)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES2-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	3.171E+00
Annual average local PEC in surface water (dissolved)	mg/L	2.608E+00
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.199E+01
Local PEC in sea water during emission episode	mg/L	3.171E-01
Annual average local PEC in sea water (dissolved)	mg/L	2.607E-01
Local PEC in marine sediment during emission episode	mg/kg dwt	1.199E+00
PEC for microorganisms in STP	mg/L	3.164E+01
Comments		

1.2.2.4.3 Predicted exposure concentration in soils

Table 21: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES2-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.142E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	3.030E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	9.378E-03
Comments		

Predicted exposure concentration in the atmospheric compartment

Table 22: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES2-E1</i>
Annual average local PEC in air (total)	kg/m ³	2.112E-13
Comments		

1.2.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.3 Use as Process chemical

1.3.1 Exposure Scenario 3

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.3.2.4.

Table 23: Description of ES 3

Reference Number	3
1.3.1.1 Title	
Free short title	Use as Process chemical
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 8a, 8b, 9, 13, 14, and 15; ERC 4
1.3.1.2 Operational conditions and Risk management measures	
1.3.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.3.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.3.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where opportunity for exposure arises.

Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.3.1.2.4 Control of workers exposure for PROC 5	
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).
Use descriptor covered	PROC 5
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.3.1.2.5 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.3.1.2.6 Control of workers exposure for PROC 8b and 9	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.

	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	
Use descriptor covered	PROC 8b and 9	
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2 and Table 14		
1.3.1.2.7 Control of workers exposure for PROC 13		
Workers related free short title	Treatment of articles by dipping and pouring.	
Use descriptor covered	PROC 13	
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of both hands (480 cm²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	

Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves with basic training	Yes	Effectiveness: 90%
1.3.1.2.9 Control of workers exposure for PROC 14		
Workers related free short title	Production of preparations or articles by tableting, compression, extrusion, pelletisation.	
Use descriptor covered	PROC 14	
Processes, tasks, activities covered	Processing of preparations and/or substances (liquid and solid) into preparations or articles. Substances in the chemical matrix may be exposed to elevated mechanical and/or thermal energy conditions. Exposure is predominantly related to volatiles and/or generated fumes, dust may be formed as well.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of both hands (480 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	

Domain		Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure			
Not relevant in ECETOC TRA			
Conditions and measures related to personal protection, hygiene and health evaluation			
Respiratory protection required		No	
1.3.1.2.10 Control of workers exposure for PROC 15			
Workers related free short title		Use as laboratory reagent	
Use descriptor covered		PROC 15	
Processes, tasks, activities covered		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.	
Assessment Method		ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2			

Additional good practice advice (for environment) beyond the REACH CSA
Use of tightly fitting safety goggles (The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.3.2 Exposure Estimation

1.3.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 59
 For the estimated exposure for workers / PROC 2 see Table 16
 For the estimated exposure for workers / PROC 3 see Table 5
 For the estimated exposure for workers / PROC 4 see Table 6
 For the estimated exposure for workers / PROC 5 see Table 17
 For the estimated exposure for workers / PROC 8a see Table 7
 For the estimated exposure for workers / PROC 8b see Table 8
 For the estimated exposure for workers / PROC 9 see Table 18
 For the estimated exposure for workers / PROC 15 see Table 9

Table 24: Estimated exposure for workers – PROC 13

Calculation tool used: ECETOC TRA 2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.22	mg/m ³	NA
Long-term exposure, systemic, dermal	1.37	mg/kg bw/d	NA

NA = Not applicable

Table 25: Estimated exposure for workers – PROC 14

Calculation tool used: ECETOC TRA 2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	3.43	mg/kg bw/d	NA

NA = Not applicable

1.3.2.2. Consumer exposure

Not applicable

1.3.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a K_{ow} of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.3.2.4. Environmental exposure**Table 26: Environmental Exposure Scenario ES3-E1**

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES3-E1
Contributing scenario	Use As Process Chemical
Environmental Release Category	ERC4
Specific ERC	ESVOC 44
Assessment scenario	
Operational Conditions	
Amounts used	

Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.075
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	50,000
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	300 - ESVOC 44
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES3-E1
Narrative	Release fraction derived from SpERC (ESVOC

	44)
Release fraction to air from process	2.00E-02
Release fraction to wastewater from process	0.00E+00
Release fraction to soil from process (regional only)	1.00E-05
Local release to air (kg/d)	1.00E+03
Local release to sewage (kg/d)	0.00E+00
Local release to soil (kg/d)	5.00E-01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	1,025,591
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.3.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 27: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES3-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	1.189E-02
Annual average local PEC in surface water (dissolved)	mg/L	1.189E-02
Local PEC in fresh water sediment during emission episode	mg/kg dwt	4.494E-02
Local PEC in sea water during emission episode	mg/L	1.227E-03
Annual average local PEC in sea water (dissolved)	mg/L	1.227E-03
Local PEC in marine sediment during emission episode	mg/kg dwt	4.636E-03
PEC for microorganisms in STP	mg/L	0.000E+00
Comments		

1.3.2.4.2 Predicted exposure concentration in soils**Table 28: Predicted exposure concentration in soils**

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES3-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	7.459E-02
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	7.442E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	9.708E-02
Comments		

1.3.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 29: Predicted exposure concentration in the atmospheric compartment**

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES3-E1</i>
Annual average local PEC in air (total)	kg/m ³	2.285E-07
Comments		

1.3.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning

can be considered negligible. The Kow for DEG is 0.0339.

1.4 Distribution of substance

1.4.1 Exposure Scenario 4

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.4.2.4.

Table 30: Description of ES 4

Reference Number	4
1.4.1.1 Title	
Free short title	Distribution of substance
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 8a, 8b, 9, and 15; ERC 1
1.4.1.2 Operational conditions and Risk management measures	
1.4.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.4.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.4.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation).

	Use in batch and other process (synthesis) where opportunity for exposure arises.
Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.4.1.2.4 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.4.1.2.5 Control of workers exposure for PROC 8b and 9	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Use descriptor covered	PROC 8b and 9
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage

Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2 and Table 14	
1.4.1.2.6 Control of workers exposure for PROC 15	
Workers related free short title	Use as laboratory reagent
Use descriptor covered	PROC 15
Processes, tasks, activities covered	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.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	

Additional good practice advice (for environment) beyond the REACH CSA	
Use of tightly fitting safety goggles (The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)	

1.4.2 Exposure Estimation

1.4.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 15
 For the estimated exposure for workers / PROC 2 see Table 16
 For the estimated exposure for workers / PROC 3 see Table 5
 For the estimated exposure for workers / PROC 4 see Table 6
 For the estimated exposure for workers / PROC 8a see Table 7
 For the estimated exposure for workers / PROC 8b see Table 8
 For the estimated exposure for workers / PROC 9 see Table 18
 For the estimated exposure for workers / PROC 15 see Table 9

1.4.2.2. Consumer exposure

Not applicable

1.4.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

9.4.2.4. Environmental exposure

Table 31: Environmental Exposure Scenario ES4-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES4-E1
Contributing scenario	Distribution Of Substance
Environmental Release Category	ERC1
Specific ERC	ESVOC 3
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,333
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	300 - ESVOC 3

Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM,1) \times (1 - ERMM,2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	

Identifier	ES4-E1
Narrative	Release fraction derived from SpERC (ESVOC 3)
Release fraction to air from process	1.00E-05
Release fraction to wastewater from process	1.00E-05
Release fraction to soil from process (regional only)	1.00E-05
Local release to air (kg/d)	1.33E-02
Local release to sewage (kg/d)	1.33E-02
Local release to soil (kg/d)	1.33E-02
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	72,381,806
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\left \frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}} \right $ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.4.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 32: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Local Concentration, Compartment: STP and aquatic	unit	ES4-E1
Local PEC in surface water during emission episode (dissolved)	mg/L	1.018E-04
Annual average local PEC in surface water (dissolved)	mg/L	8.682E-05
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.850E-04
Local PEC in sea water during emission episode	mg/L	1.014E-05
Annual average local PEC in sea water (dissolved)	mg/L	8.641E-06
Local PEC in marine sediment during emission episode	mg/kg dwt	3.834E-05
PEC for microorganisms in STP	mg/L	8.437E-04
Comments		

1.4.2.4.2 Predicted exposure concentration in soils

Table 33: Predicted exposure concentration in soils

Local Concentration, Compartment: soil	unit	ES4-E1
PEC Local in agricultural soil, averaged over 30 days	mg/kg dwt	1.998E-05
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.775E-05
Local PEC in grass land, averaged over 180 days	mg/kg dwt	1.749E-05
Comments		

1.4.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 34: Predicted exposure concentration in the atmospheric compartment

Local Concentration, Compartment: air	unit	ES4-E1
Annual average local PEC in air (total)	kg/m ³	3.057E-12
Comments		

1.4.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.5 Formulation & (re)packing of substance and mixtures

1.5.1 Exposure Scenario 5

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.5.2.4.

Table 35: Description of ES 5

Reference Number	5
1.5.1.1 Title	
Free short title	Formulation & (re)packing of substance and mixtures
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 8a, 8b, 9, 14, and 15; ERC 2
1.5.1.2 Operational conditions and Risk management measures	
1.5.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.5.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
9.5.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where opportunity for exposure arises.

Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.5.1.2.4 Control of workers exposure for PROC 5	
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).
Use descriptor covered	PROC 5
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.5.1.2.5 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.5.1.2.6 Control of workers exposure for PROC 8b and 9	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.

	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Use descriptor covered	PROC 8b and 9
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2 and Table 14	
1.5.1.2.7 Control of workers exposure for PROC 14	
Workers related free short title	Production of preparations or articles by tableting, compression, extrusion, pelletisation.
Use descriptor covered	PROC 14
Processes, tasks, activities covered	Processing of preparations and/or substances (liquid and solid) into preparations or articles. Substances in the chemical matrix may be exposed to elevated mechanical and/or thermal energy conditions. Exposure is predominantly related to volatiles and/or generated fumes, dust may be formed as well.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 67	
1.5.1.2.8 Control of workers exposure for PROC 15	
Workers related free short title	Use as laboratory reagent
Use descriptor covered	PROC 15
Processes, tasks, activities covered	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.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.5.2 Exposure Estimation**1.5.2.1. Workers exposure**

For the estimated exposure for workers / PROC 1 see Table 15

For the estimated exposure for workers / PROC 2 see Table 16

For the estimated exposure for workers / PROC 3 see Table 5

For the estimated exposure for workers / PROC 4 see Table 6

For the estimated exposure for workers / PROC 5 see Table 61

For the estimated exposure for workers / PROC 8a see Table 7

For the estimated exposure for workers / PROC 8b see Table 8

For the estimated exposure for workers / PROC 9 see Table 18

For the estimated exposure for workers / PROC 14 see Table 25

For the estimated exposure for workers / PROC 15 see Table 9

1.5.2.2. Consumer exposure

Not applicable

9.5.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.5.2.4. Environmental exposure

Table 36: Environmental Exposure Scenario ES5-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES5-E1
Contributing scenario	Formulation & (Re) Packing Of Substances And Mixtures
Environmental Release Category	ERC2
Specific ERC	ESVOC 4
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1

Fraction of main source to local environment	0.15
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	100,000
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	300 - ESVOC 4
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES5-E1
Narrative	Release fraction derived from SpERC (ESVOC 4)
Release fraction to air from process	2.50E-03
Release fraction to wastewater from process	5.00E-03

Release fraction to soil from process (regional only)	1.00E-04
Local release to air (kg/d)	2.50E+02
Local release to sewage (kg/d)	5.00E+02
Local release to soil (kg/d)	1.00E+01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	174,474
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.5.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 37: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES5-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	3.169E+00
Annual average local PEC in surface water (dissolved)	mg/L	2.605E+00
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.198E+01
Local PEC in sea water during emission episode	mg/L	3.169E-01
Annual average local PEC in sea water (dissolved)	mg/L	2.605E-01
Local PEC in marine sediment during emission episode	mg/kg dwt	1.198E+00
PEC for microorganisms in STP	mg/L	3.164E+01
Comments		

1.5.2.4.2 Predicted exposure concentration in soils

Table 38: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES5-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.287E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	4.481E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	2.957E-02
Comments		

1.5.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 39: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES5-E1</i>
Annual average local PEC in air (total)	kg/m ³	5.713E-08
Comments		

1.5.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.6 Production of Polymers

1.6.1 Exposure Scenario 6

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.6.2.4.

Table 40: Description of ES 6

Reference Number	6
1.6.1.1 Title	
Free short title	Production of polymers
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 6, 8a, 8b, 9, and 15; ERC 6c
1.6.1.2 Operational conditions and Risk management measures	
1.6.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.6.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.6.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where opportunity for exposure arises.

Use descriptor covered	PROC 3 and 4	
Processes, tasks, activities covered	<p>Batch manufacture of a chemical or formulation 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</p> <p>Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.</p>	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2		
1.6.1.2.4 Control of workers exposure for PROC 5		
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).	
Use descriptor covered	PROC 5	
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 14		
1.6.1.2.5 Control of workers exposure for PROC 6		
Workers related free short title	Calendering operations	
Use descriptor covered	PROC 6	
Processes, tasks, activities covered	Processing of product matrix Calendering at elevated temperature an large exposed surface	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		

Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves with basic training	Yes	Effectiveness: 90%
1.5.1.2.6 Control of workers exposure for PROC 8a		
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.	
Use descriptor covered	PROC 8a	
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2		
1.5.1.2.7 Control of workers exposure for PROC 8b and 9		
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	
Use descriptor covered	PROC 8b and 9	

Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2 and Table 14	
1.5.1.2.8 Control of workers exposure for PROC 15	
Workers related free short title	Use as laboratory reagent
Use descriptor covered	PROC 15
Processes, tasks, activities covered	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.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	

Additional good practice advice (for environment) beyond the REACH CSA
Use of tightly fitting safety goggles (The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes).

1.6.2 Exposure Estimation

1.6.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 15

For the estimated exposure for workers / PROC 2 see Table 16

For the estimated exposure for workers / PROC 3 see Table 5

For the estimated exposure for workers / PROC 4 see Table 6

For the estimated exposure for workers / PROC 5 see Table 17

For the estimated exposure for workers / PROC 8a see Table 7

For the estimated exposure for workers / PROC 8b see Table 8

For the estimated exposure for workers / PROC 9 see Table 18

For the estimated exposure for workers / PROC 15 see Table 9

Table 41: Estimated exposure for workers – PROC 6

Calculation tool used: ECETOC TRA 2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	2.74	mg/kg bw/d	NA

NA = Not applicable

1.6.2.2. Consumer exposure

Not applicable

1.6.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.6.2.4. Environmental exposure

Table 42: Environmental Exposure Scenario ES6-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES6-E1
Contributing scenario	Production Of Polymers
Environmental Release Category	ERC6c
Specific ERC	ESVOC 43
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.075
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	50,000
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	300 - ESVOC 43
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%

Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES6-E1
Narrative	Release fraction derived from SpERC (ESVOC 43)
Release fraction to air from process	2.00E-03
Release fraction to wastewater from process	1.00E-02
Release fraction to soil from process (regional only)	1.00E-04
Local release to air (kg/d)	1.00E+02
Local release to sewage (kg/d)	5.00E+02
Local release to soil (kg/d)	5.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	87,155
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p>	

m_{site} : Substance use rate at site
 $E_{\text{ER,site}}$: Efficacy of RMM at site
 $F_{\text{release,site}}$: Initial release fraction at site
 DF_{site} : dilution factor of STP effluent in river

1.6.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 43: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES6-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	3.172E+00
Annual average local PEC in surface water (dissolved)	mg/L	2.608E+00
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.199E+01
Local PEC in sea water during emission episode	mg/L	3.172E-01
Annual average local PEC in sea water (dissolved)	mg/L	2.608E-01
Local PEC in marine sediment during emission episode	mg/kg dwt	1.199E+00
PEC for microorganisms in STP	mg/L	3.164E+01
Comments		

1.6.2.4.2 Predicted exposure concentration in soils

Table 44: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES6-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.216E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	3.772E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.907E-02
Comments		

1.6.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 45: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES6-E1</i>
Annual average local PEC in air (total)	kg/m ³	2.285E-08
Comments		

1.6.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.7 Use in Paints/Coatings (industrial)

General remarks

PROC 7:

ECETOC TRA generally is considered to be not suitable for the calculation of processes including aerosol generation. Thus, the inhalative exposure concerning the spraying process was evaluated using Stoffenmanager v4.0, whereas the dermal exposure was calculated with RISKOFDERM v2.1.

Regarding Stoffenmanager the 75th percentile was taken as the relevant exposure value. Regarding RISKOFDERM the 75th percentile of the "Exposure loading per shift body" was added with the 75th percentile of the "Exposure loading per shift hand". The values given in µl was converted into mg and divided by a body weight of 70 kg which is generally assumed for workers. In addition, appropriate body protection was considered within the calculation of the final dermal exposure value.

1.7.1 Exposure Scenario 7

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.7.2.4.

Table 46: Description of ES 7

Reference Number	7
1.7.1.1 Title	
Free short title	Use in Paints/Coatings (industrial)
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 10, 13, and 15; ERC 4
1.7.1.2 Operational conditions and Risk management measures	
1.7.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.7.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2

Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.7.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where opportunity for exposure arises.
Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.7.1.2.4 Control of workers exposure for PROC 5	
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).
Use descriptor covered	PROC 5
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.7.1.2.5 Control of workers exposure for PROC 7	
Workers related free short title	Industrial spraying

Use descriptor covered		PROC 7	
Processes, tasks, activities covered		Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls; in case of coating, overspray may lead to waste water and waste.	
Assessment Method		Stoffenmanager v4.0 – Task: “Handling of liquids at high pressure resulting in substantial generation of mist or spray/haze”(inhalative exposure) RISKOFDERM v2.1 – Process: “Spraying” (dermal exposure)	
Product characteristic			
Physical state		Liquid	
Fugacity		Low	
Concentration of substance		100	%
Vapour pressure of the substance		0.008	hPa
Amounts used			
Application rate	1 l/min	Parameter RISKOFDERM	from
Frequency and duration of use/exposure			
Duration of exposure	6	hours/day	Parameter RISKOFDERM from (Limiting value; Assumed duration within Stoffenmanager: 4-8 hours)
Frequency of exposure	4-5	days/week	Parameter Stoffenmanager from
Human factors not influenced by risk management			
Exposed skin surface		Whole body	
Other given operational conditions affecting workers exposure			
Location		Inside	
Room volume		> 1000 m³	Parameter Stoffenmanager from
General ventilation		No general ventilation	Parameter Stoffenmanager from
Work within one meter of the source		No	
Direction of spraying		Downward	Parameter RISKOFDERM from
Technical conditions and measures at process level (source) to prevent release			

None			
Technical conditions and measures to control dispersion from source towards the worker			
Segregation	Ensure that worker is > 1 m from the source		Parameter from Stoffenmanager and RISKOFDERM
Local exhaust ventilation (Direction of airflow away from the worker)	Yes	Effectiveness: ca. 50%	Parameter from Stoffenmanager and RISKOFDERM
Organisational measures to prevent /limit releases, dispersion and exposure			
Work area regularly cleaned	Yes		Parameter from Stoffenmanager
Equipment regularly inspected and well cleaned	Yes		Parameter from Stoffenmanager
Spray direction	Level		Parameter from RISKOFDERM
Conditions and measures related to personal protection, hygiene and health evaluation			
Respiratory protection required	No	Parameter from Stoffenmanager	
Use of suitable gloves with basic training	Yes	Effectiveness: 90%	Relevant regarding exposure of the hands
Wearing of appropriate working clothes (e.g. an overall)	Yes	Effectiveness: 80%	Relevant regarding exposure of the body
1.7.1.2.6 Control of workers exposure for PROC 8a			
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.		
Use descriptor covered	PROC 8a		
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.		
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)		
For further details on OCs and RMMs see Table 2			
1.7.1.2.7 Control of workers exposure for PROC 8b			
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.		

Use descriptor covered	PROC 8b	
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2		
1.7.1.2.8 Control of workers exposure for PROC 10		
Workers related free short title	Roller application or brushing	
Use descriptor covered	PROC 10	
Processes, tasks, activities covered	Low energy spreading of e.g. coatings Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		

Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves with basic training	Yes	Effectiveness: 90%
1.7.1.2.9 Control of workers exposure for PROC 13		
Workers related free short title	Treatment of articles by dipping and pouring.	
Use descriptor covered	PROC 13	
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 23		
1.7.1.2.10 Control of workers exposure for PROC 15		
Workers related free short title	Use as laboratory reagent	
Use descriptor covered	PROC 15	
Processes, tasks, activities covered	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.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 2		

Additional good practice advice (for environment) beyond the REACH CSA	
Use of tightly fitting safety goggles (The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)	

1.7.2 Exposure Estimation

1.7.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 3

For the estimated exposure for workers / PROC 2 see Table 4

For the estimated exposure for workers / PROC 3 see Table 5

For the estimated exposure for workers / PROC 4 see Table 6

For the estimated exposure for workers / PROC 5 see Table 17

For the estimated exposure for workers / PROC 8a see Table 7

For the estimated exposure for workers / PROC 8b see Table 8

For the estimated exposure for workers / PROC 13 see Table 24

For the estimated exposure for workers / PROC 15 see Table 9

Table 47: Estimated exposure for workers – PROC 7

Calculation tool used: Stoffenmanager v4.0

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	0.84	mg/m ³	75 th percentile
Long-term exposure, systemic, dermal	75.0	mg/kg bw/d	See 1.7: General remarks

NA = Not applicable

Table 48: Estimated exposure for workers – PROC 10

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.21	mg/m ³	NA
Long-term exposure, systemic, dermal	2.74	mg/kg bw/d	NA

NA = Not applicable

1.7.2.2. Consumer exposure

Not applicable

1.7.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.7.2.4. Environmental exposure**Table 49: Environmental Exposure Scenario ES7-E1**

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES7-E1
Contributing scenario	Use In Paints/Coatings
Environmental Release Category	ERC4
Specific ERC	CEPE 16a
Assessment scenario	

Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	9,561 (maximum passing tonnage)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	1
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	42,050
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	220 - CEPE 16a
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	CEPE 16a - Wet scrubber or filtration
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES7-E1

Narrative	Release fraction derived from SpERC (CEPE 16a)
Release fraction to air from process	9.80E-01
Release fraction to wastewater from process	2.00E-02
Release fraction to soil from process (regional only)	0.00E+00
Local release to air (kg/d)	4.26E+04
Local release to sewage (kg/d)	8.69E+02
Local release to soil (kg/d)	0.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	42,052
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.7.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 50: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES7-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	5.349E+00
Annual average local PEC in surface water (dissolved)	mg/L	3.235E+00
Local PEC in fresh water sediment during emission episode	mg/kg dwt	2.022E+01
Local PEC in sea water during emission episode	mg/L	5.350E-01
Annual average local PEC in sea water (dissolved)	mg/L	3.236E-01
Local PEC in marine sediment during emission episode	mg/kg dwt	2.022E+00
PEC for microorganisms in STP	mg/L	5.322E+01
Comments		

1.7.2.4.2 Predicted exposure concentration in soils

Table 51: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES7-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.530E+00
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.389E+00
Local PEC in grass land, averaged over 180 days	mg.kg dwt	2.040E+00
Comments		

1.7.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 52: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES7-E1</i>
Annual average local PEC in air (total)	kg/m ³	6.905E-06
Comments		

1.7.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.8 Use in Paints/Coatings/Adhesives/ Sealants/ Foams/ Polymers/ filled Polymers (professional)

General remarks

PROC 11:

PROC 11:

As ECETOC TRA generally is considered to be not suitable for the calculation of processes including aerosol generation. Thus, the inhalative exposure concerning the spraying process was evaluated using Stoffenmanager v4.0; the dermal exposure was estimated using the RISKOFDERM model v2.1.

Regarding Stoffenmanager the 75th percentile was taken as the relevant exposure value. Regarding RISKOFDERM the 75th percentile of the "Exposure loading per shift body" was added with the 75th percentile of the "Exposure loading per shift hand". The values given in µl was converted into mg and divided by a body weight of 70 kg which is generally assumed for workers. In addition, appropriate body protection was considered within the calculation of the final dermal exposure value.

1.8.1 Exposure Scenario 8

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 9.8.2.4.

Table 53: Description of ES 8

Reference Number	8
1.8.1.1 Title	
Free short title	Use in Paints/Coatings/ Adhesives/ Sealants/ Foams/ Polymers/ filled Polymers (professional)
Systematic title based on use descriptor	SU22; PROC 1, 2, 3, 4, 5, 8a, 8b, 9, 10, 11, 13, 14, 15, and 19; ERC 8d
1.8.1.2 Operational conditions and Risk management measures	
1.8.1.2.1 Control of workers exposure for PROC 1, 2, 3	
Workers related free short title	Use in closed process, no likelihood of exposure. Use in closed, continuous process with occasional controlled exposure. Use in closed batch process (synthesis or formulation).
Use descriptor covered	PROC 1, 2, 3
Processes, tasks, activities covered	Use of the substances in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems. Continuous process but where the design philosophy is not specifically aimed at minimizing

		emissions. It is not high integrity and occasional expose will arise e.g. through maintenance, sampling and equipment breakages. Batch manufacture of a chemical or formulation 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.	
Assessment Method		ECETOC TRA workers (v2.0) modified (see 1. Genral remarks)	
Product characteristic			
Physical state	Liquid		
Fugacity	Low		
Concentration of substance	100	%	
Vapour pressure of the substance	0.008	hPa	
Amounts used			
Not relevant			
Frequency and duration of use/exposure			
Duration of exposure	> 4	hours/day	
Frequency of exposure	≤ 240	days/year	
Human factors not influenced by risk management			
Exposed skin surface	Palm of one hand (240 cm²)	Relevant for PROC 1 and 3	
	Palm of two hands (480 cm²)	Relevant for PROC 2	
Other given operational conditions affecting workers exposure			
Location	Indoor		
Domain	Professional		
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	No		
Organisational measures to prevent /limit releases, dispersion and exposure			
Not relevant for ECETOC TRA			
Conditions and measures related to personal protection, hygiene and health evaluation			
Respiratory protection required	No		
1.8.1.2.2 Control of workers exposure for PROC 4 and 5			
Workers related free short title	Use in batch and other process (synthesis) where opportunity for exposure arises. Mixing or blending in batch processes for		

	formulation of preparations and articles (multistage and/or significant contact)	
Use descriptor covered	PROC 4 and 5	
Processes, tasks, activities covered	<p>Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.</p> <p>Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage.</p>	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
	Palm of both hands (480 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Professional	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	

Use of suitable gloves with basic training	Yes	Effectiveness: 90%	Relevant for PROC 5
	No		Relevant for PROC 4
1.8.1.2.3 Control of workers exposure for PROC 8a			
Workers related free short title		Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.	
Use descriptor covered		PROC 8a	
Processes, tasks, activities covered		Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.	
Assessment Method		ECETOC TRA Worker v2.0 with modifications (see 1. General Remarks)	
Product characteristic			
Physical state		Liquid	
Fugacity		Low	
Concentration of substance		100	%
Vapour pressure of the substance		0.008	hPa
Amounts used			
Not relevant			
Frequency and duration of use/exposure			
Duration of exposure		>4 hours	hours/day
Frequency of exposure		≤ 240	days/year
Human factors not influenced by risk management			
Exposed skin surface	Both hands (960 cm ²)	Relevant for PROC 8a	
Other given operational conditions affecting workers exposure			
Location		Indoor	
Domain		Professional	
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	Effectiveness: 80%	
In case no LEV is present, a suitable respiratory protection with adequate effectiveness is required.			
Organisational measures to prevent /limit releases, dispersion and exposure			
Not relevant in ECETOC TRA			
Conditions and measures related to personal protection, hygiene and health evaluation			
Respiratory protection	No		

required		
1.8.1.2.4 Control of workers exposure for PROC 8b and 9		
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Transfer of substance or preparation into small containers (dedicated filling line, including weighing).	
Use descriptor covered	PROC 8b and 9	
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4 hours	Hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of both hands (480 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Professional	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		

Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
1.8.1.2.5 Control of workers exposure for PROC 10		
Workers related free short title	Roller application or brushing	
Use descriptor covered	PROC 10	
Processes, tasks, activities covered	Low energy spreading of e.g. coatings. Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	Hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Professional	
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	Effectiveness: 80%
In case no LEV is present, a suitable respiratory protection with adequate effectiveness is required		
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection	No	

required			
Use of suitable gloves with basic training	Yes	Effectiveness: 90%	
1.8.1.2.6 Control of workers exposure for PROC 11			
Workers related free short title	Non industrial spraying		
Use descriptor covered	PROC 11		
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls.		
Assessment Method	Stoffenmanager v4.0 – Task „Handling of liquids at high pressure resulting in substantial generation of mist or spray/haze“ RISKOFDERMv2.1 – Process „Spraying“		
Product characteristic			
Physical state	Liquid		
Fugacity	Low		
Concentration of substance	100	%	
Vapour pressure of the substance	0.008	hPa	
Amounts used			
Application rate of product	0.05	L/min	
Frequency and duration of use/exposure			
Duration of exposure	180	mins	Parameter from RISKOFDERM (Limiting value; Assumed duration within Stoffenmanager: 4-8 hours)
Frequency of exposure	4-5	days/week	Parameter from Stoffenmanager
Human factors not influenced by risk management			
Exposed skin surface	Whole body		
Other given operational conditions affecting workers exposure			
Location	Inside		
Room volume	100 -1000 m³	Parameter from Stoffenmanager	
General ventilation	General ventilation (mechanical)	Parameter from Stoffenmanager	
Technical conditions and measures at process level (source) to prevent release			

Segregation	Worker is within one meter of the source	Parameter from Stoffenmanager RISKOFDERM
Direction of airflow	Not clearly away from the worker	Parameter from RISKOFDERM
Technical conditions and measures to control dispersion from source towards the worker		
Control measures	No control measures at the source	Parameter from Stoffenmanager
Organisational measures to prevent /limit releases, dispersion and exposure		
Work area regularly cleaned	Yes	Parameter from Stoffenmanager
Ensure that not more than one worker is carrying out the task at the same time.		
Equipment regularly inspected and well cleaned	Yes	Parameter from Stoffenmanager
Spray direction	Level	Parameter from RISKOFDERM
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves with basic training	Yes	Effectiveness: 90%
Wearing of appropriate working clothes (e.g. an overall)	Yes	Effectiveness: 80%
1.8.1.2.7 Control of workers exposure for PROC 13 and 14		
Workers related free short title	Treatment of articles by dipping and pouring. Production of preparations or articles by tableting, compression, extrusion, pelletisation.	
Use descriptor covered	PROC 13 and 14	
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating,). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface. Use of the substances in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications	

		(see 1. General remarks)	
Product characteristic			
Physical state	Liquid		
Fugacity	Low		
Concentration of substance	100	%	
Vapour pressure of the substance	0.008	hPa	
Amounts used			
Not relevant			
Frequency and duration of use/exposure			
Duration of exposure	> 4	Hours/day	
Frequency of exposure	≤ 240	days/year	
Human factors not influenced by risk management			
Exposed body parts	Palm of both hands (480 cm ²)		
Other given operational conditions affecting workers exposure			
Location	Indoor		
Domain	Professional		
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		
Organisational measures to prevent /limit releases, dispersion and exposure			
Not relevant in ECETOC TRA			
Conditions and measures related to personal protection, hygiene and health evaluation			
Respiratory protection required	No		
Use of suitable gloves	Yes	Effectiveness: 90%	Relevant for PROC 13
	No		Relevant for PROC 14
1.8.1.2.8Control of workers exposure for PROC 15			
Workers related free short title	Use as laboratory reagent.		
Use descriptor covered	PROC 15		
Processes, tasks, activities covered	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.		
Assessment Method	ECETOC TRA workers (v2.0) modified (see 1. General remarks)		

Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (240 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Professional	
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	No	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant for ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
1.8.1.2.9 Control of workers exposure for PROC 19		
Workers related free short title	Hand-mixing with intimate contact and only PPE available	
Use descriptor covered	PROC 19	
Processes, tasks, activities covered	Addresses occupations where intimate and intentional contact with substances occurs without any specific exposure controls other than PPE.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications ¹	
Product characteristic		
Physical state	liquid	
Fugacity	low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa

Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	< 15	minutes/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Both hands and main part of arms (1980 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Professional	
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	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves	Yes	Effectiveness: 90%

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles
(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.8.2 Exposure Estimation

1.8.2.1. Workers exposure

Table 54: Estimated exposure for workers – PROC 1

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	0.04	mg/m ³	NA

Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA
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NA = Not applicable

Table 55: Estimated exposure for workers – PROC 2

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	1.37	mg/kg bw/d	NA

NA = Not applicable

Table 56: Estimated exposure for workers – PROC 3

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	13.27	mg/m ³	NA
Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA

NA = Not applicable

Table 57: Estimated exposure for workers – PROC 4

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.22	mg/m ³	NA
Long-term exposure, systemic, dermal	6.86	mg/kg bw/d	NA

NA = Not applicable

Table 58: Estimated exposure for workers – PROC 5

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.22	mg/m ³	NA
Long-term exposure, systemic, dermal	13.71	mg/kg bw/d	NA

NA = Not applicable

Table 59: Estimated exposure for workers – PROC 8a

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	13.71	mg/kg bw/d	NA

NA = Not applicable

Table 60: Estimated exposure for workers – PROC 8b

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.22	mg/m ³	NA
Long-term exposure, systemic, dermal	6.86	mg/kg bw/d	NA

NA = Not applicable

Table 61: Estimated exposure for workers – PROC 9

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.22	mg/m ³	NA
Long-term exposure, systemic, dermal	6.86	mg/kg bw/d	NA

NA = Not applicable

Table 62: Estimated exposure for workers – PROC 10

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	2.74	mg/kg bw/d	NA

NA = Not applicable

Table 63: Estimated exposure for workers – PROC 11

Calculation tool used: Stoffenmanager v4.0 and RISKOFDERMv2.1

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	4.14	mg/m ³	75 th percentile
Long-term exposure, systemic, dermal	64.70	mg/kg bw/d	75 th percentile (see 1.8 General remarks)

NA = Not applicable

Table 64: Estimated exposure for workers – PROC 13

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.22	mg/m ³	NA
Long-term exposure, systemic, dermal	1.37	mg/kg bw/d	NA

NA = Not applicable

Table 65: Estimated exposure for workers – PROC 14

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	44.22	mg/m ³	NA
Long-term exposure, systemic, dermal	3.43	mg/kg bw/d	NA

NA = Not applicable

Table 66: Estimated exposure for workers – PROC 15

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.11	mg/m ³	NA
Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA

NA = Not applicable

Table 67: Estimated exposure for workers – PROC 19

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	11.05	mg/m ³	NA
Long-term exposure, systemic, dermal	14.14	mg/kg bw/d	NA

NA = Not applicable

1.8.2.2. Consumer exposure

Not applicable

1.8.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

9.8.2.4. Environmental exposure**Table 68: Environmental Exposure Scenario ES8-E1**

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES8-E1
Contributing scenario	Use In Paints/Coatings
Environmental Release Category	ERC8d
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 – ERC8d

Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES8-E1
Narrative	Release fraction derived from ERC (8d)
Release fraction to air from process	1.00E+00
Release fraction to wastewater from process	1.00E+00
Release fraction to soil from process (regional only)	2.00E-01
Local release to air (kg/d)	1.10E+02
Local release to sewage (kg/d)	1.10E+02
Local release to soil (kg/d)	2.19E+01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	

Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	7,299

1.8.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 69: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES8-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	8.301E-01
Annual average local PEC in surface water (dissolved)	mg/L	8.301E-01
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.138E+00
Local PEC in sea water during emission episode	mg/L	8.284E-02
Annual average local PEC in sea water (dissolved)	mg/L	8.284E-02
Local PEC in marine sediment during emission episode	mg/kg dwt	3.131E-01
PEC for microorganisms in STP	mg/L	6.935E+00
Comments		

1.8.2.4.2 Predicted exposure concentration in soils

Table 70: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES8-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.879E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.695E-01
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.650E-01
Comments		

1.8.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 71: Predicted exposure concentration in the atmospheric compartment**

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES8-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.083E-10
Comments		

1.8.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.9 Use in Paints/Coatings /Surface treatment products (Consumer use)

General remarks

PC9a and PC15:

Regarding PC 9a and PC 15 two Sub-scenarios have been evaluated.

Sub-Scenario 1: Use in Paints/Coatings – non-spraying products (Water borne wall paint)

Sub-Scenario 2: Use in Paints/Coatings – spraying products

These Sub-Scenarios are intended to represent reasonable worst-case scenarios for PC9a and 15.

PC18:

To reflect a reasonable worst case scenario, the following assumptions have been made:

- An ink cartridge contains 50g of printing ink
- 50g printink ink are sufficient to print 300 pages

Generally, two steps have been assessed. Refilling of cartridges (Part A) and the printing process itself (Part B).

For the step “Refilling of toners” the ConsExpo default database for Cleaning and washing/All-purpose cleaner/Liquid/Mixing and Loading was regarded to be suitable as a basis for the inhalative and dermal exposure estimation (in case the ConsExpo default values have been used, this is stated below). Exposure via the oral route is anticipated to be not relevant.

The step “Printing process” was calculated using the evaporation model postulating instantaneous release as a worst case regarding inhalative exposure. With regard to the printing process dermal and oral exposure is considered to be negligible.

PC23 and 34:

It is assumed that the use of impregnation products for leather or textiles is covered within the scenarios described for PC 9a and 15. As DEG is a solvent which usually evaporated during or immediately after the application, a possible exposure to DEG by wearing/using impregnated products is considered to be negligible.

PC31:

For PC 31 the use of a floor/furniture polish reflects a representative worst case scenario.

1.9.1 Exposure Scenario

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.9.2.4.

Table 72 Description of the ES

Reference Number	9
1.9.1.1. Title	
Free short title	Use in Paints/Coatings /Surface treatment products (Consumer use)
Systematic title based on use descriptor	SU21; PC 9a, 15, 18, 23, 31 and 34; ERC 8d
1.9.1.2. Operational conditions and risk management measures	

1.9.1.2.1 Control of consumer exposure for PC 9a and 15		
1.9.1.2.1.1 Sub-Scenario 1/Use in Paints/Coatings - non-spraying products		
Name of contributing scenario	Use in Paints/Coatings - non-spraying products	
Use descriptor covered	PC 9a, PC 15 PC 23 and 34 (Use of impregnation products); see above (General remarks)	
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet ¹	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Painting products/Brush and roller painting/Water borne wall paint	
Product characteristic		
Physical state	liquid	
Concentration of substance	max 10.0 %	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	45 g/mol	(Default value)
Mass transfer rate	0.277 m/min	Thibodeaux's method; (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	1250 g/day	(Default value)
Frequency and duration of use/exposure		
Duration of exposure	132 min	(Default value)
Duration of application	120 min	(Default value)
Frequency of exposure	1day/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Hands and forearms (1900 cm ²)	
Contact rate	30 mg/min	(Default value)
Release duration	7200 s	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	20 m ³	(Default value)
Ventilation rate	0.6 per hour	(Default value)

Release area	10 m²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		
1.9.1.2.1.2 Sub-Scenario 2/Use in Paints/Coatings - spraying products		
Name of contributing scenario	Use in Paints/Coatings–spraying products	
Use descriptor covered	PC 9a, PC 15	
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet ¹	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Painting products/Spray painting/Spray cans	
Product characteristic		
Physical state	Liquid	
Concentration of substance	max. 10.0 %	
Vapour pressure of the substance	0.008 hPa	
Airborn fraction	1	
Weight fraction non-volatile	0.3	(Default value)
Density non-volatile	1.5 g/cm³	(Default value)
Amounts used		
Mass generation rate	0.33 g/s	(Default value)
Frequency and duration of use/exposure		
Duration of spraying	15 min	(Default value)
Duration of exposure	15 min	(Default value)
Frequency of exposure	2 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Inhalation cut-off diameter	15 µm	(Default value)
Non-respirable uptake fraction	1	
Exposed skin surface	Hands and forearms (1900 cm²)	
Contact rate	100 mg/min	(Default value)
Release duration	900 s	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2

Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	34 m ³	(Default value)
Room height	2.25 m	(Default value)
Ventilation rate	1.5 per hour	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Spraying away from exposed person		
Conditions and measures related to personal protection and hygiene		
Not applicable		
1.9.1.2.2 Control of consumer exposure for PC 18		
Name of contributing scenario	Use in Printing inks	
Use descriptor covered	PC 18	
Processes, tasks, activities covered	Refilling of toners (cartridges) – Part A; Printing process – Part B: Continuous printing of pages over a longer period of time	
Assessment Method	ConsExpo 4.1 Refilling of toners: Based on the ConsExpo default database for Cleaning and washing/All-purpose cleaner/Liquid/Mixing and Loading Printing process: Inhalation – evaporation model/instantaneous release	
Part A. Refilling step		
Product characteristic		
Physical state	Liquid	
Concentration of substance	max. 5%	
Vapour pressure of the substance	0,123 hPa	
Mol weight matrix	22 g/mol	High fraction of water is assumed
Mass transfer rate	0.277 m/min	Thibodeaux's method;
Amounts used		
Applied amount	50 g	Amount of printing ink contained in a cartridge See footnote 4
Frequency and duration of use/exposure		
Duration of exposure	0.75 min	(Default value)
Duration of application	0.3 min	(Default value)
Frequency of exposure	365 days/year	Not relevant for the

		calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting workers exposure		
Location	Inside	
Room volume	-	A “personal volume” of 1 m³ is assumed
Ventilation rate	0.5 per hour	(Default value)
Release area	20 cm²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		
Part B. Printing process		
Product characteristic		
Physical state	Liquid	
Concentration of substance	max. 5%	
Vapour pressure of the substance	0,123 hPa	
Amounts used		
Applied amount	16.0 g/day	Amount of printing ink needed to print 300 pages
Frequency and duration of use/exposure		
Duration of exposure	600 mins	
Frequency of exposure	365 days/year	Not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting workers exposure		
Location	Inside	
Room volume	25 m³	See footnote 5
Ventilation rate	0.6 per hour	See footnote 6
Application temperature	25°C	

Organisational measures to prevent /limit releases, dispersion and exposure		
Not applicable		
Conditions and measures related to personal protection, hygiene and health evaluation		
Not applicable		
1.9.1.2.3 Control of consumer exposure for PC 31		
Name of contributing scenario	Use in surface treatment products – non-spraying products	
Use descriptor covered	PC 31	
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet ⁷	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Cleaning and washing/Floor carpet and furniture products/Furniture polish	
Product characteristic		
Physical state	Liquid	
Concentration of substance	max 10 %	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	272 g/mol	(Default value)
Mass transfer rate	4660 m/min	Langmuirs method; (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	550 g/day	(Default value) See footnote 8
Frequency and duration of use/exposure		
Duration of exposure	240 min	(Default value)
Duration of application	900 min	(Default value)
Frequency of exposure	1 day/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	One hand or palm of both hands (430 cm ²)	(Default value)
Contact rate	30 mg/min	(Default value)
Release duration	7200 s	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting consumers exposure		

Location	Inside	
Room volume	58 m ³	(Default value)
Ventilation rate	0.5 per hour	(Default value)
Release area	22 m ²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		

1.9.2 Exposure Estimation

1.9.2.1. Workers exposure

Not applicable.

1.9.2.2. Consumer exposure

General Remarks

PC18:

In order to reflect the worst case regarding the long-term inhalative and dermal exposure, the exposure resulting from the refilling step and the printing process are added up.

Table 73: Estimated exposure for consumers / Contributing Scenario for PC9a and 15
Sub-Scenario 1/Use in Paints/Coatings – non-spraying products

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Long-term exposure, systemic/local, inhalative	0.09	mg/m ³	
Long-term exposure, systemic, dermal	5.54	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	

NA = Not applicable

Table 74: Estimated exposure for consumers / Contributing Scenario for PC9 and 15
Sub-Scenario 2/Use in Paints/Coatings - spraying products

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Long-term exposure, systemic/local inhalative	0.52	mg/m ³	
Long-term exposure, systemic, dermal	2,31	mg/kg bw/d	
Long-term exposure, systemic, oral	0.26	mg/kg bw/d	

Table 75: Estimated exposure for consumers / Contributing Scenario for PC18

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Part A. Refilling step			
Long-term exposure, systemic/local, inhalative	NA	mg/m ³	Estimated exposure value is regarded to be negligible (2.55E-8 mg/m ³)
Long-term exposure, systemic, dermal	0.007	mg/kg bw/d	
Part B. Printing process			
Long-term exposure, systemic/local, inhalative	2.22	mg/m ³	
Long-term exposure, systemic, dermal	NA	mg/kg bw/d	See general remarks 9.9.1
Combined exposure (Part A + Part B)			
Long-term exposure,	2.22	mg/m ³	

systemic/local, inhalative			
Long-term exposure, systemic, dermal	0.007	mg/kg bw/d	

Table 76: Estimated exposure for consumers / Contributing Scenario for PC31

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Long-term exposure, systemic/local, inhalative	0.05	mg/m ³	
Long-term exposure, systemic, dermal	8.46	mg/kg bw/d	

1.9.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.9.2.4. Environmental exposure

The environmental exposure assessment for this scenario is covered under the environmental assessment for Exposure Scenario 8 (Use in Paints/Coatings/ Adhesives/ Sealants/ Foams/ Polymers/ filled Polymers (professional)) in Section 1.8.2.4.

1.10 Use in Cleaning agents (industrial)

General remarks

PROC 7:

See 1.7

1.10.1 Exposure Scenario 10

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.10.2.4.

Table 77: Description of ES 10

Reference Number	10
1.10.1.1 Title	
Free short title	Use in Cleaning agents (industrial)
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 7, 8a, 8b, 10, and 13; ERC 4
1.10.1.2 Operational conditions and Risk management measures	
1.10.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.10.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.10.1.2.3 Control of workers exposure for PROC 3 and 4	

Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where opportunity for exposure arises.
Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.10.1.2.4 Control of workers exposure for PROC 7	
Workers related free short title	Industrial spraying
Use descriptor covered	PROC 7
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls; in case of coating, overspray may lead to waste water and waste.
Assessment Method	Stoffenmanager v4.0
For further details on OCs and RMMs see Table 46	
1.10.1.2.5 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	

1.10.1.2.6 Control of workers exposure for PROC 8b	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use descriptor covered	PROC 8b
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.10.1.2.7 Control of workers exposure for PROC 10	
Workers related free short title	Roller application or brushing
Use descriptor covered	PROC 10
Processes, tasks, activities covered	Low energy spreading of e.g. coatings Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 46	
1.10.1.2.8 Control of workers exposure for PROC 13	
Workers related free short title	Treatment of articles by dipping and pouring.
Use descriptor covered	PROC 13
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 23	

Additional good practice advice (for environment) beyond the REACH CSA
Use of tightly fitting safety goggles (The substance has shown to cause mucosal irritations at relatively high concentrations.

Thus, it is recommended to protect the eyes)

1.10.2 Exposure Estimation

1.10.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 15
 For the estimated exposure for workers / PROC 2 see Table 16
 For the estimated exposure for workers / PROC 3 see Table 5
 For the estimated exposure for workers / PROC 4 see Table 6
 For the estimated exposure for workers / PROC 7 see Table 47
 For the estimated exposure for workers / PROC 8a see Table 7
 For the estimated exposure for workers / PROC 8b see Table 8
 For the estimated exposure for workers / PROC 10 see Table 48
 For the estimated exposure for workers / PROC 13 see Table 24

1.10.2.2. Consumer exposure

Not applicable

1.10.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.10.2.4. Environmental exposure

Table 78: Environmental Exposure Scenario ES10-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES10-E1
Contributing scenario	Use In Cleaning Agents
Environmental Release Category	ERC4
Specific ERC	AISE 13
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.000055
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	50
Frequency and duration of use	

Type of release	Continuous
Emission days (days/year)	220 - AISE 13
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES10-E1
Narrative	Release fraction derived from SpERC (AISE 13)
Release fraction to air from process	0.00E+00
Release fraction to wastewater from process	1.00E+00
Release fraction to soil from process (regional only)	0.00E+00
Local release to air (kg/d)	0.00E+00
Local release to sewage (kg/d)	5.00E+01
Local release to soil (kg/d)	0.00E+00

Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	284
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{spERC} * (1 - E_{ER,spERC}) * F_{release,spERC}}{DF_{spERC}} \geq \frac{m_{site} * (1 - E_{ER,site}) * F_{release,site}}{DF_{site}}$ <p> m_{spERC}: Substance use rate in spERC $E_{ER,spERC}$: Efficacy of RMM in spERC $F_{release,spERC}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{ER,site}$: Efficacy of RMM at site $F_{release,site}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.10.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 79: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Local Concentration, Compartment: STP and aquatic	unit	ES10-E1
Local PEC in surface water during emission episode (dissolved)	mg/L	9.744E-01
Annual average local PEC in surface water (dissolved)	mg/L	8.487E-01
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.684E+00

Local PEC in sea water during emission episode	mg/L	9.452E-02
Annual average local PEC in sea water (dissolved)	mg/L	8.195E-02
Local PEC in marine sediment during emission episode	mg/kg dwt	3.573E-01
PEC for microorganisms in STP	mg/L	3.164E+00
Comments		

1.10.2.4.2 Predicted exposure concentration in soils

Table 80: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES10-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.160E-02
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	3.210E-03
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.118E-03
Comments		

1.10.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 81: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES10-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.353E-13
Comments		

1.10.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.11 Use in Cleaning agents (Professional Use)

General remarks

PROC 11:

See 1.8

1.11.1 Exposure Scenario 11

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.11.2.4.

Table 82: Description of ES 11

Reference Number	11
1.11.1.1 Title	
Free short title	Use in Cleaning agents (professional)
Systematic title based on use descriptor	SU22; PROC 1, 2, 3, 4, 8a, 8b, 10, 11, and 13; ERC 8a
1.11.1.2 Operational conditions and Risk management measures	
1.11.1.2.1 Control of workers exposure for PROC 1, 2, 3	
Workers related free short title	Use in closed process, no likelihood of exposure. Use in closed, continuous process with occasional controlled exposure. Use in closed batch process (synthesis or formulation).
Use descriptor covered	PROC 1, 2, 3
Processes, tasks, activities covered	Use of the substances in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems. Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity and occasional expose will arise e.g. through maintenance, sampling and equipment breakages. Batch manufacture of a chemical or formulation 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.
Assessment Method	ECETOC TRA workers (v2.0) modified (see 1. Genral remarks)
For further details on OCs and RMMs see Table 53	

1.11.1.2.2 Control of workers exposure for PROC 4	
Workers related free short title	Use in batch and other process (synthesis) where opportunity for exposure arises.
Use descriptor covered	PROC 4
Processes, tasks, activities covered	Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.11.1.2.3 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General Remarks)
For further details on OCs and RMMs see Table 53	
1.11.1.2.4 Control of workers exposure for PROC 8b	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use descriptor covered	PROC 8b
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.11.1.2.5 Control of workers exposure for PROC 10	
Workers related free short title	Roller application or brushing
Use descriptor covered	PROC 10
Processes, tasks, activities covered	Low energy spreading of e.g. coatings. Including

	cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.11.1.2.6 Control of workers exposure for PROC 11	
Workers related free short title	Non industrial spraying
Use descriptor covered	PROC 11
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls.
Assessment Method	Stoffenmanager v4.0 and RISKOFDERMv2.1
For further details on OCs and RMMs see Table 53	
1.11.1.2.7 Control of workers exposure for PROC 13	
Workers related free short title	Treatment of articles by dipping and pouring.
Use descriptor covered	PROC 13
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating.). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.11.2 Exposure Estimation

1.11.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 10
 For the estimated exposure for workers / PROC 2 see Table 11
 For the estimated exposure for workers / PROC 3 see Table 12
 For the estimated exposure for workers / PROC 4 see Table 13
 For the estimated exposure for workers / PROC 8a see Table 15
 For the estimated exposure for workers / PROC 8b see Table 16
 For the estimated exposure for workers / PROC 10 see Table 18
 For the estimated exposure for workers / PROC 11 see Table 19
 For the estimated exposure for workers / PROC 13 see Table 20

1.11.2.2. Consumer exposure

Not applicable

1.11.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.11.2.4. Environmental exposure

Table 83: Environmental Exposure Scenario ES11-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES11-E1
Contributing scenario	Use In Cleaning Agents
Environmental Release Category	ERC8a
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 – ERC8a

Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES11-E1
Narrative	Release fraction derived from ERC (8a)
Release fraction to air from process	1.00E+00
Release fraction to wastewater from process	1.00E+00
Release fraction to soil from process (regional only)	0.00E+00
Local release to air (kg/d)	1.10E+02
Local release to sewage (kg/d)	1.10E+02
Local release to soil (kg/d)	0.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	

Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	7,387

1.11.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 84: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES11-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	8.202E-01
Annual average local PEC in surface water (dissolved)	mg/L	8.202E-01
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.100E+00
Local PEC in sea water during emission episode	mg/L	8.191E-02
Annual average local PEC in sea water (dissolved)	mg/L	8.191E-02
Local PEC in marine sediment during emission episode	mg/kg dwt	3.096E-01
PEC for microorganisms in STP	mg/L	6.935E+00
Comments		

1.11.2.4.2 Predicted exposure concentration in soils

Table 85: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES11-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.877E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.693E-01
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.647E-01
Comments		

1.11.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 86: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES11-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.081E-10
Comments		

1.11.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.12. Use in Cleaning agents (Consumer use)

General remarks

In order to assess products included in PC35, the following three Sub-Scenarios have been calculated.

Sub-Scenario 1: Use in All-purpose cleaners - non-spraying products

Sub-Scenario 2: Use in All-purpose cleaner/spraying products

Sub-Scenario 3: Use in Floor cleaning products

These Sub-Scenarios are intended to represent resonable worst case scenarios for PC35.

Sub-Scenario 1:

Sub-Scenario 1 consists of two parts.

Part A considers the mixing and loading step in which the concentrated cleaner liquid is diluted with water; Part B considers the application of this solution. As a worst case scenario it was assumed that the concentrated cleaner liquid is diluted in a ratio of 1:5.

Sub-Scenario 2:

Sub-Scenario 2 consits of two parts.

Part A considers the spraying step, whereas Part B refers to the application step.

Sub-Scenario 1:

Sub-Scenario 1 consists of two parts.

Part A considers the mixing and loading step in which the concentrated cleaner liquid is diluted with water; Part B considers the application of this solution. As a worst case scenario it was assumed that the concentrated cleaner liquid is diluted in a ratio of 1:10.

1.12.1. Exposure Scenario 12**General Remarks**

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.12.2.4.

Table 87: Description of the ES 12

Reference Number	12	
1.12.1.1. Title		
Free short title	Use in Cleaning agents (Consumer use)	
Systematic title based on use descriptor	SU21; PC 35; ERC 8a	
1.12.1.2. Operational conditions and risk management measures		
1.12.1.2.1 Control of consumer exposure for PC 35		
1.12.1.2.1.1 Sub-Scenario 1/Use in All-purpose cleaners - non-spraying products		
Name of contributing scenario	Use in All-purpose cleaners – non-spraying products	
Use descriptor covered	PC 35	
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Cleaning and Washing/All-purpose cleaners/Liquid	
Part A. Mixing and Loading		
Product characteristic		
Physical state	liquid	
Concentration of substance	max 20 %	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	22 g/mol	(Default value)
Mass transfer rate	3660 m/min	Langmuirs method (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	500 g/day	(Default value – refers to half of the bottle content) See footnote 2
Frequency and duration of use/exposure		
Duration of exposure	0.75 min	(Default value)
Duration of application	0.3 min	(Default value)

Frequency of exposure	104 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm ²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 5
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume		A “personal volume” of 1 m ³ is assumed
Ventilation rate	0.5 per hour	(Default value)
Release area	20 cm ²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		
Part B. Application		
Product characteristic		
Physical state	Liquid	
Concentration of substance	Max. 4 %	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	18 g/mol	(Default value)
Mass transfer rate	3660 m/min	Langmuirs method (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	400 g/day	(Default value) See footnote 3
Frequency and duration of use/exposure		
Duration of exposure	240 min	(Default value)
Duration of application	20 min	(Default value)
Frequency of exposure	104 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)

Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm ²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 5
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	58 m ³	(Default value)
Ventilation rate	0.5 per hour	(Default value)
Release area	10 m ²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		
1.12.1.2.1.2 Sub-Scenario 2/Use in All-purpose cleaners - spraying products		
Name of contributing scenario	Use in All-purpose cleaners – spraying products	
Use descriptor covered	PC 35	
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Cleaning and Washing/All-purpose cleanrs/Spraying	
Part A. Spraying		
Product characteristic		
Physical state	Liquid	
Concentration of substance	max 5 %	
Vapour pressure of the substance	0.008 hPa	
Airborn fraction	0.2	(Default value)
Weight fraction non-volatile	0.05	(Default value)
Density non-volatile	1.8 g/cm ³	(Default value)
Amounts used		
Mass generation rate	0.78 g/s	(Default value)
Frequency and duration of use/exposure		
Duration of spraying	0.41 min	(Default value)
Duration of exposure	60 min	(Default value)
Frequency of exposure	365 days/year	(Default value – not relevant for the

		calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Inhalation cut-off diameter	15 µm	(Default value)
Non-respirable uptake fraction	1	(Default value)
Exposed skin surface	Hands and forearms (1900 cm²)	
Contact rate	46 mg/min	(Default value)
Release duration	2.6 s	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 5
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	15 m³	(Default value)
Room height	2.5 m	(Default value)
Ventilation rate	2.5 per hour	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Spraying away from exposed person		
Conditions and measures related to personal protection and hygiene		
Not applicable		
Part B. Cleaning		
Product characteristic		
Physical state	Liquid	
Concentration of substance	max. 5 %	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	22 g/mol	(Default value)
Mass transfer rate	3660 m/min	Langmuirs method (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	16.2 g/day	(Default value) See footnote 4
Frequency and duration of use/exposure		
Duration of exposure	60 min	(Default value)
Duration of application	10 min	(Default value)
Frequency of exposure	365 days/year	(Default value – not relevant for the calculation of the mean

		concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm ²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 5
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	15 m ³	(Default value)
Ventilation rate	2.5 per hour	(Default value)
Release area	1.71 m ²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		
1.12.1.2.1.3 Sub-Scenario 3/Use in Floor cleaning products		
Name of contributing scenario	Use in Floor cleaning products	
Use descriptor covered	PC 35	
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet ¹	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Cleaning and Washing/Floor, carpet and furniture products/Floor cleaning liquid	
Part A. Mixing and Loading		
Product characteristic		
Physical state	Liquid	
Concentration of substance	max 4 %	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	22 g/mol	(Default value)
Mass transfer rate	3660 m/min	Langmuirs method (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	500 g/day	(Default value – refers to half of the bottle content) See footnote 2

Frequency and duration of use/exposure		
Duration of exposure	0.75 min	(Default value)
Duration of application	0.3 min	(Default value)
Frequency of exposure	104 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm ²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 5
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume		A “personal volume” of 1 m ³ is assumed
Ventilation rate	1 per hour	(Default value)
Release area	20 cm ²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		
Part B. Application		
Product characteristic		
Physical state	Liquid	
Concentration of substance	Max. 4.0 %	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	18 g/mol	(Default value)
Mass transfer rate	3660 m/min	Langmuirs method (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	880 g/day	(Default value) See footnote 3
Frequency and duration of use/exposure		
Duration of exposure	240 min	(Default value)
Duration of application	30 min	(Default value)

Frequency of exposure	104 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm ²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 5
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	58 m ³	(Default value)
Ventilation rate	0.5 per hour	(Default value)
Release area	22 m ²	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		

1.12.2 Exposure Estimation

1.12.2.1. Workers exposure

Not applicable.

1.12.2.2. Consumer exposure

General Remarks

All Sub-Scenarios consists of two parts (Part A: Mixing and Loading and Part B: Application or Part A: Spraying and Part B Cleaning). To calculate the exposure resulting in each Sub-Scenario the exposure estimates resulting from Part A and Part B are added.

Table 88: Estimated exposure for consumers / Contributing Scenario for PC35
 Sub-Scenario 1/Use in All-purpose cleaners – non-spraying products

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Part A. Mixing and Loading			
Long-term exposure, systemic/local, inhalative	0.0007	mg/m ³	
Long-term exposure, systemic, dermal	0.03	mg/kg bw/d	
Long-term, exposure, systemic, oral	NA	mg/kg bw/d	
Part B. Application			
Long-term exposure, systemic/local, inhalative	0.03	mg/m ³	
Long-term exposure, systemic, dermal	11.70	mg/kg bw/d	
Long-term, exposure, systemic, oral	NA	mg/kg bw/d	
Part A and B. Mixing/Loading and Application			
Long-term exposure, systemic/local, inhalative	0.03	mg/m ³	
Long-term exposure, systemic, dermal	11.73	mg/kg bw/d	

NA = Not applicable

Table 89: Estimated exposure for consumers / Contributing Scenario for PC35

Sub-Scenario 2/Use in All-purpose cleaners – spraying products

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Part A. Spraying			
Long-term exposure, systemic/local, inhalative	NA	mg/m ³	Estimated exposure value is regarded to be negligible (1,1E-5 mg/m ³)
Long-term exposure, systemic, dermal	0.01	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	Estimated exposure value is regarded to be negligible (0.0006 mg/kg bw/day)
Part B. Cleaning			
Long-term exposure, systemic/local, inhalative	0.008	mg/m ³	
Long-term exposure, systemic, dermal	0.12	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	
Part A and B. Spraying and Cleaning			
Long-term exposure, systemic/local, inhalative	0.008	mg/m ³	
Long-term exposure, systemic, dermal	0.13	mg/kg bw/d	

NA = Not applicable

Table 90: Estimated exposure for consumers / Contributing Scenario for PC35
 Sub-Scenario 3/Use in Floor cleaning products

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Part A. Mixing and Loading			
Long-term exposure, systemic/local, inhalative	NA	mg/m ³	Estimated exposure value is regarded to be negligible (0.0001 mg/m ³)
Long-term exposure, systemic, dermal	0.008	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	
Part B. Application			
Long-term exposure, systemic/local, inhalative	0.05	mg/m ³	
Long-term exposure, systemic, dermal	14.6	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	
Part A and B. Mixing/Loading and Application			
Long-term exposure, systemic/local, inhalative	0.05	mg/m ³	
Long-term exposure, systemic, dermal	14.6	mg/kg bw/d	

NA = Not applicable

1.12.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.12.2.4. Environmental exposure

The environmental exposure scenario is covered under the environmental assessment for Use in Cleaning agents (professional) in Section 1.11.2.4.

1.13 Use in Biocidal products (Consumer use)

1.13.1 Exposure Scenario 13

General Remarks

The ConsExpo default database scenario “Disinfectants for use indoor” was chosen as a representative scenario for the Product Category. The scenario consists of two parts (Part A: Spraying and Part B: Wiping). To calculate the exposure resulting in each Sub-Scenario the exposure estimates resulting from Part A and Part B are added. The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.13.2.4.

Table 91: Description of the ES 13

Reference Number		13	
1.13.1.1. Title			
Free short title		Use in Biocidal products (Consumer use)	
Systematic title based on use descriptor		SU21; PC 8; ERC 8d	
1.13.1.2. Operational conditions and risk management measures			
1.12.1.2.1 Control of consumer exposure for PC 8			
Name of contributing scenario		Use in Biocidal products	
Use descriptor covered		PC 8	
Processes, tasks, activities covered		see above (General Remarks); see corresponding Fact Sheet	
Assessment Method		ConsExpo 4.1 Based on the ConsExpo default database for Disinfectants/Disinfectants for indoor use	
Part A. Spraying			
Product characteristic			
Physical state		Liquid	
Concentration of substance		max 10 %	
Vapour pressure of the substance		0.008 hPa	
Airborn fraction		0.2	(Default value)
Weight fraction non-volatile		0.8	
Density non-volatile		1.8 g/cm³	(Default value)
Amounts used			
Mass generation rate		0.75 g/s	(Default value)
Frequency and duration of use/exposure			
Duration of spraying		0.51 min	(Default value)
Duration of exposure		60 min	(Default value)

Frequency of exposure	365 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Inhalation cut-off diameter	15 µm	(Default value)
Non-respirable uptake fraction	1	(Default value)
Exposed skin surface	Hands and forearms (1900 cm ²)	
Contact rate	46 mg/min	(Default value)
Release duration	2.6 s	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	15 m ³	(Default value)
Room height	2.5 m	(Default value)
Ventilation rate	2.5 per hour	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Spraying away from exposed person		
Conditions and measures related to personal protection and hygiene		
Not applicable		
Part B. Wiping		
Product characteristic		
Physical state	Liquid	
Concentration of substance	max. 10 %	
Vapour pressure of the substance	0.008 hPa	
Amounts used		
Applied amount	0.02 g/day	(Default value)
Frequency and duration of use/exposure		
Frequency of exposure	365 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm ²)	(Default value)

Other given operational conditions affecting consumers exposure		
Location	Inside	
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		

1.13.2 Exposure Estimation

1.13.2.1. Workers exposure

Not applicable.

1.13.2.2. Consumer exposure

General Remarks

The scenario consists of two parts (Part A: Mixing and Loading and Part B: Application or Part A: Spraying and Part B Cleaning). To calculate the exposure resulting in each Sub-Scenario the exposure estimates resulting from Part A and Part B are added.

Table 92: Estimated exposure for consumers / Contributing Scenario for PC8

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Part A. Spraying			
Long-term exposure, systemic/local, inhalative	0.001	mg/m ³	
Long-term exposure, systemic, dermal	0.04	mg/kg bw/d	
Long-term exposure, systemic, oral	0.005	mg/kg bw/d	
Part B. Wiping			
Long-term exposure, systemic/local, inhalative	NA	mg/m ³	

Long-term exposure, systemic, dermal	0.03	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	
Part A and B. Spraying and Cleaning			
Long-term exposure, systemic/local, inhalative	0.001	mg/m ³	
Long-term exposure, systemic, dermal	0.07	mg/kg bw/d	

NA = Not applicable

1.13.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.13.2.4. Environmental exposure

The environmental exposure scenario is evaluated below. Exposure has been estimated using the version of the ECETOC TRA Integrated Tool current at the time of preparation of this document.

Table 93: Environmental Exposure Scenario ES13-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES13-E1
Contributing scenario	Use in Biocidal Products
Environmental Release Category	ERC8d
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1

Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 - ERC8d
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES13-E1
Narrative	Release fraction derived from ERC (8d)
Release fraction to air from process	1.00E+00
Release fraction to wastewater from process	1.00E+00
Release fraction to soil from process	2.00E-01

(regional only)	
Local release to air (kg/d)	1.10E+02
Local release to sewage (kg/d)	1.10E+02
Local release to soil (kg/d)	2.19E+01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	7,299

1.13.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 94: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES13-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	8.301E-01
Annual average local PEC in surface water (dissolved)	mg/L	8.301E-01
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.138E+00
Local PEC in sea water during emission episode	mg/L	8.284E-02
Annual average local PEC in sea water (dissolved)	mg/L	8.284E-02
Local PEC in marine sediment during emission episode	mg/kg dwt	3.131E-01
PEC for microorganisms in STP	mg/L	6.935E+00
Comments		

1.13.2.4.2 Predicted exposure concentration in soils**Table 95: Predicted exposure concentration in soils**

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES13-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.879E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.695E-01
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.650E-01
Comments		

1.13.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 96: Predicted exposure concentration in the atmospheric compartment**

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES13-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.083E-10
Comments		

1.13.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.14 Use in Lubricants (industrial)**1.14.1 Exposure Scenario 14****General Remarks**

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.14.2.4.

Table 97: Description of ES 14

Reference Number	14
1.14.1.1 Title	
Free short title	Use in lubricants (industrial)
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 17 and 18; ERC 4
1.14.1.2. Operational conditions and risk management measures	
1.14.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.14.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.14.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation). Use in batch and other process (synthesis) where

	opportunity for exposure arises.
Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.14.1.2.4 Control of workers exposure for PROC 5	
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).
Use descriptor covered	PROC 5
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.14.1.2.5 Control of workers exposure for PROC 7	
Workers related free short title	Industrial spraying
Use descriptor covered	PROC 7
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls; in case of coating, overspray may lead to waste water and waste.
Assessment Method	Stoffenmanager v4.0
For further details on OCs and RMMs see Table 46	
1.14.1.2.6 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation

	(charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.14.1.2.7 Control of workers exposure for PROC 8b	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use descriptor covered	PROC 8b
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.14.1.2.8 Control of workers exposure for PROC 9	
Workers related free short title	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Use descriptor covered	PROC 9
Processes, tasks, activities covered	Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.14.1.2.9 Control of workers exposure for PROC 10	
Workers related free short title	Roller application or brushing
Use descriptor covered	PROC 10
Processes, tasks, activities covered	Low energy spreading of e.g. coatings Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
Assessment Method	ECETOC TRA Worker v2.0 with modifications

	(see 1. General remarks)	
For further details on OCs and RMMs see Table 46		
1.14.1.2.10 Control of workers exposure for PROC 13		
Workers related free short title	Treatment of articles by dipping and pouring.	
Use descriptor covered	PROC 13	
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
For further details on OCs and RMMs see Table 23		
1.14.1.2.11 Control of workers exposure for PROC 17 and 18		
Workers related free short title	Lubrication at high energy conditions and in partly open process. Greasing at high energy conditions.	
Use descriptor covered	PROC 17 and 18	
Processes, tasks, activities covered	Lubrication at high energy conditions (temperature, friction) between moving parts and substance; significant part of process is open to workers. The metal working fluid may form aerosols or fumes due to rapidly moving metal parts. Use as lubricant where significant energy or temperature is applied between the substance and the moving parts.	
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)	
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day

Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Industrial	
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	Effectiveness: 90%
In case no Local exhaust ventilation is present a suitable respiratory protection of adequate effectiveness is required.		
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant in ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves with basic training	Yes	Effectiveness: 90%
		Relevant for PROC 17

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.14.2 Exposure Estimation

1.14.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 15
 For the estimated exposure for workers / PROC 2 see Table 16
 For the estimated exposure for workers / PROC 3 see Table 5
 For the estimated exposure for workers / PROC 4 see Table 6
 For the estimated exposure for workers / PROC 7 see Table 47
 For the estimated exposure for workers / PROC 8a see Table 7
 For the estimated exposure for workers / PROC 8b see Table 8
 For the estimated exposure for workers / PROC 9 see Table 18
 For the estimated exposure for workers / PROC 10 see Table 48
 For the estimated exposure for workers / PROC 13 see Table 24

Table 98: Estimated exposure for workers – PROC 17

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	4.42	mg/m ³	NA
Long-term exposure, systemic, dermal	2.74	mg/kg bw/d	NA

NA = Not applicable

Table 99: Estimated exposure for workers – PROC 18

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	4.42	mg/m ³	NA
Long-term exposure, systemic, dermal	13.71	mg/kg bw/d	NA

NA = Not applicable

1.14.2.2. Consumer exposure

Not applicable

1.14.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.14.2.4. Environmental exposure

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Table 100: Environmental Exposure Scenario ES14-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES14-E1
Contributing scenario	Use In Lubricants
Environmental Release Category	ERC4
Specific ERC	ESVOC 13
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.0005
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	5,000
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	20 - ESVOC 13
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%

Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES14-E1
Narrative	Release fraction derived from SpERC (ESVOC 13)
Release fraction to air from process	3.00E-05
Release fraction to wastewater from process	1.00E-03
Release fraction to soil from process (regional only)	1.00E-03
Local release to air (kg/d)	1.50E-01
Local release to sewage (kg/d)	5.00E+00
Local release to soil (kg/d)	5.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	842,524
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p>	

m_{site} : Substance use rate at site
 $E_{\text{ER,site}}$: Efficacy of RMM at site
 $F_{\text{release,site}}$: Initial release fraction at site
 DF_{site} : dilution factor of STP effluent in river

1.14.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 101: Predicted exposure concentrations in the STP and in the aquatic compartments

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES14-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	3.281E-02
Annual average local PEC in surface water (dissolved)	mg/L	2.905E-03
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.240E-01
Local PEC in sea water during emission episode	mg/L	3.275E-03
Annual average local PEC in sea water (dissolved)	mg/L	2.845E-04
Local PEC in marine sediment during emission episode	mg/kg dwt	1.238E-02
PEC for microorganisms in STP	mg/L	3.164E-01
Comments		

1.14.2.4.2 Predicted exposure concentration in soils

Table 102: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES14-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.203E-03
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	3.638E-04
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.549E-04
Comments		

1.14.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 103: Predicted exposure concentration in the atmospheric compartment**

<i>Local Compartment: air</i>	<i>Concentration, unit</i>	<i>ES14-E1</i>
Annual average local PEC in air (total)	kg/m ³	2.325E-12
Comments		

1.14.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.15 Use in Metal-working fluids (industrial)

1.15.1 Exposure Scenario 15

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.15.2.4.

Table 104: Description of ES 15

Reference Number	15
1.15.1.1 Title	
Free short title	Use in metal-working fluids (industrial)
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, and 17; ERC 4
1.15.1.2. Operational conditions and risk management measures	
1.15.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.15.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.15.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation).
	Use in batch and other process (synthesis) where

	opportunity for exposure arises.
Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.15.1.2.4 Control of workers exposure for PROC 5	
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).
Use descriptor covered	PROC 5
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.15.1.2.5 Control of workers exposure for PROC 7	
Workers related free short title	Industrial spraying
Use descriptor covered	PROC 7
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls; in case of coating, overspray may lead to waste water and waste.
Assessment Method	Stoffenmanager v4.0
For further details on OCs and RMMs see Table 46	
1.15.1.2.6 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation

	(charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.15.1.2.7 Control of workers exposure for PROC 8b	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use descriptor covered	PROC 8b
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.15.1.2.8 Control of workers exposure for PROC 9	
Workers related free short title	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Use descriptor covered	PROC 9
Processes, tasks, activities covered	Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.15.1.2.9 Control of workers exposure for PROC 10	
Workers related free short title	Roller application or brushing
Use descriptor covered	PROC 10
Processes, tasks, activities covered	Low energy spreading of e.g. coatings Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
Assessment Method	ECETOC TRA Worker v2.0 with modifications

	(see 1. General remarks)
For further details on OCs and RMMs see Table 46	
1.15.1.2.10 Control of workers exposure for PROC 13	
Workers related free short title	Treatment of articles by dipping and pouring.
Use descriptor covered	PROC 13
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 23	
1.15.1.2.11 Control of workers exposure for PROC 17	
Workers related free short title	Lubrication at high energy conditions and in partly open process.
Use descriptor covered	PROC 17
Processes, tasks, activities covered	Lubrication at high energy conditions (temperature, friction) between moving parts and substance; significant part of process is open to workers. The metal working fluid may form aerosols or fumes due to rapidly moving metal parts.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 45	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.15.2 Exposure Estimation

1.15.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 15
 For the estimated exposure for workers / PROC 2 see Table 16
 For the estimated exposure for workers / PROC 3 see Table 5
 For the estimated exposure for workers / PROC 4 see Table 6
 For the estimated exposure for workers / PROC 7 see Table 47
 For the estimated exposure for workers / PROC 8a see Table 7
 For the estimated exposure for workers / PROC 8b see Table 8
 For the estimated exposure for workers / PROC 9 see Table 18
 For the estimated exposure for workers / PROC 10 see Table 48
 For the estimated exposure for workers / PROC 13 see Table 24
 For the estimated exposure for workers / PROC 17 see Table 98

1.15.2.2. Consumer exposure

Not applicable

1.15.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.15.2.4. Environmental exposure

Table 105: Environmental Exposure Scenario ES15-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES15-E1
Contributing scenario	Use In Metal Working Fluids
Environmental Release Category	ERC4
Specific ERC	ESVOC 18
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.0005
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	5,000
Frequency and duration of use	
Type of release	Continuous

Emission days (days/year)	20 - ESVOC 18
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES15-E1
Narrative	Release fraction derived from SpERC (ESVOC 18)
Release fraction to air from process	6.00E-03
Release fraction to wastewater from process	1.00E-03
Release fraction to soil from process (regional only)	0.00E+00
Local release to air (kg/d)	3.00E+01
Local release to sewage (kg/d)	5.00E+00
Local release to soil (kg/d)	0.00E+00
Total efficiency of removal from	

wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	696,441
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.15.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 106 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES15-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	3.586E-02
Annual average local PEC in surface water (dissolved)	mg/L	5.957E-03
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.356E-01
Local PEC in sea water during emission episode	mg/L	3.595E-03
Annual average local PEC in sea water (dissolved)	mg/L	6.041E-04
Local PEC in marine sediment during emission episode	mg/kg dwt	1.359E-02
PEC for microorganisms in STP	mg/L	3.164E-01
Comments		

1.15.2.4.2 Predicted exposure concentration in soils

Table 107: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES15-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.098E-02
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.015E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	9.982E-03
Comments		

1.15.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 108: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES15-E1</i>
Annual average local PEC in air (total)	kg/m ³	4.635E-10
Comments		

1.15.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.16 Use in Metal-working fluids (professional)

1.16.1 Exposure Scenario 16

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.16.2.4.

Table 109: Description of ES 16

Reference Number	16
1.16.1.1 Title	
Free short title	Use in metal-working fluids (professional)
Systematic title based on use descriptor	SU22; PROC 1, 2, 3, 5, 8a, 8b, 9, 10, 11, 13, and 17; ERC 8a
1.16.1.2 Operational conditions and Risk management measures	
1.16.1.2.1 Control of workers exposure for PROC 1, 2, 3	
Workers related free short title	Use in closed process, no likelihood of exposure. Use in closed, continuous process with occasional controlled exposure. Use in closed batch process (synthesis or formulation).
Use descriptor covered	PROC 1, 2, 3
Processes, tasks, activities covered	Use of the substances in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems. Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity and occasional expose will arise e.g. through maintenance, sampling and equipment breakages. Batch manufacture of a chemical or formulation 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.
Assessment Method	ECETOC TRA workers (v2.0) modified (see 1. Genral remarks)
For further details on OCs and RMMs see Table 53	
1.16.1.2.2 Control of workers exposure for PROC 5	
Workers related free short title	Use in batch and other process (synthesis) where opportunity for exposure arises.
Use descriptor covered	PROC 5

Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.16.1.2.3 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non-dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General Remarks)
For further details on OCs and RMMs see Table 53	
1.16.1.2.4 Control of workers exposure for PROC 8b and 9	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Use descriptor covered	PROC 8b and 9
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.16.1.2.5 Control of workers exposure for PROC 10	
Workers related free short title	Roller application or brushing
Use descriptor covered	PROC 10

Processes, tasks, activities covered	Low energy spreading of e.g. coatings. Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.16.1.2.6 Control of workers exposure for PROC 11	
Workers related free short title	Non industrial spraying
Use descriptor covered	PROC 11
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls.
Assessment Method	Stoffenmanager v4.0 and RISKOFDERMv2.1
For further details on OCs and RMMs see Table 53	
1.16.1.2.7 Control of workers exposure for PROC 13	
Workers related free short title	Treatment of articles by dipping and pouring.
Use descriptor covered	PROC 13
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dyeing, plating,). Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.16.1.2.8 Control of workers exposure for PROC 17	
Workers related free short title	Lubrication at high energy conditions and in partly open process.
Use descriptor covered	PROC 17
Processes, tasks, activities covered	Lubrication at high energy conditions (temperature, friction) between moving parts and substance; significant part of process is open to workers.
Assessment Method	ECETOC TRA workers (v2.0) modified

		(see 1. General remarks)
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Professional	
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	Yes	Effectiveness: 80%
In case no Local exhaust ventilation is present a suitable respiratory protection of adequate effectiveness is required.		
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant for ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves	Yes	Effectiveness: 90%

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.16.2 Exposure Estimation

1.16.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 54
 For the estimated exposure for workers / PROC 2 see Table 55
 For the estimated exposure for workers / PROC 3 see Table 56
 For the estimated exposure for workers / PROC 5 see Table 58
 For the estimated exposure for workers / PROC 8a see Table 59
 For the estimated exposure for workers / PROC 8b see Table 60
 For the estimated exposure for workers / PROC 10 see Table 62
 For the estimated exposure for workers / PROC 11 see Table 63
 For the estimated exposure for workers / PROC 13 see Table 64

Table 110: Estimated exposure for workers – PROC 17

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.10	mg/m ³	NA
Long-term exposure, systemic, dermal	2.74	mg/kg bw/d	NA

NA = Not applicable

1.16.2.2. Consumer exposure

Not applicable

1.16.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.16.2.4. Environmental exposure

The environmental exposure scenario is evaluated below. Exposure has been estimated using the version of the ECETOC TRA Integrated Tool current at the time of preparation of this document.

Table 111: Environmental Exposure Scenario ES16-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES16-E1
Contributing scenario	Use In Metal Working Fluids
Environmental Release Category	ERC8a
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 – ERC8a
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%

Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES16-E1
Narrative	Release fraction derived from ERC (8a)
Release fraction to air from process	1.00E+00
Release fraction to wastewater from process	1.00E+00
Release fraction to soil from process (regional only)	0.00E+00
Local release to air (kg/d)	1.10E+02
Local release to sewage (kg/d)	1.10E+02
Local release to soil (kg/d)	0.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	7,387

1.16.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 112: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Local Concentration, Compartment: STP and aquatic	unit	ES16-E1
Local PEC in surface water during emission episode (dissolved)	mg/L	8.202E-01
Annual average local PEC in surface water (dissolved)	mg/L	8.202E-01
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.100E+00
Local PEC in sea water during emission episode	mg/L	8.191E-02
Annual average local PEC in sea water (dissolved)	mg/L	8.191E-02

Local PEC in marine sediment during emission episode	mg/kg dwt	3.096E-01
PEC for microorganisms in STP	mg/L	6.935E+00
Comments		

1.16.2.4.2 Predicted exposure concentration in soils

Table 113: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES16-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.877E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.693E-01
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.647E-01
Comments		

1.16.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 114: Predicted exposure concentration in the atmospheric compartment**

<i>Local Compartment: air</i>	<i>Concentration, unit</i>	<i>ES16-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.081E-10
Comments		

1.16.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.17 Use in/as Functional fluids (industrial)**1.17.1 Exposure Scenario 17****General Remarks**

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.17.2.4.

Table 115: Description of ES 17

Reference Number	17
1.17.1.1 Title	
Free short title	Use in / as functional fluids (industrial)
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 8a, 8b, and 9; ERC 7
1.17.1.2 Operational conditions and Risk management measures	
1.17.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.17.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.17.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation).
	Use in batch and other process (synthesis) where opportunity for exposure arises.

Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.17.1.2.4 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.17.1.2.5 Control of workers exposure for PROC 8b	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use descriptor covered	PROC 8b
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.17.1.2.6 Control of workers exposure for PROC 9	
Workers related free short title	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Use descriptor covered	PROC 9

Processes, tasks, activities covered	Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.17.2 Exposure Estimation

1.17.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 15

For the estimated exposure for workers / PROC 2 see Table 16

For the estimated exposure for workers / PROC 3 see Table 5

For the estimated exposure for workers / PROC 4 see Table 6

For the estimated exposure for workers / PROC 8a see Table 7

For the estimated exposure for workers / PROC 8b see Table 8

For the estimated exposure for workers / PROC 9 see Table 18

1.17.2.2. Consumer exposure

Not applicable

1.17.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.17.2.4. Environmental exposure

Table 116: Environmental Exposure Scenario ES17-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES17-E1
Contributing scenario	Use In/As Functional Fluids
Environmental Release Category	ERC7
Specific ERC	ESVOC 31

Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.00005
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	500
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	20 - ESVOC 31
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	

Other environmental control measures additional to above	
Identifier	ES17-E1
Narrative	Release fraction derived from SpERC (ESVOC 31)
Release fraction to air from process	1.00E-04
Release fraction to wastewater from process	1.00E-03
Release fraction to soil from process (regional only)	1.00E-03
Local release to air (kg/d)	5.00E-02
Local release to sewage (kg/d)	5.00E-01
Local release to soil (kg/d)	5.00E-01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	631,657
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.17.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 117: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES17-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	4.376E-03
Annual average local PEC in surface water (dissolved)	mg/L	1.386E-03
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.654E-02
Local PEC in sea water during emission episode	mg/L	4.318E-04
Annual average local PEC in sea water (dissolved)	mg/L	1.328E-04
Local PEC in marine sediment during emission episode	mg/kg dwt	1.632E-03
PEC for microorganisms in STP	mg/L	3.164E-02
Comments		

1.17.2.4.2 Predicted exposure concentration in soils**Table 118: Predicted exposure concentration in soils**

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES17-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	2.887E-04
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	2.049E-04
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.840E-04
Comments		

1.17.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 119: Predicted exposure concentration in the atmospheric compartment**

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES17-E1</i>
Annual average local PEC in air (total)	kg/m ³	8.775E-13
Comments		

1.17.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.18 Use in/as Functional fluids (professional)

1.18.1 Exposure Scenario

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.18.2.4.

Table 120: Description of ES 18

Reference Number	18
1.18.1.1 Title	
Free short title	Use in/as functional fluids (professional)
Systematic title based on use descriptor	SU22; PROC 1, 2, 3, 4, 8a, 9, and 20; ERC 9b
1.18.1.2 Operational conditions and Risk management measures	
1.18.1.2.1 Control of workers exposure for PROC 1, 2, 3	
Workers related free short title	Use in closed process, no likelihood of exposure. Use in closed, continuous process with occasional controlled exposure. Use in closed batch process (synthesis or formulation).
Use descriptor covered	PROC 1, 2, 3
Processes, tasks, activities covered	Use of the substances in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems. Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity and occasional exposure will arise e.g. through maintenance, sampling and equipment breakages. Batch manufacture of a chemical or formulation 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.
Assessment Method	ECETOC TRA workers (v2.0) modified (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.8.1.2.2 Control of workers exposure for PROC 4	
Workers related free short title	Use in batch and other process (synthesis) where opportunity for exposure arises.
Use descriptor covered	PROC 4

Processes, tasks, activities covered	Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.18.1.2.3 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General Remarks)
For further details on OCs and RMMs see Table 53	
1.18.1.2.4 Control of workers exposure for PROC 9	
Workers related free short title	Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
Use descriptor covered	PROC 9
Processes, tasks, activities covered	Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.18.1.2.4 Control of workers exposure for PROC 20	
Workers related free short title	Heat and pressure transfer fluids in dispersive, professional use but closed systems.
Use descriptor covered	PROC 20
Processes, tasks, activities covered	Motor and engine oils, brake fluids. Also in these applications, the lubricant may be exposed to high energy conditions and chemical reactions may take place during use. Exhausted fluids need to be disposed of as waste. Repair and maintenance may lead to skin contact.

Assessment Method		ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
Product characteristic		
Physical state	Liquid	
Fugacity	Low	
Concentration of substance	100	%
Vapour pressure of the substance	0.008	hPa
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Human factors not influenced by risk management		
Exposed skin surface	Palm of both hands (480 cm ²)	
Other given operational conditions affecting workers exposure		
Location	Indoor	
Domain	Professional	
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	No	
Organisational measures to prevent /limit releases, dispersion and exposure		
Not relevant for ECETOC TRA		
Conditions and measures related to personal protection, hygiene and health evaluation		
Respiratory protection required	No	
Use of suitable gloves	No	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.18.2 Exposure Estimation

1.18.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 54

For the estimated exposure for workers / PROC 2 see Table 55

For the estimated exposure for workers / PROC 3 see Table 56

For the estimated exposure for workers / PROC 4 see Table 57

For the estimated exposure for workers / PROC 8a see Table 59

For the estimated exposure for workers / PROC 9 see Table 61

Table 121: Estimated exposure for workers – PROC 20

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.10	mg/m ³	NA
Long-term exposure, systemic, dermal	1.71	mg/kg bw/d	NA

NA = Not applicable

1.18.2.2. Consumer exposure

Not applicable

1.18.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.18.2.4. Environmental exposure

Table 122: Environmental Exposure Scenario ES18-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES18-E1
Contributing scenario	Use In/As Functional Fluids
Environmental Release Category	ERC9b
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	

Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 - ERC9b
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES18-E1
Narrative	Release fraction derived from ERC (9b)

Release fraction to air from process	5.00E-02
Release fraction to wastewater from process	5.00E-02
Release fraction to soil from process (regional only)	5.00E-02
Local release to air (kg/d)	5.48E+00
Local release to sewage (kg/d)	5.48E+00
Local release to soil (kg/d)	5.48E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	139,337

1.18.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 123: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES18-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	4.348E-02
Annual average local PEC in surface water (dissolved)	mg/L	4.348E-02
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.644E-01
Local PEC in sea water during emission episode	mg/L	4.327E-03
Annual average local PEC in sea water (dissolved)	mg/L	4.327E-03
Local PEC in marine sediment during emission episode	mg/kg dwt	1.636E-02
PEC for microorganisms in STP	mg/L	3.467E-01
Comments		

1.18.2.4.2 Predicted exposure concentration in soils**Table 124: Predicted exposure concentration in soils**

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES18-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	9.443E-03
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	8.523E-03
Local PEC in grass land, averaged over 180 days	mg.kg dwt	8.294E-03
Comments		

1.18.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 125: Predicted exposure concentration in the atmospheric compartment**

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES18-E1</i>
Annual average local PEC in air (total)	kg/m ³	5.444E-12
Comments		

1.18.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.19 Use in Heat transfer and Hydraulic fluids (Consumer use)

General remarks

Generally, heat transfer and hydraulic fluids are products being in closed systems. Thus, exposure towards the substance is considered to be negligible within that stage of use. Relevant exposure may occur during charging and/or discharging.

Several scenarios (default databases) in ConsExpo 4.1 address a "Mixing and Loading" step. However, usually these scenarios are based on the assumption that relatively small amounts of product (<100g) are charged. Regarding the charging/discharging of heat transfer and hydraulic fluids presumably greater amounts of product are handled. Thus, the exposure resulting from charging/discharging of heat transfer and hydraulic fluids is assessed by means of a calculation of PROC 8a for the professional domain which is considered to represent the charging/discharging process performed by consumers in an appropriate way.

To calculate PROC 8a the ECETOC TRA worker tool (v2.0) was used. Deviating from the ECETOC TRA calculation algorithms a direct multiplication of the basic estimate by the fraction of the substance in the preparation used was done. This approach is considered to be applicable due to the low volatility of the substance.

Oral exposure is regarded to be no relevant route of exposure for the ES.

1.19.1 Exposure Scenario 19

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.19.2.4.

Table 126: Description of the ES 19

Reference Number	19
1.19.1.1. Title	
Free short title	Use in Heat transfer and Hydraulic fluids (Consumer use)
Systematic title based on use descriptor	SU21; PC 16, PC17; (PROC8a); ERC 9b
1.19.1.2. Operational conditions and risk management measures	
1.19.1.2.1 Control of consumer exposure for PC16 and PC17	
Name of contributing scenario	Use in Heat transfer and Hydraulic fluids
Use descriptor covered	PC16 and PC17
Processes, tasks, activities covered	see above (General Remarks);
Assessment Method	ECETOC TRA (worker) v2.0 with modifications (see 1.19 General remarks)
Product characteristic	
Physical state	Liquid
Concentration of substance	max 45 %
Vapour pressure of the substance	0.008 hPa

Amounts used		
Not applicable		
Frequency and duration of use/exposure		
Duration of exposure	< 15 min	
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm ²)	
Type of activity (inhalation rate)	Light activity	See footnote 1
Other given operational conditions affecting consumers exposure		
Location	Inside	
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		

1.19.2 Exposure Estimation

1.19.2.1. Workers exposure

Not applicable.

1.19.2.2. Consumer exposure

Table 127: Estimated exposure for consumers / Contributing Scenario for PC16 and PC 17

Calculation tool used: ECETOC TRA (worker) v2.0

Route of exposure	dose / conc	Unit	Justification
Long-term exposure, systemic/local, inhalative	4.97	mg/m ³	
Long-term exposure, systemic, dermal	6.17	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	See 1.19 General remarks

1.19.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.19.2.4. Environmental exposure

The environmental exposure scenario is covered under the environmental assessment for Exposure Scenario 18 (Use in/as functional fluids (professional)) in Section 1.18.2.4.

1.20 Use in/as De-icing/Anti-icing applications/agents (professional)**1.20.1 Exposure Scenario 20****General Remarks**

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.20.2.4.

Table 128: Description of ES 20

Reference Number	20
1.20.1.1 Title	
Free short title	Use in/as de-icing/anti-icing applications/agents (professional)
Systematic title based on use descriptor	SU22; PROC 1, 2, 8a, 8b, and 11; ERC 8d
1.20.1.2 Operational conditions and Risk management measures	
1.20.1.2.1 Control of workers exposure for PROC 1 and 2	
Workers related free short title	Use in closed process, no likelihood of exposure. Use in closed, continuous process with occasional controlled exposure.
Use descriptor covered	PROC 1 and 2
Processes, tasks, activities covered	Use of the substances in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems. Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity and occasional expose will arise e.g. through maintenance, sampling and equipment breakages.
Assessment Method	ECETOC TRA workers (v2.0) modified (see 1. Genral remarks)
For further details on OCs and RMMs see Table 53	
1.20.1.2.2 Control of workers exposure for PROC 8a	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and

	cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General Remarks)
For further details on OCs and RMMs see Table 53	
1.20.1.2.3 Control of workers exposure for PROC 8b	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use descriptor covered	PROC 8b
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 53	
1.20.1.2.4 Control of workers exposure for PROC 11	
Workers related free short title	Non industrial spraying
Use descriptor covered	PROC 11
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls.
Assessment Method	Stoffenmanager v4.0 and RISKOFDERMv2.1
For further details on OCs and RMMs see Table 53	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.20.2 Exposure Estimation

1.20.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 54

For the estimated exposure for workers / PROC 2 see Table 55

For the estimated exposure for workers / PROC 8a see Table 59

For the estimated exposure for workers / PROC 8b see Table 60

For the estimated exposure for workers / PROC 11 see Table 63

1.20.2.2. Consumer exposure

Not applicable

1.20.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.20.2.4. Environmental exposure**Table 129: Environmental Exposure Scenario ES20-E1**

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES20-E1
Contributing scenario	Use In/As De-Icing/Anti-Icing Applications/Agents
Environmental Release Category	ERC8d
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 – ERC8d
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES20-E1
Narrative	Release fraction derived from ERC (8d)
Release fraction to air from process	1.00E+00
Release fraction to wastewater from process	1.00E+00
Release fraction to soil from process (regional only)	2.00E-01
Local release to air (kg/d)	1.10E+02
Local release to sewage (kg/d)	1.10E+02
Local release to soil (kg/d)	2.19E+01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	7,299

1.20.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 130: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES20-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	8.301E-01
Annual average local PEC in surface water (dissolved)	mg/L	8.301E-01
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.138E+00
Local PEC in sea water during emission episode	mg/L	8.284E-02
Annual average local PEC in sea water (dissolved)	mg/L	8.284E-02
Local PEC in marine sediment during emission episode	mg/kg dwt	3.131E-01
PEC for microorganisms in STP	mg/L	6.935E+00
Comments		

1.20.2.4.2 Predicted exposure concentration in soils

Table 131: Predicted exposure concentrations in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES20-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.879E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.695E-01
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.650E-01
Comments		

1.20.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 132: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES20-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.083E-10
Comments		

1.20.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.21 Use in/as De-icing/Anti-icing applications/agents (Consumer Use)

General remarks

In order to assess products included in PC4 two Sub-Scenarios have been assessed.

Sub-Scenario 1: Use in de-icing applications/agents

Sub-Scenario 2: Use in anti-icing agents

These Sub-Scenarios are intended to represent reasonable worst case scenarios for PC4.

Sub-Scenario 1:

With view on different De-icing products (door lock de-icer, windshield de-icers, and others), de-icing of windows/windshields was considered to be a worst case scenario.

To calculate this scenario the ConsExpo 4.1 default database Cleaning and washing/Miscellaneous cleaning and washing products/Glass cleaner was used. The scenarios of using a glass cleaner was considered to be similar to the scenario of using a de-icing agent e.g. for windows/windshields.

Sub-Scenario 1 consists of two parts.

Part A considers the spraying of the product, whereas Part B considers the cleaning process.

Sub-Scenario 2:

Generally, anti-icing agents are products being in closed systems. Thus, exposure towards the substance is considered to be negligible within that stage of use. Relevant exposure may occur during charging and/or discharging.

Several scenarios (default databases) in ConsExpo 4.1 address a "Mixing and Loading" step. However, usually these scenarios are based on the assumption that relatively small amounts of product (<100g) are charged. Regarding the charging/discharging of anti-icing agents presumably greater amounts of product are handled. Thus, the exposure resulting from charging/discharging of heat transfer and hydraulic fluids is assessed by means of a calculation of PROC 8a for the professional domain which is considered to represent the charging/discharging process performed by consumers in a appropriate way. PROC 8a has been calculated as described under 1.19.

Oral exposure is regarded to be no relevant route of exposure for this ES.

1.21.1 Exposure Scenario

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.21.2.4.

Table 133: Description of the ES 21

Reference Number	21
1.21.1.1. Title	
Free short title	Use in/as de-icing/anti-icing applications/agents (Consumer use)
Systematic title based on use descriptor	SU21; PC 4; ERC 8d
1.21.1.2. Operational conditions and risk management measures	

1.21.1.2.1 Control of consumer exposure for PC 4		
1.21.1.2.1.1 Sub-Scenario 1/Use in De-icing applications - spraying products		
Name of contributing scenario	Use in De-icing application – spraying products	
Use descriptor covered	PC 4	
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet ¹	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Cleaning and Washing/Miscellaneous cleaning and washing products/Glass cleaner	
Part A. Spraying		
Product characteristic		
Physical state	Liquid	
Concentration of substance	100 %	
Vapour pressure of the substance	0.008 hPa	
Airborn fraction	1.0	
Weight fraction non-volatile	1.0	
Density non-volatile	1.8 g/cm ³	(Default value)
Amounts used		
Mass generation rate	0.78 g/s	(Default value)
Frequency and duration of use/exposure		
Duration of spraying	0.7 min	(Default value)
Duration of exposure	240 min	(Default value)
Frequency of exposure	365 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Inhalation cut-off diameter	15 µm	(Default value)
Non-respirable uptake fraction	1	(Default value)
Exposed skin surface	Hands and forearms (1900 cm ²)	
Contact rate	46 mg/min	(Default value)
Release duration	42 s	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	58 m ³	(Default value)

Room height	2.5 m	(Default value)
Ventilation rate	0.5 per hour	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Spraying away from exposed person		
Conditions and measures related to personal protection and hygiene		
Not applicable		
Part B. Cleaning		
Product characteristic		
Physical state	Liquid	
Concentration of substance	max. 100 %	
Vapour pressure of the substance	0.008 hPa	
Amounts used		
Applied amount	0.29 g/day	(Default value)
Frequency and duration of use/exposure		
Frequency of exposure	365 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	Palm of one hand (215 cm²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting consumers exposure		
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		
1.21.1.2.1.2. Sub-Scenario 2/Use in Anti-freezing agents		
Name of contributing scenario	Use in Anti-freezing agents	
Use descriptor covered	PC4	
Processes, tasks, activities covered	see above (General Remarks);	
Assessment Method	ECETOC TRA (worker) v2.0 with modifications (see 1.19 and 19.21 General remarks)	
Product characteristic		
Physical state	Liquid	

Concentration of substance	max 45 %	
Vapour pressure of the substance	0.008 hPa	
Amounts used		
Not applicable		
Frequency and duration of use/exposure		
Duration of exposure	< 15 min	
Human factors not influenced by risk management		
Exposed skin surface	Both hands (960 cm²)	
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting consumers exposure		
Location	Inside	
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		

1.21.2 Exposure Estimation

1.21.2.1. Workers exposure

Not applicable.

1.21.2.2. Consumer exposure

General Remarks

The Sub-scenarios “Use in De-icing agents-spraying products” consists of two parts (Part A: Spraying and Part B Cleaning). To calculate the exposure resulting in each Sub-Scenario the exposure estimates resulting from Part A and Part B are added.

Table 134: Estimated exposure for consumers / Contributing Scenario for PC4

Sub-Scenario/Use in De-icing agents-spraying products

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Part A. Spraying			
Long-term exposure, systemic/local, inhalative	0.0007	mg/m ³	
Long-term exposure, systemic, dermal	0.50	mg/kg bw/d	
Long-term exposure, systemic, oral	0.005	mg/kg bw/d	
Part B. Cleaning			
Long-term exposure, systemic/local, inhalative	NA	mg/m ³	
Long-term exposure, systemic, dermal	4.46	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/da	

Part A and B. Spraying and Cleaning			
Long-term exposure, systemic/local, inhalative	0.0006	mg/m ³	
Long-term exposure, systemic, dermal	4.96	mg/kg bw/d	

NA = Not applicable

Table 135: Estimated exposure for consumers / Contributing Scenario for PC4

Sub-Scenario/Use in Anti-freezing agents

Calculation tool used: ECETOC TRA (worker) v2.0 (see 1. General remarks)

Route of exposure	dose / conc	Unit	Justification
Long-term exposure, systemic/local, inhalative	4.97	mg/m ³	
Long-term exposure, systemic, dermal	6.17	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	See 1.21 General remarks

1.21.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.21.2.4. Environmental exposure

The environmental exposure scenario is covered under the environmental assessment for Exposure Scenario 20 (Use in/as de-icing/anti-icing applications/agents (professional)) in Section 1.20.2.4.

1.22 Use in laboratories (industrial and professional)

1.22.1 Exposure Scenario 22

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.22.2.4.

Table 136: Description of ES 22

Reference Number	22
1.22.1.1 Title	
Free short title	Use in laboratories (industrial and professional)
Systematic title based on use descriptor	SU3 and 22; PROC 15; ERC 8a
1.22.1.2 Operational conditions and Risk management measures	
1.22.1.2.1 Control of workers exposure for PROC 15	
Workers related free short title	Use as laboratory reagent
Use descriptor covered	PROC 15
Processes, tasks, activities covered	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.
Assessment Method	ECETOC TRA Worker v2.0 with modifications ¹
For further details on OCs and RMMs see Table 2	
The OCs and RMMs described apply for both industrial and professional use	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles
(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.22.2 Exposure Estimation

1.22.2.1. Workers exposure

Table 137: Estimated exposure for workers – 15 (industrial and professional)PROC
Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, systemic/local, inhalative	22.10	mg/m ³	NA
Long-term exposure, systemic, dermal	0.34	mg/kg bw/d	NA

NA = Not applicable

1.22.2.2. Consumer exposure

Not applicable

1.22.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.22.2.4. Environmental exposure

The environmental exposure scenario is evaluated below. Exposure has been estimated using the version of the ECETOC TRA Integrated Tool current at the time of preparation of this document.

Table 138: Environmental Exposure Scenario ES22-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES22-E1
Contributing scenario	Use In Laboratories
Environmental Release Category	ERC8a
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local environment	0.002
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 – ERC8a
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	

Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES22-E1
Narrative	Release fraction derived from ERC (8a)
Release fraction to air from process	1.00E+00
Release fraction to wastewater from process	1.00E+00
Release fraction to soil from process (regional only)	0.00E+00
Local release to air (kg/d)	1.10E+02
Local release to sewage (kg/d)	1.10E+02
Local release to soil (kg/d)	0.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	7,387

1.22.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 139: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES22-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	8.202E-01
Annual average local PEC in surface water (dissolved)	mg/L	8.202E-01
Local PEC in fresh water sediment during emission episode	mg/kg dwt	3.100E+00
Local PEC in sea water during emission episode	mg/L	8.191E-02
Annual average local PEC in sea water (dissolved)	mg/L	8.191E-02
Local PEC in marine sediment during emission episode	mg/kg dwt	3.096E-01
PEC for microorganisms in STP	mg/L	6.935E+00
Comments		

1.22.2.4.2 Predicted exposure concentration in soils

Table 140: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES22-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.877E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	1.693E-01
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.647E-01
Comments		

1.22.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 141: Predicted exposure concentration in the atmospheric compartment**

Local Concentration, Compartment: air	unit	ES22-E1
Annual average local PEC in air (total)	kg/m ³	1.081E-10
Comments		

1.22.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.23 Use in Adhesives and Sealants (Consumer use)**General remarks**

In order to assess products included in PC1, the use of a carpet glue has been chosen as representative worst case scenario

1.23.1 Exposure Scenario 23**General Remarks**

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.23.2.4.

Table 142: Description of the ES 23

Reference Number	23
1.23.1.1. Title	
Free short title	Use in Adhesives and Sealants (Consumer use)
Systematic title based on use descriptor	SU21; PC 1; ERC 8c
1.23.1.2. Operational conditions and risk management measures	
1.23.1.2.1 Control of consumer exposure for PC 1	
Name of contributing scenario	Use in Adhesives and Sealants
Use descriptor covered	PC 1
Processes, tasks, activities covered	see above (General Remarks); see corresponding Fact Sheet ¹
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Do it yourself products/Glues/Carpet glue
Part A. Mixing and Loading	
Product characteristic	

Physical state	Liquid	
Concentration of substance	max 0.075%	
Vapour pressure of the substance	0.008 hPa	
Mol weight matrix of the product	3000 g/mol	(Default value)
Mass transfer rate	3660 m/min	Langmuirs method (as stated in the corresponding Fact Sheet)
Amounts used		
Applied amount	9000 g/day	(Default value – refers to half of the bottle content) See footnote 2
Frequency and duration of use/exposure		
Duration of exposure	75 min	(Default value)
Duration of application	75 min	(Default value)
Frequency of exposure	0.25 days/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Exposed skin surface	50% of one hand palm (110 cm ²)	(Default value)
Type of activity (inhalation rate)	Light activity	See footnote 2
Other given operational conditions affecting consumers exposure		
Location	Inside	
Room volume	58 m ³	(Default value)
Ventilation rate	0.5 per hour	(Default value)
Release area	4 m ²	(Default value)
Contact rate	30 mg/min	(Default value)
Release duration	4500 s	(Default value)
Application temperature	25°C	
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		

1.23.2 Exposure Estimation

1.23.2.1. Workers exposure

Not applicable.

1.23.2.2. Consumer exposure**Table 143: Estimated exposure for consumers / Contributing Scenario for PC 1**

Calculation tool used: ConsExpo 4.1

Route of exposure	dose / conc	Unit	Justification
Long-term exposure, systemic/local, inhalative	0.31	mg/m ³	
Long-term exposure, systemic, dermal	0.26	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	

1.23.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.23.2.4. Environmental exposure

The environmental exposure scenario is evaluated below. Exposure has been estimated using the version of the ECETOC TRA Integrated Tool current at the time of preparation of this document.

Table 144: Environmental Exposure Scenario ES23-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES23-E1
Contributing scenario	Use In Adhesives
Environmental Release Category	ERC8c
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local environment	0.002

Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 - ERC8c
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES23-E1
Narrative	Release fraction derived from ERC (8c)
Release fraction to air from process	1.50E-01
Release fraction to wastewater from process	1.00E-02
Release fraction to soil from process (regional only)	0.00E+00
Local release to air (kg/d)	1.64E+01

Local release to sewage (kg/d)	1.10E+00
Local release to soil (kg/d)	0.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	68,027

1.23.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 145: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES23-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	1.652E-02
Annual average local PEC in surface water (dissolved)	mg/L	1.652E-02
Local PEC in fresh water sediment during emission episode	mg/kg dwt	6.245E-02
Local PEC in sea water during emission episode	mg/L	1.677E-03
Annual average local PEC in sea water (dissolved)	mg/L	1.677E-03
Local PEC in marine sediment during emission episode	mg/kg dwt	6.340E-03
PEC for microorganisms in STP	mg/L	6.935E-02
Comments		

1.23.2.4.2 Predicted exposure concentration in soils

Table 146: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES23-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	2.465E-02
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	2.446E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	2.442E-02
Comments		

1.23.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 147: Predicted exposure concentration in the atmospheric compartment**

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES23-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.621E-11
Comments		

1.23.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.24 Production of Polymers, filled polymers, Foams, Coatings, Adhesives, Sealants

1.24.1 Exposure Scenario 24

General Remarks

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.24.2.4.

Table 148: Description of ES 25

Reference Number	24
1.24.1.1 Title	
Free short title	Production of Polymers, filled polymers, foams, coatings, adhesives, sealants
Systematic title based on use descriptor	SU3; PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 14, and 15; ERC 6c
1.24.1.2 Operational conditions and Risk management measures	
1.24.1.2.1 Control of workers exposure for PROC 1	
Workers related free short title	Use in closed process, no likelihood of exposure
Use descriptor covered	PROC 1
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.24.1.2.2 Control of workers exposure for PROC 2	
Workers related free short title	Use in closed, continuous process with occasional controlled exposure
Use descriptor covered	PROC 2
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.24.1.2.3 Control of workers exposure for PROC 3 and 4	
Workers related free short title	Use in closed batch process (synthesis or formulation).

	Use in batch and other process (synthesis) where opportunity for exposure arises.
Use descriptor covered	PROC 3 and 4
Processes, tasks, activities covered	Batch manufacture of a chemical or formulation 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 Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.24.1.2.4 Control of workers exposure for PROC 5	
Workers related free short title	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).
Use descriptor covered	PROC 5
Processes, tasks, activities covered	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 14	
1.24.1.2.5 Control of workers exposure for PROC 7	
Workers related free short title	Industrial spraying
Use descriptor covered	PROC 7
Processes, tasks, activities covered	Air dispersive techniques Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls; in case of coating, overspray may lead to waste water and waste.
Assessment Method	Stoffenmanager v4.0
For further details on OCs and RMMs see Table 46	
1.24.1.2.6 Control of workers exposure for PROC 8a	

Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Use descriptor covered	PROC 8a
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in non- dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.24.1.2.7 Control of workers exposure for PROC 8b and 9	
Workers related free short title	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Use descriptor covered	PROC 8b and 9
Processes, tasks, activities covered	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	
1.24.1.2.8 Control of workers exposure for PROC 10	
Workers related free short title	Roller application or brushing
Use descriptor covered	PROC 10
Processes, tasks, activities covered	Low energy spreading of e.g. coatings Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 46	
1.24.1.2.9 Control of workers exposure for PROC 13	
Workers related free short title	Treatment of articles by dipping and pouring.
Use descriptor covered	PROC 13
Processes, tasks, activities covered	Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating). Substance is

	applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 23	
1.24.1.2.10 Control of workers exposure for PROC 14	
Workers related free short title	Production of preparations or articles by tableting, compression, extrusion, pelletisation.
Use descriptor covered	PROC 14
Processes, tasks, activities covered	Processing of preparations and/or substances (liquid and solid) into preparations or articles. Substances in the chemical matrix may be exposed to elevated mechanical and/or thermal energy conditions. Exposure is predominantly related to volatiles and/or generated fumes, dust may be formed as well.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
Product characteristic	
1.24.1.2.11 Control of workers exposure for PROC 15	
Workers related free short title	Use as laboratory reagent
Use descriptor covered	PROC 15
Processes, tasks, activities covered	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.
Assessment Method	ECETOC TRA Worker v2.0 with modifications (see 1. General remarks)
For further details on OCs and RMMs see Table 2	

Additional good practice advice (for environment) beyond the REACH CSA

Use of tightly fitting safety goggles

(The substance has shown to cause mucosal irritations at relatively high concentrations. Thus, it is recommended to protect the eyes)

1.24.2 Exposure Estimation

1.24.2.1. Workers exposure

For the estimated exposure for workers / PROC 1 see Table 15
 For the estimated exposure for workers / PROC 2 see Table 16
 For the estimated exposure for workers / PROC 3 see Table 5
 For the estimated exposure for workers / PROC 4 see Table 6
 For the estimated exposure for workers / PROC 5 see Table 17
 For the estimated exposure for workers / PROC 7 see Table 47
 For the estimated exposure for workers / PROC 8a see Table 7
 For the estimated exposure for workers / PROC 8b see Table 8
 For the estimated exposure for workers / PROC 9 see Table 18
 For the estimated exposure for workers / PROC 10 see Table 48
 For the estimated exposure for workers / PROC 13 see Table 24
 For the estimated exposure for workers / PROC 14 see Table 25
 For the estimated exposure for workers / PROC 15 see Table 9

1.24.2.2. Consumer exposure

Not applicable

1.24.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.24.2.4. Environmental exposure

Table 149: Environmental Exposure Scenario ES24-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES24-E1
Contributing scenario	Production Of Polymers
Environmental Release Category	ERC6c
Specific ERC	ESVOC 43
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	1
Fraction of main source to local environment	0.075
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	50,000

Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	300 - ESVOC 43
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ERMM, 1) \times (1 - ERMM, 2))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES24-E1
Narrative	Release fraction derived from SpERC (ESVOC 43)
Release fraction to air from process	2.00E-03
Release fraction to wastewater from process	1.00E-02
Release fraction to soil from process (regional only)	1.00E-04
Local release to air (kg/d)	1.00E+02
Local release to sewage (kg/d)	5.00E+02

Local release to soil (kg/d)	5.00E+00
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M _{Safe}) based on removal from domestic sewage treatment (kg/d)	87,155
Scaling	
<p>The downstream user can check the compliance of his site by comparing site specific data with defaults used in the exposure assessment. The site specific quotient should be inferior or equal to the spERC quotient.</p> $\frac{m_{\text{spERC}} * (1 - E_{\text{ER,spERC}}) * F_{\text{release,spERC}}}{DF_{\text{spERC}}} \geq \frac{m_{\text{site}} * (1 - E_{\text{ER,site}}) * F_{\text{release,site}}}{DF_{\text{site}}}$ <p> m_{spERC}: Substance use rate in spERC $E_{\text{ER,spERC}}$: Efficacy of RMM in spERC $F_{\text{release,,spERC}}$: Initial release fraction in spERC DF_{spERC}: dilution factor of STP effluent in river </p> <p> m_{site}: Substance use rate at site $E_{\text{ER,site}}$: Efficacy of RMM at site $F_{\text{release,,site}}$: Initial release fraction at site DF_{site}: dilution factor of STP effluent in river </p>	

1.24.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 150: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES24-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	3.172E+00
Annual average local PEC in surface water (dissolved)	mg/L	2.608E+00
Local PEC in fresh water sediment during emission episode	mg/kg dwt	1.199E+01
Local PEC in sea water during emission episode	mg/L	3.172E-01
Annual average local PEC in sea water (dissolved)	mg/L	2.608E-01
Local PEC in marine sediment during emission episode	mg/kg dwt	1.199E+00
PEC for microorganisms in STP	mg/L	3.164E+01
Comments		

1.24.2.4.2 Predicted exposure concentration in soils

Table 151: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES24-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	1.216E-01
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	3.772E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	1.907E-02
Comments		

1.24.2.4.3 Predicted exposure concentration in the atmospheric compartment

Table 152: Predicted exposure concentration in the atmospheric compartment

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES24-E1</i>
Annual average local PEC in air (total)	kg/m ³	2.285E-08
Comments		

1.24.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.25 Production of rigid foam (Consumer use)**1.25.1 Exposure Scenario 25****General Remarks**

The relevant OCs used for calculation of environmental exposure are mentioned under paragraph 1.25.2.4.

Table 153: Description of the ES 25

Reference Number	25	
1.25.1.1. Title		
Free short title	Production of rigid foam (Consumer use)	
Systematic title based on use descriptor	SU21; PC 32; ERC 8f	
1.25.1.2. Operational conditions and risk management measures		
1.25.1.2.1 Control of consumer exposure for PC32		
Name of contributing scenario	Production of rigid foam (Consumer use)	
Use descriptor covered	PC32	
Processes, tasks, activities covered	see above (General Remarks);	
Assessment Method	ConsExpo 4.1 Based on the ConsExpo default database for Do it yourself products/Miscelleaneous do it yourself products/insulation foam/Application	
Product characteristic		
Physical state	Liquid	
Concentration of substance	Max. 5 %	
Vapour pressure of the substance	0.123 hPa	
Amounts used		
Applied amount	825 g	Default value See footnote 1
Frequency and duration of use/exposure		
Duration of exposure	30 min	Default value
Exposure frequency	0.2 1/year	(Default value – not relevant for the calculation of the mean concentration on day of exposure)
Human factors not influenced by risk management		
Type of activity (inhalation rate)	Light activity	See footnote 3
Eposed skin surface	1900 cm²	Default value
Other given operational conditions affecting consumers exposure		

Location	Inside	
Application temperature	25°C	
Inhalation rate	1.5 l/hr	Default value
Room volume	57.5 m ³	Default value
Conditions and measures related to information and behavioural advice to consumers		
Not applicable		
Conditions and measures related to personal protection and hygiene		
Not applicable		

1.25.2 Exposure Estimation

1.25.2.1. Workers exposure

Not applicable

1.25.2.2. Consumer exposure**Table 154: Estimated exposure for consumers / Contributing Scenario for PC32**

Calculation tool used: ECETOC TRA (worker) v2.0 (see 1. General remarks)

Route of exposure	dose / conc	Unit	Justification
Long-term exposure, systemic/local, inhalative	0.07	mg/m ³	
Long-term exposure, systemic, dermal	0.19	mg/kg bw/d	
Long-term exposure, systemic, oral	NA	mg/kg bw/d	

1.25.2.3. Indirect exposure of humans via the environment (oral)

The bioaccumulation potential of this substance is very low, with a Kow of 0.0339; therefore, indirect exposure of humans via the environment can be considered negligible.

1.25.2.4. Environmental exposure

The environmental exposure scenario is evaluated below. Exposure has been estimated using the version of the ECETOC TRA Integrated Tool current at the time of preparation of this document.

Table 155: Environmental Exposure Scenario ES25-E1

Section 1	Operational conditions and risk management measures
Section 1.2	Control of environmental exposure
Identifier*	ES25-E1
Contributing scenario	Production Of Rigid Foam
Environmental Release Category	ERC8f
Specific ERC	
Assessment scenario	
Operational Conditions	
Amounts used	
Amounts used in the EU (tonnes/year)	200,000 (total industry tonnage for use in production of polymers)
Fraction of EU tonnage used in region	0.1
Fraction of main source to local	0.002

environment	
Fraction of substance in end-use products	1
Maximum daily site tonnage (kg/day)	1,096
Frequency and duration of use	
Type of release	Continuous
Emission days (days/year)	365 - ERC8f
Site specific monitoring data results for surface water effluent	
Location of sample	
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10 (default)
Local marine water dilution factor	100 (default)
Other given operational conditions affecting environmental exposure	
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emissions to provide a typical removal efficiency of (%)	
Treat wastewater (prior to discharge to receiving water) to provide the required removal efficiency of (%) $E_{Total,RMM} = 1 - ((1 - ER_{MM,1}) \times (1 - ER_{MM,2}))$	87%
Organizational measures to prevent/limit release from site	
Conditions and measures related to municipal sewage treatment plant	
Conditions and measures related to external treatment of waste for disposal	
Conditions and measures related to external recovery of waste	
Other environmental control measures additional to above	
Identifier	ES25-E1
Narrative	Release fraction derived from ERC (8f)
Release fraction to air from process	1.50E-01
Release fraction to wastewater from process	1.00E-02
Release fraction to soil from process (regional only)	5.00E-03

Local release to air (kg/d)	1.64E+01
Local release to sewage (kg/d)	1.10E+00
Local release to soil (kg/d)	5.48E-01
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	
Total efficiency of removal from air emissions (%)	
The maximum allowable site tonnage (M_{Safe}) based on removal from domestic sewage treatment (kg/d)	68,011

1.25.2.4.1 Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

Table 156: Predicted exposure concentrations in the STP and in the aquatic compartments (freshwater, seawater and sediments)

<i>Local Concentration, Compartment: STP and aquatic</i>	<i>unit</i>	<i>ES25-E1</i>
Local PEC in surface water during emission episode (dissolved)	mg/L	1.677E-02
Annual average local PEC in surface water (dissolved)	mg/L	1.677E-02
Local PEC in fresh water sediment during emission episode	mg/kg dwt	6.338E-02
Local PEC in sea water during emission episode	mg/L	1.701E-03
Annual average local PEC in sea water (dissolved)	mg/L	1.701E-03
Local PEC in marine sediment during emission episode	mg/kg dwt	6.428E-03
PEC for microorganisms in STP	mg/L	6.935E-02
Comments		

1.25.2.4.2 Predicted exposure concentration in soils

Table 157: Predicted exposure concentration in soils

<i>Local Concentration, Compartment: soil</i>	<i>unit</i>	<i>ES25-E1</i>
Local PEC in agricultural soil, averaged over 30 days	mg/kg dwt	2.465E-02
Local PEC agricultural soil, averaged over 180 days	mg/kg dwt	2.447E-02
Local PEC in grass land, averaged over 180 days	mg.kg dwt	2.442E-02
Comments		

1.25.2.4.3 Predicted exposure concentration in the atmospheric compartment**Table 158: Predicted exposure concentration in the atmospheric compartment**

<i>Local Concentration, Compartment: air</i>	<i>unit</i>	<i>ES25-E1</i>
Annual average local PEC in air (total)	kg/m ³	1.621E-11
Comments		

1.25.2.4.4 Predicted exposure concentration in food for secondary poisoning

The bioaccumulation potential of this substance is very low, therefore secondary poisoning can be considered negligible. The Kow for DEG is 0.0339.

1.26. Regional exposure concentrations

Table 159: Regional exposure concentrations

<i>Regional concentrations</i>	<i>unit</i>	<i>value</i>
Regional PEC in surface water (total)	mg/L	1.551E+00
Regional PEC in sea water (total)	mg/L	1.513E-01
Regional PEC in air (total)	kg/m ³	7.711E-10
Regional PEC in agricultural soil (total)	kg/kg _{wwt}	8.096E-07
Regional PEC in natural soil (total)	mg/kg dwt	1.161E+00
Regional PEC in industrial soil (total)	mg/kg dwt	1.161E+00
Regional PEC in sediment (total)	mg/kg dwt	4.999E+00
Regional PEC in sea water sediment (total)	mg/kg dwt	4.954E-01
Comments		

2. RISK CHARACTERISATION

General remarks

Environment

In the chemical safety assessment performed according to Article 14(3) in connection with Annex I section 3 (Environmental Hazard Assessment) and section 4 (PBT/ vPvB Assessment) no hazard was identified. Also, according to Annex VI of Directive 67/548/EEC, there is no environmental classification for diethylene glycol.

The aquatic toxicity of the five short chain ethylene glycols (mono-, di-, tri-, tetra- and pentaethylene glycol) were evaluated as a single category. Data on the acute toxicity are available for all three trophic levels (fish, aquatic invertebrates and algae). In the majority of tests no effect was observed, even at concentrations beyond 100 mg/L. All the available data indicate that the members of the category should exhibit low toxicity. Therefore all category members can be evaluated as not harmful to aquatic life.

In addition, diethylene glycol has a low Kow of 0.0339, is not expected to bioaccumulate, and is readily biodegradable. Thus, environmental classification of diethylene glycol for acute or chronic aquatic hazards is not indicated. The environmental assessment was performed using the latest available version of ECETOC TRA. In absence of a marine sediment PNEC, the ECETOC TRA tool extrapolated the marine sediment PNEC value listed in Table 204 below.

Table 160: PNEC's

Compartments	PNEC	
STP	199.5	mg L ⁻¹
Freshwater	10	mg L ⁻¹
Freshwater sediment	20.9	mg kg _{dwt} ⁻¹
Marine water	1	mg L ⁻¹
Marine water sediment	3.781E-03	mg kg _{dwt} ⁻¹
Soil	1.53	mg kg _{dwt} ⁻¹

Human Health – Worker

Short-term exposure: 2,2'-oxydiethanol is not classified regarding acute inhalative or dermal toxicity.

Thus, an exposure assessment and a risk characterisation regarding short-term exposure (peak exposure) and therefore have not been performed.

Human Health – Consumer

Short-term exposure: 2,2'-oxydiethanol is not classified regarding acute inhalative or dermal toxicity.

Thus, an exposure assessment and a risk characterisation regarding short-term exposure (peak exposure) and therefore have not been performed.

Risk characterisation ratio: The inhalative long-term DNEL is based on local effects observed at long-term

Exposure (20-22 hours) towards Ethan-1,2-diol aerosols in humans. The consumer use was assumed to be of no concern if the “mean concentration on day of exposure” does not exceed the inhalative long-term DNEL. Therefore the RCR inhalative is based on the ratio of the “mean concentration on day of exposure” and the inhalative long-term DNEL.

The inhalative long-term DNEL is derived from local effects observed, whereas the dermal long-term DNEL refers to systemic effects. However, the inhalative long-term DNEL is considered to be protective also from systemic effects. Thus, although addressing different effects, the RCR inhalative and the RCR dermal are added to calculate a RCR combined.

2.1. Manufacturing of substance

2.1.1 Environment

Table 161: RCR's for ES1-E1

Compartments: Characterization Ratio	Risk ES1-E1
STP	2.771E-01
Freshwater	5.529E-01
Freshwater sediment	9.999E-01
Soil	1.304E-01
Marine water	5.529E-01
Marine water sediment	5.529E-01

2.1.2 Human Health

2.1.2.1 Workers

Table 162: RCR Workers / PROC 1

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.0007	0.004
Long-term exposure, systemic, dermal	0.0032	

Table 163: RCR Workers / PROC 2

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.38
Long-term exposure, systemic, dermal	0.01	

Table 164: RCR Workers / PROC 3

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.22	0.22
Long-term exposure, systemic, dermal	0.003	

Table 165: RCR Workers / PROC 4

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.43
Long-term exposure, systemic, dermal	0.06	

Table 166: RCR Workers / PROC 8a

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.07	0.20
Long-term exposure, systemic, dermal	0.13	

Table 167: RCR Workers / PROC 8b

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.43
Long-term exposure, systemic, dermal	0.06	

Table 168: RCR Workers / PROC 15

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.37
Long-term exposure, systemic, dermal	0.003	

2.1.2.2 Consumers

Not relevant.

2.1.2.3 Indirect exposure to humans via the environment

The substance is classified with R22 (Acute toxicity oral Cat. 4). The hazard classes as well as the entire toxicological profile indicate no severe toxicity with regard to possible exposure of men via the environment. Furthermore, the low log kow of -1.36 implies that an exposure via the food is not likely; the readily biodegradability implies that the substance will rapidly disappear from water and soil via mineralization and therefore will not probably pose a risk for drinking water.

In conclusion, the toxicological and ecotoxicological properties of the substance give no reason for concern regarding a hazard for men via the indirect exposure route. Thus, a quantitative assessment have not been performed.

2.2 Use as Intermediate

2.2.1 Environment

Table 169: RCR's for ES2-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES2-E1</i>
STP	1.586E-01
Freshwater	3.171E-01
Freshwater sediment	5.736E-01
Soil	7.463E-02
Marine water	3.171E-01
Marine water sediment	3.171E-01

2.2.2 Human Health

2.2.2.1 Workers

For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC15 see Table 168

Table 170: RCR Workers / PROC 1

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.0007	0.004
Long-term exposure, systemic, dermal	0.0032	

Table 171: RCR Workers / PROC 2

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.07	0.08
Long-term exposure, systemic, dermal	0.01	

Table 172: RCR Workers / PROC 5

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.38
Long-term exposure, systemic, dermal	0.01	

Table 173: RCR Workers / PROC 9

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.43
Long-term exposure, systemic, dermal	0.06	

2.2.2.2 Consumers

Not relevant.

2.2.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.3 Use as Process chemical

2.3.1 Environment

Table 174: RCR's for ES3-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES3-E1</i>
STP	0.000E+00
Freshwater	1.189E-03
Freshwater sediment	2.150E-03
Soil	4.875E-02
Marine water	1.227E-03
Marine water sediment	1.227E-03

2.3.2 Human Health

2.3.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC5 see Table 172
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC9 see Table 173
 For PROC15 see Table 168

Table 175: RCR Workers / PROC 13

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.75
Long-term exposure, systemic, dermal	0.01	

Table 176: RCR Workers / PROC 14

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.40
Long-term exposure, systemic, dermal	0.03	

2.3.2.2 Consumers

Not relevant.

2.3.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.4 Distribution of substance

2.4.1 Environment

Table 177: RCR's for ES4-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES4-E1</i>
STP	4.229E-06
Freshwater	1.018E-05
Freshwater sediment	1.842E-05
Soil	1.306E-05
Marine water	1.014E-05
Marine water sediment	1.014E-05

2.4.2 Human Health

2.4.2.1 Workers

For PROC1 see Table 170
For PROC2 see Table 171
For PROC3 see Table 164
For PROC4 see Table 165
For PROC8a see Table 166
For PROC8b see Table 167
For PROC9 see Table 173
For PROC15 see Table 168

2.4.2.2 Consumers

Not relevant.

2.4.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.5 Formulation & (re)packing of substances and mixtures

2.5.1 Environment

Table 178: RCR's for ES5-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES5-E1</i>
STP	1.586E-01
Freshwater	3.169E-01
Freshwater sediment	5.732E-01
Soil	8.411E-02
Marine water	3.169E-01
Marine water sediment	3.169E-01

2.5.2 Human Health

2.5.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC5 see Table 172
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC9 see Table 173
 For PROC14 see Table 176
 For PROC15 see Table 168

2.5.2.2 Consumers

Not relevant.

2.5.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.6 Production of polymers

2.6.1 Environment

Table 179: RCR's for ES6-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES6-E1</i>
STP	1.586E-01
Freshwater	3.172E-01
Freshwater sediment	5.737E-01
Soil	7.948E-02
Marine water	3.172E-01
Marine water sediment	3.172E-01

2.6.2 Human Health

2.6.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC5 see Table 172
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC9 see Table 173
 For PROC15 see Table 168

Table 180: RCR Workers / PROC 6

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.40
Long-term exposure, systemic, dermal	0.03	

2.6.2.2 Consumers

Not relevant.

2.6.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.7 Use in Paints/Coatings (industrial)

2.7.1 Environment

Table 181: RCR's for ES7-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES7-E1</i>
STP	2.668E-01
Freshwater	5.349E-01
Freshwater sediment	9.676E-01
Soil	9.999E-01
Marine water	5.350E-01
Marine water sediment	5.350E-01

2.7.2 Human Health

2.7.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC5 see Table 172
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC13 see Table 175
 For PROC15 see Table 168

Table 182: RCR Workers / PROC 7

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.01	0.71
Long-term exposure, systemic, dermal	0.70	

Table 183: RCR Workers / PROC 10

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.77
Long-term exposure, systemic, dermal	0.03	

2.7.2.2 Consumers

Not relevant.

2.7.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.8 Use in Paints/Coatings /Adhesives/ Sealants/ Foams/ Polymers / filled Polymers (professional)

2.8.1 Environment

Given the similar manner in which environmental exposures would be expected to occur in association with both the professional and consumer use of paints and coatings, and given the conservative nature of the high tonnage (based on the estimated EU-wide use of DEG in the production of polymers) used in the assessment, this environmental assessment also covers the environmental assessment for Exposure Scenario 9 (Use in Paints/Coatings /Surface treatment products (Consumer use)).

Table 184: RCR's for ES8-E1

Compartments: Characterization Ratio	Risk ES8-E1
STP	3.476E-02
Freshwater	8.301E-02
Freshwater sediment	1.501E-01
Soil	1.228E-01
Marine water	8.284E-02
Marine water sediment	8.284E-02

2.8.2 Human Health

2.8.2.1 Workers

Table 185: RCR Workers / PROC 1

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.0007	0.004
Long-term exposure, systemic, dermal	0.0032	

Table 186: RCR Workers / PROC 2

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.38
Long-term exposure, systemic, dermal	0.01	

Table 187: RCR Workers / PROC 3

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.22	0.22
Long-term exposure, systemic, dermal	0.003	

Table 188: RCR Workers / PROC 4

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.80
Long-term exposure, systemic, dermal	0.06	

Table 189: RCR Workers / PROC 5

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.75
Long-term exposure, systemic, dermal	0.01	

Table 190: RCR Workers / PROC 8a

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.50
Long-term exposure, systemic, dermal	0.13	

Table 191: RCR Workers / PROC 8b

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.80
Long-term exposure, systemic, dermal	0.06	

Table 192: RCR Workers / PROC 9

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.80
Long-term exposure, systemic, dermal	0.06	

Table 193: RCR Workers / PROC 10

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.40
Long-term exposure, systemic, dermal	0.03	

Table 194: RCR Workers / PROC 11

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.07	0.67
Long-term exposure, systemic, dermal	0.60	

Table 195: RCR Workers / PROC 13

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.75
Long-term exposure, systemic, dermal	0.01	

Table 196: RCR Workers / PROC 14

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.74	0.77
Long-term exposure, systemic, dermal	0.03	

Table 197: RCR Workers / PROC 15

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.37
Long-term exposure, systemic, dermal	0.003	

Table 198: RCR Workers / PROC 19¹

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.18	0.31
Long-term exposure, systemic, dermal	0.13	

2.8.2.2 Consumers

Not relevant.

2.8.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.9 Use in Paints/Coatings/Surface treatment products (Consumer use)

2.9.1 Environment

See Section 2.8.1.

2.9.2 Human Health

2.9.2.1 Workers

Not relevant

2.9.2.2 Consumers

Table 199: RCR Consumer/ PC 9a and 15

Sub-Scenario 1/Use in Paints/Coatings - non-spraying products

Calculation tool used: ConsExpo 4.1 (see also 1.9)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic, inhalative	0.008	0.11
Long-term exposure, systemic, dermal	0.10	
Long-term exposure, systemic, oral	NA	

NA = not applicable

Table 200: RCR Consumer/ PC 9a and 15

Sub-Scenario 2/Use in Paints/Coatings – spraying products

Calculation tool used: ConsExpo 4.1 (see also 1.9)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic, inhalative	0.04	0.08 (RCR oral not included)
Long-term exposure, systemic, dermal	0.04	
Long-term exposure, systemic, oral	The RCR for oral exposure has not been addressed quantitatively. However, due to the relatively low exposure resulting from oral exposure (see 1.9) in combination with the relatively low dermal and inhalative exposure, the consumer use is considered to be of no concern	

NA = not applicable

Table 201: RCR Consumer/ PC 18

Calculation tool used: ConsExpo 4.1 (see also 1.9)

Calculation tool used: CONSEXPO 4.1 (see also 1.9)

Exposure	RCR per route [-]	RCR combined [-]
Part A. Refilling		
Long-term exposure, systemic, inhalative	NA (see 1.9)	0.001
Long-term exposure, systemic, dermal	0.001	
Long-term exposure, systemic, oral	NA (see 1.9)	
Part B. Printing process		
Long-term exposure, systemic, inhalative	0.19	0.19
Long-term exposure, systemic, dermal	NA (see 1.9)	
Long-term exposure, systemic, oral	NA (see 1.9)	
Part A and B. Refilling and Printing process		
Long-term exposure, systemic, inhalative	0.19	0.19
Long-term exposure, systemic, dermal	0.001	
Long-term exposure, systemic, oral	NA	

NA = not applicable

Table 202: RCR Consumer/ PC 31

Calculation tool used: ConsExpo 4.1 (see also 1.9)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic, inhalative	0.004	0.16
Long-term exposure, systemic, dermal	0.16	
Long-term exposure, systemic, oral	NA	

2.9.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.10 Use in Cleaning agents (industrial)

2.10.1 Environment

Table 203: RCR's for ES10-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES10-E1</i>
STP	1.586E-02
Freshwater	9.744E-02
Freshwater sediment	1.762E-01
Soil	7.580E-03
Marine water	9.452E-02
Marine water sediment	9.452E-02

2.10.2 Human Health

2.10.2.1 Workers

For PROC1 see Table 170
For PROC2 see Table 171
For PROC3 see Table 164
For PROC4 see Table 165
For PROC7 see Table 182
For PROC8a see Table 166
For PROC8b see Table 167
For PROC10 see Table 183
For PROC13 see Table 175

2.10.2.2 Consumers

Not relevant.

2.10.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.11 Use in Cleaning agents (professional)

2.11.1 Environment

Given the similar manner in which environmental exposures would be expected to occur in association with both the professional and consumer use of cleaning agents, and given the conservative nature of the high tonnage (based on the estimated EU-wide use of DEG in the production of polymers) used in the assessment, this environmental assessment also covers the environmental assessment for Exposure Scenario 12 (Use in Cleaning agents (Consumer use)).

Table 204: RCR's for ES11-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES11-E1</i>
STP	3.476E-02
Freshwater	8.202E-02
Freshwater sediment	1.483E-01
Soil	1.227E-01
Marine water	8.191E-02
Marine water sediment	8.191E-02

2.11.2 Human Health

2.11.2.1 Workers

For PROC1 see Table 185
 For PROC2 see Table 186
 For PROC3 see Table 187
 For PROC4 see Table 188
 For PROC8a see Table 190
 For PROC8b see Table 191
 For PROC10 see Table 193
 For PROC11 see Table 194
 For PROC13 see Table 175

2.11.2.2 Consumers

Not relevant.

2.11.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.12 Use in Cleaning agents (Consumer use)**2.12.1 Environment**

See Section 2.11.1.

2.12.2 Human Health**2.12.2.1 Workers**

Not relevant

2.12.2.2 Consumers**Table 205: RCR Consumer/ PC 35**

Sub-Scenario 1/Use in All-purpose cleaners - non-spraying products

Calculation tool used: ConsExpo 4.1 (see also 1.12)

Calculation tool used: CONSEXPO 4.1 (see also 4.12)

Exposure	RCR per route [-]	RCR combined [-]
Part A. Mixing and Loading		
Long-term exposure, systemic, inhalative	RCR is regarded to be negligible	0.0006
Long-term exposure, systemic, dermal	0.0006	
Long-term exposure, systemic, oral	NA	
Part B. Application		
Long-term exposure, systemic, inhalative	0.003	0.22
Long-term exposure, systemic, dermal	0.22	
Long-term exposure, systemic, oral	NA	
Part A and B. Mixing/Loading and Application		
Long-term exposure, systemic, inhalative	0.003	0.22
Long-term exposure, systemic, dermal	0.22	
Long-term exposure, systemic, oral	NA	

NA = not applicable

Table 206: RCR Consumer/ PC 35

Sub-Scenario 2/Use in All-purpose cleaners - spraying products

Calculation tool used: ConsExpo 4.1 (see also 1.12)

Exposure	RCR per route [-]	RCR combined [-]
Part A. Spraying		
Long-term exposure, systemic, inhalative	NA (see 1.12)	0.0002
Long-term exposure, systemic, dermal	0.0002	
Long-term exposure, systemic, oral	NA (see 1.12)	
Part B. Cleaning		
Long-term exposure, systemic, inhalative	0.0007	0.003
Long-term exposure, systemic, dermal	0.002	
Long-term exposure, systemic, oral	NA	
Part A and B. Mixing/Loading and Application		
Long-term exposure, systemic, inhalative	0.0007	0.003
Long-term exposure, systemic, dermal	0.0002	
Long-term exposure, systemic, oral	NA	

Table 207: RCR Consumer/ PC 35

Sub-Scenario 3/Use in Floor cleaning products

Calculation tool used: ConsExpo 4.1 (see also 1.12)

Exposure	RCR per route [-]	RCR combined [-]
Part A. Mixing and Loading		
Long-term exposure, systemic, inhalative	NA (see 1.12)	0.0002
Long-term exposure, systemic, dermal	0.0002	
Long-term exposure, systemic, oral	NA	
Part B. Application		
Long-term exposure, systemic, inhalative	0.004	0.28
Long-term exposure, systemic, dermal	0.28	
Long-term exposure, systemic, oral	NA	
Part A and B. Mixing/Loading and Application		
Long-term exposure, systemic, inhalative	0.004	0.28
Long-term exposure, systemic, dermal	0.28	
Long-term exposure, systemic, oral	NA	

2.13 Use in Biocidal Products (Consumer use)

2.13.1 Environment

Table 208: RCR's for ES13-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES13-E1</i>
STP	3.476E-02
Freshwater	8.301E-02
Freshwater sediment	1.501E-01
Soil	1.228E-01
Marine water	8.284E-02
Marine water sediment	8.284E-02

2.13.2 Human Health

2.13.2.1 Workers

Not relevant

2.13.2.2 Consumers

Table 209: RCR Consumer/PC 8

Calculation tool used: ConsExpo 4.1 (see also 9.12)

Exposure		RCR per route [-]	RCR combined [-]
Part A. Spraying			
Long-term exposure, systemic, inhalative		RCR is regarded to be negligible	0.0008
Long-term exposure, systemic, dermal		0.0008	
Long-term exposure, systemic, oral		The RCR for oral exposure has not been addressed quantitatively. However, due to the relatively low exposure resulting from oral exposure (see 1.9) in combination with the relatively low dermal and inhalative exposure, the consumer use is considered to be of no concern	
Part B. Wiping			
Long-term exposure, systemic, inhalative		NA	0.0006
Long-term exposure, systemic, dermal		0.0006	
Long-term exposure, systemic, oral		NA	
Part A and B. Mixing/Loading and Application			
Long-term exposure,		NA	0.001

systemic, inhalative Long-term exposure, systemic, dermal Long-term exposure, systemic, oral	0.001 NA	
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NA = not applicable

2.13.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.14 Use in Lubricants (industrial)

2.14.1 Environment

Table 210: RCR's for ES14-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES14-E1</i>
STP	1.586E-03
Freshwater	3.281E-03
Freshwater sediment	5.935E-03
Soil	7.860E-04
Marine water	3.275E-03
Marine water sediment	3.275E-03

2.14.2 Human Health

2.14.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC7 see Table 182
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC9 see Table 173
 For PROC10 see Table 183
 For PROC13 see Table 175

Table 211: RCR Workers / PROC 17

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.07	0.10
Long-term exposure, systemic, dermal	0.03	

Table 212: RCR Workers / PROC 18

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.07	0.20
Long-term exposure, systemic, dermal	0.13	

2.14.2.2 Consumers

Not relevant.

2.14.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.15 Use in Metal-working fluids (industrial)

2.15.1 Environment

Table 213: RCR's for ES15-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES15-E1</i>
STP	1.586E-03
Freshwater	3.586E-03
Freshwater sediment	6.487E-03
Soil	7.179E-03
Marine water	3.595E-03
Marine water sediment	3.595E-03

2.15.2 Human Health

2.15.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC5 see Table 172
 For PROC7 see Table 182
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC9 see Table 173
 For PROC10 see Table 183
 For PROC13 see Table 175
 For PROC17 see Table 211

2.15.2.2 Consumers

Not relevant.

2.15.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.16 Use in Metal-working fluids (professional)

2.16.1 Environment

Table 214: RCR's for ES16-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES16-E1</i>
STP	3.476E-02
Freshwater	8.202E-02
Freshwater sediment	1.483E-01
Soil	1.227E-01
Marine water	8.191E-02
Marine water sediment	8.191E-02

2.16.2 Human Health

2.16.2.1 Workers

For PROC1 see Table 185
 For PROC2 see Table 186
 For PROC3 see Table 187
 For PROC5 see Table 189
 For PROC8a see Table 190
 For PROC8b see Table 191
 For PROC9 see Table 192
 For PROC10 see Table 193
 For PROC11 see Table 194
 For PROC13 see Table 175

Table 215: RCR Workers / PROC 17

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.34	0.37
Long-term exposure, systemic, dermal	0.03	

2.16.2.2 Consumers

Not relevant.

2.16.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.17 Use in Functional fluids (industrial)

2.17.1 Environment

Table 216: RCR's for: ES17-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES17-E1</i>
STP	1.586E-04
Freshwater	4.376E-04
Freshwater sediment	7.916E-04
Soil	1.887E-04
Marine water	4.318E-04
Marine water sediment	4.318E-04

2.17.2 Human Health

2.17.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC9 see Table 173

2.17.2.2 Consumers

Not relevant.

2.17.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.18 Use in Functional fluids (professional)

2.18.1 Environment

Given the similar manner in which environmental exposures would be expected to occur in association with both the professional and consumer use of functional fluids, and given the conservative nature of the high tonnage (based on the estimated EU-wide use of DEG in the production of polymers) used in the assessment, this environmental assessment also covers the environmental assessment for Exposure Scenario 19 (Use in Heat transfer and Hydraulic fluids (Consumer use)).

Table 217: RCR's for ES18-E1

Compartments: Characterization Ratio	Risk ES18-E1
STP	1.738E-03
Freshwater	4.348E-03
Freshwater sediment	7.865E-03
Soil	6.172E-03
Marine water	4.327E-03
Marine water sediment	4.327E-03

2.18.2 Human Health**2.18.2.1 Workers**

For PROC1 see Table 185

For PROC2 see Table 186

For PROC3 see Table 187

For PROC5 see Table 189

For PROC8a see Table 190

For PROC9 see Table 192

Table 218: RCR Workers / PROC 20

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.50	0.53
Long-term exposure, systemic, dermal	0.03	

2.18.2.2 Consumers

Not relevant.

10.18.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.19 Use in Heat transfer and Hydraulic fluids (Consumer use)**2.19.1 Environment**

See Section 2.18.1.

2.19.2 Human Health**2.19.2.1 Workers**

Not relevant

2.19.2.2 Consumers

Table 219: RCR Consumer/ PC 16 and 17

Calculation tool used: ECETOC TRA (worker) v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic, inhalative	0.41	0.53
Long-term exposure, systemic, dermal	0.12	
Long-term exposure, systemic, oral	NA (see 1.19)	

NA = not applicable

2.20 Use in/as De-icing/Anti-icing applications/agents (professional)

2.20.1 Environment

Given the similar manner in which environmental exposures would be expected to occur in association with both the professional and consumer use of de-icing products, and given the conservative nature of the high tonnage (based on the estimated EU-wide use of DEG in the production of polymers) used in the assessment, this environmental assessment also covers the environmental assessment for Exposure Scenario 21 (Use in/as De-icing/Anti-icing applications/agents (Consumer Use)).

Table 220: RCR's for ES20-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES20-E1</i>
STP	3.476E-02
Freshwater	8.301E-02
Freshwater sediment	1.501E-01
Soil	1.228E-01
Marine water	8.284E-02
Marine water sediment	8.284E-02

2.20.2 Human Health

2.20.2.1 Workers

For PROC1 see Table 185
 For PROC2 see Table 186
 For PROC8a see Table 190
 For PROC8b see Table 192
 For PROC11 see Table 194

2.20.2.2 Consumers

Not relevant.

2.20.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.21 Use in/as De-icing/Anti-icing applications/agents (Consumer use)**2.21.1 Environment**

See Section 2.20.1.

2.21.2 Human Health**2.21.2.1 Workers**

Not relevant

2.21.2.2 Consumers**Table 221: RCR Consumer/ PC 4**

Sub-Scenario 1/Use in De-icing applications – spraying products

Calculation tool used: ConsExpo 4.1 (see also 1.12)

Exposure		RCR per route [-]	RCR combined [-]
Part A. Spraying			
Long-term exposure, systemic, inhalative		RCR is regarded to be negligible	0.009
Long-term exposure, systemic, dermal		0.009	
Long-term exposure, systemic, oral		The RCR for oral exposure has not been addressed quantitatively. However, due to the relatively low exposure resulting from oral exposure (see 1.9) in combination with the relatively low dermal and inhalative exposure, the consumer use is considered to be of no concern	
Part B. Cleaning			
Long-term exposure, systemic, inhalative		NA	0.08
Long-term exposure, systemic, dermal		0.08	
Long-term exposure, systemic, oral		NA	
Part A and B. Spraying and Cleaning			
Long-term exposure, systemic, inhalative		NA	0.09
Long-term exposure, systemic, dermal		0.09	
Long-term exposure, systemic, oral		NA	

NA = not applicable

Table 222: RCR Consumer/ PC 4

Sub-Scenario 2/ Use in Anti-freeing agents

Calculation tool used: ECETOC TRA (worker) v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic, inhalative	0.41	0.53
Long-term exposure, systemic, dermal	0.12	
Long-term exposure, systemic, oral	NA (see 1.21)	

NA = not applicable

2.21.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.22 Use in laboratories (professional)

2.22.1 Environment

Table 223: RCR's for ES22-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES22-E1</i>
STP	3.476E-02
Freshwater	8.202E-02
Freshwater sediment	1.483E-01
Soil	1.227E-01
Marine water	8.191E-02
Marine water sediment	8.191E-02

2.22.2 Human Health

2.22.2.1 Workers

For PROC15 (industrial) see Table 168

Table 224: RCR Workers / PROC 15 (professional)

Calculation tool used: ECETOC TRA v2.0 modified (see 1. General remarks)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic/local, inhalative	0.37	0.37
Long-term exposure, systemic, dermal	0.003	

2.22.2.2 Consumers

Not relevant.

2.22.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.23 Use in Adhesives and Sealants (Consumer use)

2.23.1 Environment

Table 225: RCR's for ES23-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES23-E1</i>
STP	3.476E-04
Freshwater	1.652E-03
Freshwater sediment	2.988E-03
Soil	1.611E-02
Marine water	1.677E-03
Marine water sediment	1.677E-03

2.23.2 Human Health

2.23.2.1 Workers

Not relevant

2.23.2.2 Consumers

Table 226: RCR Consumer/ PC 1

Calculation tool used: ConsExpo 4.1 (see also 1.24)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic, inhalative	0.06	0.07
Long-term exposure, systemic, dermal	0.005	
Long-term exposure, systemic, oral	NA	

2.23.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.24 Production of Polymers, filled polymers, Foams, Coatings, Adhesives, Sealants (industrial)

2.24.1 Environment

Table 227: RCR's for ES24-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk</i>	<i>ES24-E1</i>
STP		1.586E-01
Freshwater		3.172E-01
Freshwater sediment		5.737E-01
Soil		7.948E-02
Marine water		3.172E-01
Marine water sediment		3.172E-01

2.24.2 Human Health

2.24.2.1 Workers

For PROC1 see Table 170
 For PROC2 see Table 171
 For PROC3 see Table 164
 For PROC4 see Table 165
 For PROC7 see Table 182
 For PROC8a see Table 166
 For PROC8b see Table 167
 For PROC9 see Table 173
 For PROC10 see Table 183
 For PROC13 see Table 175
 For PROC14 see Table 176
 For PROC15 see Table 168

2.24.2.2 Consumers

Not relevant.

2.24.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.25 Production of rigid foam (Consumer use)

2.25.1 Environment

Table 228: RCR's for ES25-E1

<i>Compartments: Characterization Ratio</i>	<i>Risk ES25-E1</i>
STP	3.476E-04
Freshwater	1.677E-03
Freshwater sediment	3.033E-03
Soil	1.611E-02
Marine water	1.701E-03
Marine water sediment	1.701E-03

2.25.2 Human Health

2.25.2.1 Workers

Not relevant

2.25.2.2 Consumers

Table 229: RCR Consumer/ PC 32

Calculation tool used: ConsExpo 4.1 (see also 1.26)

Exposure	RCR per route [-]	RCR combined [-]
Long-term exposure, systemic, inhalative	0.006	0.01
Long-term exposure, systemic, dermal	0.004	
Long-term exposure, systemic, oral	NA	

2.25.2.3 Indirect exposure to humans via the environment

See 2.1.2.3

2.26. Overall exposure (combined for all relevant emission /release sources)**2.26.1 Environment (combined for all emission sources)**

Each exposure scenario has been individually run in ECETOC TRA using either conservative industry wide tonnages or maximum passing tonnages using Specific Environmental Release Categories (SpERCs). This approach was employed in part to avoid the unreasonable repetitive addition of regional exposures and risks to local exposures and risks that occurs when scenarios are run together in ECETOC TRA. The total regional PECs and RCRs were then estimates for each environmental compartment by summing the PECs and RCRs for all individual scenarios, resulting in passing regional RCRs for all scenarios.

Table 230: Regional RCR's

<i>Compartments: (REGIONAL)</i>	<i>RCR</i>
Freshwater	1.551E-01
Freshwater sediment	2.392E-01
Soil	5.292E-01
Marine water	1.513E-01
Marine water sediment	1.310E-01

2.26.2 Human health (combined for all exposure routes)

The consideration of an overall exposure is considered to be not relevant since the vast majority of the PROCs and PCs calculated do not yield to a RCR close to 1