



SAFETY DATA SHEET
(according to Regulation (EC) No 1907/2006 (REACH), ANNEX II)

CAPROLACTAM



SECTION 1: IDE	NTIFICATION OF THE SUBSTANCE AND (OF THE COMPANY
1.1 Product identifier		
Trade name:	ε-Caprolactam	
Other names:	2H-Azepin-2-one, hexahydro-	
Name IUPAC/ international chemical name	Azepan-2-one	
INDEX No. and name as listed in Annex VI of CLP:	613-069-00-2, ε-Caprolactam	
CAS No.:	105-60-2	
EINECS No.:	203-313-2	
REACH registration No.:	01-2119457029-36-0012	
Molecular formula:	C6H11NO	
1.2 Relevant identified uses of the subs	tance or mixture and uses advised agains	t
Relevant identified uses:	Manufacture/import of caprolactam (see ES 2) Industrial formulation of solid preparations Formulation of liquid preparations (industrial use as intermediate (see ES 5) Use as monomer for polyamide, polymers, use as monomer for resins (see ES 7) Use as monomer for thermo hardened resi Use as plasticizer for polyamide (see ES 9) Use in leather tanning, finishing, impregnat Use as laboratory chemical (see ES 11) Use in coatings/paints (consumer) (see ES	(see ES 3) al/professional) (see ES 4) thermoplastics (see ES 6) ns (see ES 8)) ion, coatings and paints (see ES 10)
Uses advised against:	None	
1.3 Details of the supplier of the safety of	data sheet	
Only Representative:	OSTCHEM GERMANY GmbH Erdmannstr. 10 222765 Hamburg, Germany Phone: +49 40 5300 300 Fax: +49 40 5300 30 33 www.ostchem.com E-mail: Irene.Nasdala@ebicon.de	
Manufacturer:	PrJSC "AZOT" 72, Heroiv Kholodnoho Yaru Str., Cherkasy Tel.: +38 0472 39-63-03	/, Ukraine
E-mail address of the person responsible for this Safety Data Sheet	PrJSC "AZOT" REACH Department onr@azot.ck.ua	
National contact:	Not available	
1.4 Emergency telephone number		
Emergency phone number:	Tel: + 49 405 300 300 Opening hours: 9-18 (CET) Languages of the phone service: German, Tel: + 38 (0472) 39 61 17 Opening hours: 0-24 Languages of the phone service: Russian,	
	SECTION 2: HAZARDS IDENTIFICATION	
2.1 Classification of the substance		
2.1.1 Clas	sification in accordance with Regulation 1272	2/2008 (CLP)
Hazard statement(s):	H302 H332 H315	Harmful if swallowed. Harmful if inhaled. Causes skin irritation.
	H319 H335	Causes serious eye irritation. May cause respiratory irritation





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systems.

2.2 Label elements		
	ling in accordance with Regulation (EC) No 12	272/2008 [CLP]
Hazard pictogram(s):		
Signal word:	Warning	
Hazard statement(s):	H302 Harmful if swallowed	Oral: Acute Tox. 4
	H332 Harmful if inhaled H315 Causes skin irritation	Inhal: Acute Tox. 4 Skin Irrit. 2
	H319 Causes serious eye irritation	Eye Irrit. 2
December 20 Chatamanta (December)	H335 May cause respiratory irritation	STOT Single Exp. 3
Precautionary Statements (Prevention):	P271 Use only outdoors or in a well-ventila P280 Wear protective gloves, eye and face P261 Avoid breathing dust, fume, gas, mist	e protection.
Precautionary Statements (Response):	P301+P312 If swallowed: Call a POISON (CENTER or doctor if you feel unwell.
	P305 + P351 + P338 IF IN EYES: Rinse ca Remove contact lenses, if present and eas	v to do. Continue rinsing.
	P304 + P340 IF INHALED: Remove persor	to fresh air and keep comfortable for
	breathing. P302 + P352 IF ON SKIN: Wash with plent	v of soan and water
Precautionary Statements (Storage):	P403 + P233 Store in a well-ventilated place	ce. Keep container tightly closed.
Other hazards (GHS):	No specific dangers known, if the regulation	ns/notes for storage and handling are
	considered. Assessment PBT / vPvB:	
	According to Annex XIII of Regulation (EC)	No.1907/2006 concerning the Registration,
	Evaluation, Authorisation and Restriction of Not fulfilling PBT (persistent/bioaccum	
	- Not fulfilling vPvB (very persistent/very	
SECTIO	N 3: COMPOSITION/INFORMATION ON ING	GREDIENTS
3.1 Substances		
Name	INDEX No. as listed in Annex VI of CLP	Weight % content (or range)
ε-Caprolactam	613-069-00-2	>99.0 % (w/w)
	SECTION 4: FIRST-AID MEASURES	
4.1 Description of first aid measures	T	
General notes:	clothing.	ng. Avoid contact with the skin, eyes and
Following eye contact:	held open, consult an eye specialist.	t 15 minutes under running water with eyelids
Following skin contact:	treatment.	ns caused by molten material require hospita
Following ingestion:	Rinse mouth immediately and then drink pl	enty of water, seek medical attention.
Following inhalation:	Keep victim calm, remove to fresh air, seek	medical attention.
Self-protection for the first aider:	None	
4.2 Most important symptoms and effect	=	
Acute effects/Delayed effects	labeling (see section 2) and/or in section 1	symptoms and effects are described in the 1.
	al attention and special treatment needed (decontamination, vital functions), no known s	pecific antidote.
The state of the s	SECTION 5: FIRE-FIGHTING MEASURES	
5.1 Extinguishing media		
Suitable extinguishing media:	Foam, carbon dioxide, water spray, water	
Not suitable extinguishing media:	None	
5.2 Special hazards arising from the sur		
Hydrogen cyanide, nitrogen and carbon ox The substances/groups of substances mei	kides.	
5.3 Advice for firefighters		





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SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

6.1.1 For non-emergency personnel

<u>Protective equipment:</u> Use breathing apparatus if exposed to vapours/dust/aerosol. Wear personal protective equipment. Unprotected persons must be kept away. Approach the release from upwind.

<u>Emergency procedures:</u> Ensure adequate ventilation. Avoid contact with skin and eyes. Avoid generating dusty conditions. Do not touch or walk through spilt material. No flares, smoking or flames in hazard area. Wear appropriate respirator when ventilation is inadequate. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas.

6.1.2 For emergency responders:

Use breathing apparatus/wear personal protective equipment. See also the information in "For non-emergency personnel".

Information regarding personal protective measures see, chapter 8.

6.2 Environmental precautions

Do not empty into drains. Retain and dispose of contaminated wash water.

6.3 Methods and material for containment and cleaning up

6.3.1 For containment:

Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas.

6.3.2 For cleaning up:

Allow to solidify and sweep/shovel up. Collect into clean, dry, properly labeled container, supplied with the cover. It is necessary to prevent dust emission. Use spark-proof tools and explosion-proof equipment.

6.3.3 Other information

For residues: Rinse away with water.

6.4 Reference to other sections

See section 8 for personal protective equipment and section 13 for waste disposal.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

<u>Protective measures:</u> Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.

<u>Measures to prevent fire:</u> Vapours may form explosive mixture with air. Take precautionary measures against static discharges. Dust can form an explosive mixture with air.

Measures to prevent aerosol and dust generation: Ensure thorough ventilation of stores and work areas.

Measures to protect the environment: Do not allow material to be released to the environment.

Advice on general occupational hygiene: Do not eat, drink or smoke in work areas. Remove contaminated clothing and protective equipment before entering eating areas. Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

7.2 Conditions for safe storage, including any incompatibilities

	9,
Technical measures/ Storage conditions:	Segregate from acids and bases. Segregate from oxidants. Further information on storage conditions: Keep crystallized caprolactam in dry storage room, equipped with proper ventilation system. Storage stability: Storage temperature: at ambient temperature (crystallized). The stated storage temperature should be noted.
Packing materials:	Stainless steel 1.4301 (V2), aluminum, Stainless steel 1.4401 and other suitable materials.
Requirements for storage rooms and vessels:	
Storage class:	13
Further information on storage conditions:	None
Incompatible products:	Strong oxidizing agents, alkali and mineral acids.
7.3 Specific end use(s):	None

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

8.1.1 National occupational exposure limit values: Not available

8.1.2 National biological limit values: Not available

8.1.3 PNEC (Predicted No Effect Concentration)

•	,
Environmental protection target	PNEC
Aqua – freshwater	2 mg/L
Aqua - marine water	0.2 mg/L
Aqua – intermittent releases	1 mg/L



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Sediment	18.7 m	g/kg sediment dw		
Soil	2.55 m	g/kg soil dw		
Sewage treatment plant	1737 m	ng/L		
Food chain: oral (secondary poisoning)	Due to	its low logPow of 0.12,	secondary poisoning is	of no concern for this substance.
Air	Not list ozone		,	n substances that deplete the
			ACUTE (Local effec	
		Route		ffect Level (DNEL)
		Noute	Workers	General population
		Oral	Not quantifiable*	Not quantifiable*
		Dermal	Not quantifiable*	Not quantifiable*
		Inhalation	10 mg/m ³	5 mg/m ³
		L	ONG TERM (Local ef	fects)
		Davita	Derived No E	ffect Level (DNEL)
		Route	Workers	General population
		Oral	Not quantifiable*	Not quantifiable*
		Dermal	Not quantifiable*	Not quantifiable*
8.1.4 DNEL:		Inhalation	5 mg/m³	2.5 mg/m ³
· · · · · · · · · · · · · · · · · · ·	were ob exposur systemic oral populati oral signs of to irritatir systemic	served at the acute limit do e is misleading. In this con c toxicity on the dermal route exposure: In an industrial so on may, in the worst case, be emic effects — inhalation exprespiratory tract irritation obs ng concentrations of caprola	se of 2000 mg/kg bw. The text, protection from irritation of e of exposure. The etting, ingestion is not an allow exposed to traces of capposure: Both OEL-values (served in humans. Following loctam, neither from human alative uptake of even high	te effect and no signs of systemic toxicity refore the derivation of DNELs for dermal on is protecting from any kind of potential nticipated route of exposure. The general prolactam only. MAK and TLV) were based on transient g single or repeated inhalation exposure(s) experience nor in animal studies, signs of the concentrations is limited by the irritant
8.1.5 Monitoring procedures: Not available	1 12010. 100			
o. r.o iviorinoring procedures. Not available				

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8.2 Exposure controls	
8.2.1 Appropriate engineering controls:	
=	vent exposure during identified uses: None required.
	Use of adequate ventilation and the high integrity of closed systems is good industrial
practice. 8.2.2 Personal protection equipment	
8.2.2.1 Eye and face protection:	Lles quitable protective equipment
8.2.2.2 Skin protection:	Use suitable protective equipment
Hand protection:	Use suitable protective equipment
Other skin protection:	Working clothes
8.2.2.3 Respiratory protection:	Use suitable protective equipment
8.2.2.4 Thermal hazards:	None.
8.2.3 Environmental exposure controls:	Dispose of rinse water in accordance with local and national regulations.
SECT	TON 9: PHYSICAL AND CHEMICAL PROPERTIES
9.1 Information on basic physical and cl	nemical properties
Appearance:	Organic solid, white
Odour:	Slight
Odour threshold:	Not available
рН	7 - 8.5 (333 g/l, 20 °C) (solid)
Melting point/Freezing point:	69,3°C (solid)
Initial boiling point and boiling range:	270.8°C at 1013.25 hPa (solid)
Flash-point:	Not relevant. The substance is a solid at 20° C and 1013 hPa.
Evaporation rate:	Not available
Flammability (solid, gas):	Non-flammable
Auto-ignition temperature	395°C at 1013 mbar (solid)
Upper/lower flammability or explosive limits	Not applicable
Oxidising properties	None
Vapour pressure:	0.0013 hPa at 20°C. (solid)

present in the molecule. Not available

Substance is a solid at 20°C and 1013 hPa.

SECTION 10: STABILITY AND REACTIVITY

Non explosive. There are no chemical groups associated with explosive properties

10.1 Reactivity

Explosive properties

Vapour density:

Relative density: Solubility in water:

Viscosity:

Stable under recommended storage and handling conditions (see section 7, handling and storage)

Not available

1,105 g/cm³ at 20°C (solid)

Study technically not feasible.

866,89 g/l at 22°C (solid)

0,12 at 25°C (solid)

10.2 Chemical stability

Decomposition temperature:

Stable under recommended storage and handling conditions (see section 7, handling and storage).

10.3 Possibility of hazardous reactions

Partition coefficient n-octanol/water:

Reacts with oxidizing agents. Polymerization coupled with heat formation.

10.4 Conditions to avoid

Temperature: > 100 °C

Avoid all sources of ignition: heat, sparks, open flame. Avoid formation of polymers in valves and pipes.

10.5 Incompatible materials

Oxidizing agents, alkali and mineral acids.

10.6 Hazardous decomposition products

Nitrogen and carbon oxides, hexane

Under normal conditions of storage and use, hazardous decomposition products should not be produced.





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11.1 Information on	toxicological effect				
11.1.1 Acute toxicity					
Route of exposure	<u>Species</u>	Method	<u>Effective</u>	<u>Exposure</u>	<u>Results</u>
oral	rat (Wistar) male/female	oral: gavage EU Method B.1 (Acute Toxicity (Oral))	<u>dose</u> –	<u>time</u> –	LD ₅₀ :1475 mg/kg bw (male) 1876 mg/kg
dermal	rat (Wistar)	(Cited as Directive 84/449/EEC, B.1) Coverage: occlusive 84/449/EWG (Official Journal of EU, Nr.	_	_	bw (female) LD ₅₀ : >2000 mg/kg bw
inhalation	rat (Wistar) male/female	L251 from 19.09.1984, p 103) inhalation: aerosol (nose/head only) equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)	_	4 h	LC ₅₀ : 8.16 mg/l
11.1.2 Skin corrosion	n/irritation:	Irritating			
11.1.3 Serious eye a	lamage/irritation:	Irritating			
11.1.4 Respiratory of	<u> </u>	Not sensitizing			
11.1.5 Germ cell mu	tagenicity:	Negative			
11.1.6 Genetic toxicit		No indication for a genotoxic potential was	s found in vi	itro and in viv	VO
11.1.7 Reproductive	toxicity:	No indications of reproductive toxicity we developmental toxicity was identified in de Therefore no classification for toxicity to re	ere identific evelopmenta eproduction	ed in a 3-ge al toxicity stu is warranted	n study in rats and n dies in rats and rabbits d
11.1.8 Carcinogenici	ty:	No indication for a carcinogenic potenti rodents	al was idei	ntified in ca	rcinogenicity studies i
11.1.9 STOT-single e	exposure:	3 (Hazard statement: H335: May cause re	spiratory irr	ritation.)	
11.1.10 STOT-repea	ted exposure:	Not available			
11.1.11 Aspiration ha	azard	Negative			
		SECTION 12: ECOLOGICAL INFORMATI	ON		
12.1 Toxicity					
Fish (freshwater, sho	ort-term):	LC50 (96h) >100 mg/l With high probability epsilon-Caprolactam is a	cutely not ha	rmful to fish.	
Fish (long-term):		Not applicable			
Freshwater invertebr	rates (short-term):	EC50 (48h) >1000 mg/l With high probability epsilon-Caprola invertebrates.	ctam is	acutely not	harmful to aquati
Freshwater invertebr	rates (long-term):	21d-NOEC of 100 mg/l With high probability, epsilon-Caprolactal aquatic invertebrates.	m doesn't r	eveal negati	ive long-term effects t
Freshwater algae:		EC50 (72h) >1000 mg/l EC10/LC10 or NOEC - 1000 mg/l With high probability, epsilon-Caprolactan	n is acutely	not harmful	to aquatic organisms.
Terrestrial plants:		Not applicable, the substance is not supp	osed to be	directly appli	ed to soil
Soil macro-organism	s:	Not applicable, the substance is not supp	osed to be	directly appli	ed to soil
Birds:		Not available			
12.2 Persistence an	nd degradability				
Abiotic degradation:					
Phototransformation/ Phototransformation Phototransformation	in air:	Half-life in air: 1 d No information required under REACH le	nislation		
Biodegradation:		Readily biodegradable according to OECI			
Hydrolysis:		Not considered to hydrolyze rapidly when		water.	
12.3 Bioaccumulati	ve potential	, , , , , , , , , , , , , , , , , , , ,			
		ctam bioaccumulates in organisms.			
12.4 Mobility in soil		:			
Known or predicted of environmental compa	distribution to	According to Mackay Level I modeling completely into water (100 %). Only very %) and soil (0.01 %).			
		, , , and oon (0.01 /0).			



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Koc at 20°C: 57.35



Adsorption coefficient:

Adsorption coefficient.	Not at 20 G. 37.33
Surface tension:	Based on chemical structure, no surface activity is to be expected.
12.5 Results of PBT and vPvB assessme	ent
The substance is neither a PBT nor a vPvB	substance.
12.6 Other adverse effects: None	
12.7 Additional information:	
Chemical oxygen demand (COD): 1,960 m	g/g
Biochemical oxygen demand (BOD): 1,110	
Other ecotoxicological advice: Do not relea	
	SECTION 13: DISPOSAL CONSIDERATIONS
13.1 Waste treatment methods:	
13.1.1 Product / Packaging disposal: Waste codes / waste designations	Must not be disposed of together with household garbage.
according to LoW (Commission Decision 2001/118/EC):	07 01 99 Wastes not otherwise specified
13.1.2 Waste treatment-relevant information:	
13.1.3 Sewage disposal-relevant information:	Do not allow product to reach sewage system.
13.1.4 Other disposal recommendations:	Disposal must be made according to official regulations.
	SECTION 14: TRANSPORT INFORMATION
Land transport	Net also if it also a demand of a demand o
ADR RID	Not classified as a dangerous good under transport regulations Not classified as a dangerous good under transport regulations
Inland waterway transport ADNR	Not classified as a dangerous good under transport regulations
Sea transport IMDG	Not classified as a dangerous good under transport regulations
Air transport IATA/ICAO	Not classified as a dangerous good under transport regulations
14.1 UN Number:	Not regulated
14.2 UN proper shipping name:	Not regulated
14.3 Transport hazard classes:	Not regulated
14.4 Packaging group:	Not regulated
14.5 Environmental hazards:	No
14.6 Special precautions for user:	None
14.7 Transport in bulk according to	Not regulated
Annex II of MARPOL 73/78 and the IBC	
Code	L SECTION 15: REGULATORY INFORMATION
	egulation/legislation specific for the substance
_	guiation/registation specific for the substance
EU Regulations Authorisations and\or restrictions on	
use: Authorisation: EU Regulation (EC) No. 1907/2006 (REACH) Annex XIV - List of substances subject to authorisation	None of the components are listed
Restrictions on use: Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	Not applicable
National regulations (country):	Not available
15.2 Chemical safety assessment:	In accordance with REACH Article 14, a Chemical Safety Assessment has been carried out for this substance.
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SECTION 16: OTHER INFORMATION

The information provided in this safety data sheet is correct to the best of our knowledge, information, and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal, and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any proceed, unless specified in the text.

material deed in combination was any early material	condicion in any processa, annoce operanea in the toxa.
	v. 3.0: Changes were made to comply with the Guidance on the compilation of safety
16.1 Indication of changes:	data sheets (version 1.1)
10.1 maication of changes.	v. 3.1: Changes were made to comply with Article 61 (CLP)
	v. 4.0: Changes were made taking into account 5 th and 8 th ATP to CLP

v. 3.0: Page header; 1.1; 1.2; 1.3; 1.4; 2.1; 3.1; 4.1; 5.1; 6.1; 6.3; 7.1; 7.2; 7.3; 8.1; 8.2; 9.1; 11.1; 12.2; 12.4; 13.1; 15.1

v. 3.1: Page header; 2.1.2; 2.2.2; 16.2

v. 4.0: Page header; 1.3; 2.2.1 v. 4.1: Page header; 1.3

v. 4.2: Page header; 1.3

16.2 Abbreviations and acronyms:

- ADN European Agreement concerning the International Carriage of Dangerous Goods on Inland Waterway
- ADNR ADN Rhine
- ADR Agreement on Dangerous Goods by Road
- CAS Chemical Abstracts Service
- CLP Classification, Labelling and Packaging of chemicals
- EC European Commission
- EEC European Economic Community
- EINECS European Inventory of Existing Commercial Chemical Substances
- ES Exposure Scenario
- GHS Globally Harmonized System of Classification and Labelling of Chemicals
- IBC Code International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
- IUPAC International Union of Pure and Applied Chemistry
- LC50 Lethal Concentration
- LD50 Lethal Dose
- LoW List of Wastes
- MARPOL International Convention for the Prevention of Pollution From Ships
- NOEC No Observed Effect Concentration
- OECD Organization for Economic Co-operation and Development
- PBT Persistent, bioaccumulative, toxic chemical
- PJSC Public Joint-Stock Company
- REACH Registration, Evaluation, Authorisation and Restriction of Chemicals
- STOT Specific Target Organ Toxicity
- UN United Nations
- vPvB very persistent, very bioaccumulative

16.3 Key literature references and sources for data: CSR (Chemical Safety Report), Guidance on safe use etc.

16.4 Training advice:	In accordance with the local regulations
16.5 Further information:	None
16.6 Full text of classifications [CLP/GHS]:	Acute Tox. 4, H302 Acute Toxicity: Oral - Category 4 Acute Tox. 4, H332 Acute Toxicity: Inhalation - Category 4 Eye Irrit. 2, H319 Serious Eye Damage/Eye Irritation - Category 2 Skin Irrit. 2, H315 Skin Corrosion/Irritation - Category 2 STOT Se 3, H335 Specific Target Organ Toxicity (Single Exposure) [Respiratory Tract Irritation] - Category 3



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ANNEXES

1. Exposure Scenario 1: Manufacture/import of Caprolactam

Number of the ES	1	
Title of exposure scenario	Manufacture/import of Caprol	actam
List of all use descriptors related to the life cycle stage	SU3; PROC 1, 2, 8b and 9; E	RC 1
Name of contributing environmental scenario and corresponding ERC	Manufacture of substances (E	ERC1).
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	
Contributing exposure scenario controlling w	orker exposure for PROC 1, 2	2, 8b and 9
Control of workers exposure for PROC 1		
Title information related to contributing scena	rio	
Workers related free short title	Use in closed process, no like	elihood of exposure
Use descriptor covered	PROC 1	
Processes, tasks, activities covered	Manufacture in closed system	n, 90 -150°C
Exposure Assessment Method	Tool used: ECETOC TRA Wo	orker (v2.0)
Product characteristic		
Physical state	liquid	Operation conditions: temperature 90 - 150°C
Concentration of substance	100	%
Fugacity	Low - Moderate	
Vapour pressure of the substance	1 - 30 (corresponds to 90- 150°C)	hPa
Amounts used		
Not relevant in ECETOC TRA		
Frequency and duration of use/exposure		
Duration of exposure	> 4	hours/day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting v	orkers exposure	
Location	Indoors	
Domain	Industrial	
Technical conditions and measures at proces	s level (source) to prevent re	lease
Not applicable – closed system		
Technical conditions and measures to control	dispersion from source towa	ards the worker
Local exhaust ventilation required	No	
Organisational measures to prevent/limit relea	ases, dispersion and exposur	re
Not relevant		
Conditions and measures related to personal	protection, hygiene and heal	th evaluation
Not relevant		
Control of workers exposure for PROC 2		
Title information related to contributing scena	rio	
Workers related free short title	Use in closed, continuous pro	ocess with occasional controlled exposure
Use descriptor covered	PROC 2	
Processes, tasks, activities covered		re the design philosophy is not specifically aimed at sional exposure will arise e.g. through maintenance, akages



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Exposure Assessment Method	Tool used: ECETOC TRA V	/orker (v2 0)
Product characteristic	1001 0300. E02100 11077	701101 (VZ.0)
Physical state	liquid	Operation conditions: temperature ca. 90°C
Concentration of substance	100	%
Fugacity	low	, , ,
Vapour pressure of the substance	1.0 (corresponds to ca. 90°C	C) hPa
Amounts used	1.0 (corresponds to ca. 50 V	5) III a
Not relevant in ECETOC TRA		
Frequency and duration of use/exposure		
Duration of exposure	> 4 h hours per	day
Frequency of exposure	≤ 240 days/year	uay
Other given operational conditions affecting		
	<u> </u>	
Location	Indoors	
Domain Technical and difference of the second seco	Industrial	-1
Technical conditions and measures at produce	cess level (source) to prevent r	elease
Not relevant		
Technical conditions and measures to con	<u> </u>	vards the worker
Appropriate local exhaust ventilation	No	
Organisational measures to prevent/limit r		
Avoiding frequent and direct contact with sub- Supervision in place to check that the RMMs i		hases. Regular cleaning of equipment and work area
Conditions and measures related to person		
	1	
Use of suitable respiratory protection	no	
Use of suitable respiratory protection Use of suitable chemical resistant gloves	1	ve Exposure Assessment
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection	no	ve Exposure Assessment
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise	no Cross reference to Qualitati	
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reco	no Cross reference to Qualitati ease should not exceed 1h/day. Commended.	Otherwise appropriate risk reduction measures (e.g.
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reco	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and	Otherwise appropriate risk reduction measures (e.g.
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reco	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and enario	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure)
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reco	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or pr	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/large
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reco	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and enario	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/large
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reco Control of workers exposure for PROC 8b: Title information related to contributing sc Workers related free short title	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or procontainers at dedicated facility.)	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/large
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconcurred of workers exposure for PROC 8b: Title information related to contributing sc Workers related free short title Use descriptor covered	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or preparation and containers at dedicated facily PROC 8b	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconcurred of workers exposure for PROC 8b: Title information related to contributing sc Workers related free short title Use descriptor covered Processes, tasks, activities covered	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or preparation and enario preparation enario	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconcurred of workers exposure for PROC 8b: Title information related to contributing sc Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or preparation and enario preparation enario	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconstitle information related to contributing sc Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or precontainers at dedicated facion PROC 8b Sampling Tool used: ECETOC TRA V	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities /orker (v2.0)
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconstituted information related to contributing sc Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or preparation and enario processed and processed	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities //orker (v2.0) Operation conditions: temperature ca. 90°C
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconcurred of workers exposure for PROC 8b: Title information related to contributing sc Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or precontainers at dedicated facily PROC 8b Sampling Tool used: ECETOC TRA V	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/large lities //orker (v2.0) Operation conditions: temperature ca. 90°C
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor released to the protection of substance Best practice advise Probing/sampling with considerable vapor released to the protection of the protection of the protection of the protection of substance Best practice advise Probing/sampling with considerable vapor released to the protection of the protection of the protection of the protection of substance Best practice advise Probing/sampling with considerable vapor released to protection of the	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or procontainers at dedicated facion PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities //orker (v2.0) Operation conditions: temperature ca. 90°C %
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconcusted of workers exposure for PROC 8b: Title information related to contributing sc Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or procontainers at dedicated facion PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities //orker (v2.0) Operation conditions: temperature ca. 90°C %
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releaseds, LEV or breathing protection) are reconsticted, LEV or breathing protection) are reconsticted for the substance Control of workers exposure for PROC 8b: Title information related to contributing so Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or procontainers at dedicated facion PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities //orker (v2.0) Operation conditions: temperature ca. 90°C %
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor relevants (LEV) or breathing protection) are reconcusted, LEV or breathing protection) are reconcusted. Title information related to contributing software related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or presentation and enario PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low 1 (corresponds to ca. 90°C)	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largetities //orker (v2.0) Operation conditions: temperature ca. 90°C % hPa
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor relevants (LEV) or breathing protection) are reconstituted and the substance Control of workers exposure for PROC 8b: Title information related to contributing so Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure	no Cross reference to Qualitative asse should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or procontainers at dedicated facion PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities Vorker (v2.0) Operation conditions: temperature ca. 90°C % hPa per day
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconcusted. LEV or breathing protection are reconcusted and the contributing score and the contribution of substance and the contribution of su	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or preparation and enario PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low 1 (corresponds to ca. 90°C) 15 min-1 h ≤ 240	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largetities //orker (v2.0) Operation conditions: temperature ca. 90°C % hPa
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor relevants (LEV) or breathing protection) are reconcusted, LEV or breathing protection) are reconcusted. Title information related to contributing sometimes of the substance Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting	no Cross reference to Qualitation case should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or procontainers at dedicated facion PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low 1 (corresponds to ca. 90°C) 15 min-1 h ≤ 240 g workers exposure	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/largelities Vorker (v2.0) Operation conditions: temperature ca. 90°C % hPa per day
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor releoutside, LEV or breathing protection) are reconcusted. The control of workers exposure for PROC 8b: Title information related to contributing scommon workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting	no Cross reference to Qualitati ease should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or preparation and enario PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low 1 (corresponds to ca. 90°C) 15 min-1 h ≤ 240 g workers exposure Indoors	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/large lities //orker (v2.0) Operation conditions: temperature ca. 90°C % hPa per day
Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Best practice advise Probing/sampling with considerable vapor relevants (LEV) or breathing protection) are reconcusted, LEV or breathing protection) are reconcusted. Title information related to contributing sometimes of the substance Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting	no Cross reference to Qualitati case should not exceed 1h/day. Commended. A (with 100 % preparation and enario Transfer of substance or preparation and enario Transfer of substance or preparation and enario PROC 8b Sampling Tool used: ECETOC TRA V Liquid 100 Low 1 (corresponds to ca. 90°C) 15 min-1 h ≤ 240 Indoors Industrial	Otherwise appropriate risk reduction measures (e.g. 15 min-1 h exposure) eparation (charging/discharging) from/to vessels/large ities //orker (v2.0) Operation conditions: temperature ca. 90°C % hPa per day days/year



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Technical conditions and measures to contro	I dispersion from source toward	ls the worker			
Appropriate local exhaust ventilation	No				
Organisational measures to prevent/limit rele	ases, dispersion and exposure				
Avoiding frequent and direct contact with substal Supervision in place to check that the RMMs in p		es. Regular cleaning of equipment and work area. OCs followed.			
Conditions and measures related to personal	protection, hygiene and health	evaluation			
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves	Cross reference to Qualitative E	vnosuro Assossment			
Use of suitable eye protection	Closs reference to Qualitative E	xposure Assessment			
Control of workers exposure for PROC 8b: B	(with 1-5 % preparation and 1-4	h exposure)			
Title information related to contributing scena	ario				
Workers related free short title	Transfer of substance or prepar containers at dedicated facilities	ation (charging/discharging) from/to vessels/large			
Use descriptor covered	PROC 8b				
Processes, tasks, activities covered	Maintenance, clean down				
Exposure Assessment Method	Tool used: ECETOC TRA Worke	er (v2.0)			
Product characteristic					
Physical state	Liquid	Operation conditions: temperature ca. 90°C			
Concentration of substance	TRA 1-5	%			
Fugacity	Low				
Vapour pressure of the substance	1 (corresponds to ca. 90°C)	hPa			
Amounts used		•			
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure		•			
Duration of exposure	1-4 hours	per day			
Frequency of exposure	≤ 240	days/year			
Other given operational conditions affecting v	workers exposure	1 2 2			
Location	Indoors				
Domain	Industrial				
Technical conditions and measures at proces	s level (source) to prevent relea	se			
Not relevant					
Technical conditions and measures to contro	I dispersion from source toward	Is the worker			
Appropriate local exhaust ventilation	No				
Organisational measures to prevent/limit rele	ases, dispersion and exposure				
	nce. Minimisation of manual phase	es. Regular cleaning of equipment and work area. OCs followed.			
Conditions and measures related to personal	protection, hygiene and health	evaluation			
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves	Cross reference to Qualitative E	vinceurs Assessment			
Use of suitable eye protection	Cross reference to Qualitative E	xposure Assessment			
Control of workers exposure for PROC 9					
Title information related to contributing scena	ario				
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	Maintenance, clean down				
Exposure Assessment Method	Tool used: ECETOC TRA Worke	er (v2.0)			
Product characteristic					
Physical state	Liquid	Operation conditions: temperature ca. 90°C			
Concentration of substance	TRA 1-5	%			
Concentration of substance	TRA 1-5	%			



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Fugacity	Low							
Vapour pressure of the substance	1 (corresponds to ca. 90°C)	hPa						
Amounts used								
Not relevant in ECETOC TRA								
Frequency and duration of use/exposure	Frequency and duration of use/exposure							
Duration of exposure	1-4 hours	per day						
Frequency of exposure	≤ 240	days/year						
Other given operational conditions affecting w	Other given operational conditions affecting workers exposure							
Location	Indoors							
Domain	Industrial							
Technical conditions and measures at process level (source) to prevent release								
Not relevant								
Technical conditions and measures to control dispersion from source towards the worker								
Appropriate local exhaust ventilation	No							
Organisational measures to prevent/limit release	ases, dispersion and exposure							
Avoiding frequent and direct contact with substar Supervision in place to check that the RMMs in place		s. Regular cleaning of equipment and work area. DCs followed.						
Conditions and measures related to personal	protection, hygiene and health e	evaluation						
Use of suitable respiratory protection	No							
Use of suitable chemical resistant gloves	Cross reference to Qualitative Ex	voccure Accessment						
Use of suitable eye protection	Cross reference to Qualitative Exposure Assessment							

Exposure Estimation

Estimated exposure for workers

Route of exposure	Concentrations			Justification
	Va	lue	Unit	
Long-term exposure, local, inhalative – PROC1	0.0)47	mg/m³	
Long-term exposure, local, inhalative – PROC2	4.	72	mg/m³	
Long-term exposure, local, inhalative –	Α	В	ma/m³	
PROC8b: A (100%) and B (1-5%)	4.72	2.83	mg/m³	
Long-term exposure, local, inhalative – PROC9	2.	83	mg/m³	





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2. Exposure Scenario 2: Distribution of Caprolactam

Number of the ES	2					
Title of exposure scenario	Distribution of Caprolactam					
List of all use descriptors related to the life	·					
cycle stage	SU3; PROC 2, 8b and 9; ERC 2					
Name of contributing environmental						
scenario and corresponding ERC	Formulation of preparations (ERC	52)				
		ous process with occasional controlled exposure				
Name(s) of contributing worker scenarios		ce or preparation (charging/discharging) from/to				
and corresponding PROCs	vessels/large containers at dedic					
	PROC 9: Transfer of substance filling line, including weighing)	or preparation into small containers (dedicated				
Contributing exposure scenario controlling we		nd Q				
Control of workers exposure for PROC 2	orker exposure for FROC 2, ob a	inu 3				
	ui a					
Title information related to contributing scena Workers related free short title		as with according to partially developing				
	-	ss with occasional controlled exposure				
Use descriptor covered	PROC 2	and the discrete and exert and existing a second				
Processes, tasks, activities covered	Storage (closed bulk or containe	er) and loading (closed system) with occasional				
Exposure Assessment Method	Tool used: ECETOC TRA Worke	r (v2.0)				
Product characteristic						
Physical state	Liquid	Operation conditions: temperature ca. 90°C				
Concentration of substance	100	%				
Fugacity	Low					
Vapour pressure of the substance	1.0 (corresponds to ca. 90°C)	hPa				
Amounts used						
Not relevant in ECETOC TRA						
Frequency and duration of use/exposure						
Duration of exposure	> 4	hours/day				
Frequency of exposure	≤ 240	days/year				
Other given operational conditions affecting w	orkers exposure					
Location	Indoors					
Domain	Industrial					
Technical conditions and measures at proces	nical conditions and measures at process level (source) to prevent release					
Not relevant						
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						
Avoiding frequent and direct contact with substar						
Supervision in place to check that the RMMs in pl						
Conditions and measures related to personal		evaluation				
Use of suitable respiratory protection	No					
Use of suitable chemical resistant gloves Use of suitable eye protection	Cross reference to Qualitative Ex	cposure Assessment				
Best practice advise						
Probing/sampling with considerable vapor releas	e should not exceed 1h/day Othe	erwise appropriate risk reduction measures (e.g.				
outside, LEV or breathing protection) are recomm		appropriate non readonon medeures (e.g.				
Control of workers exposure for PROC 8b (liq						
Title information related to contributing scena	-					
Workers related free short title		ation (charging/discharging) from/to vessels/large				
Use descriptor covered	PROC 8b					
Processes, tasks, activities covered	Transfer, filling dedicated (sampling and connection/disconnection of pipes before and after filling)					
Exposure Assessment Method	Tool used: ECETOC TRA Worke	er (v2.0)				
Product characteristic		\ -1				
Physical state	Liquid	Operation conditions: temperature ca.90°C				
Concentration of substance	100 %					
Fugacity	Low					
Vapour pressure of the substance	1 (corresponds to ca. 90 °C)	hPa				
Amounts used	1 (001103pollu3 to 08. 30 °C)] III 4				
Amounta daed						



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ALUI						
Not relevant in ECETOC TRA						
Frequency and duration of use/exposure	1	1				
Duration of exposure	15 min-1 h	per day				
Frequency of exposure	≤ 240	days/year				
Other given operational conditions affecting w	orkers exposure					
Location	Outdoors					
Domain	Industrial					
Technical conditions and measures at proces	s level (source) t	o prevent releas	se			
Not relevant						
Technical conditions and measures to control	dispersion from	source toward	s the worker			
Appropriate local exhaust ventilation	No					
Organisational measures to prevent /limit rele	ases, dispersion	and exposure				
Avoiding frequent and direct contact with substar			es. Regular cleaning of equipment and work area.			
Supervision in place to check that the RMMs in pl						
Conditions and measures related to personal	protection, hygie	ene and health e	evaluation			
Use of suitable respiratory protection	No					
Use of suitable chemical resistant gloves in						
combination with basic employee training	Cross reference	to Qualitative Ex	xposure Assessment			
Use of suitable eye protection			•			
Control of workers exposure for PROC 8b (so	lid)					
Title information related to contributing scena						
		stance or prepara	ation (charging/discharging) from/to vessels/large			
Workers related free short title		dicated facilities	(
Use descriptor covered	PROC 8b					
Processes, tasks, activities covered	Dosing of solid (Caprolactam to fo	ormulation step at ambient temperature.			
Exposure Assessment Method		TOC TRA Worke	•			
Product characteristic			()			
Physical state	Solid		Operation conditions: ambient temperature			
Concentration of substance	100		%			
Dustiness	Low		70			
Dustiness	0.0013 (corresp	ands to				
Vapour pressure of the substance	ambient tempera		hPa			
Amounts used	ambient temper	ataroj	I			
Not relevant						
Frequency and duration of use/exposure						
Duration of exposure	>4h		per day			
Frequency of exposure	≤ 240		' '			
			days/year			
Other given operational conditions affecting v		e	T			
Location	Indoors					
Domain	Industrial					
Technical conditions and measures at proces	s level (source) t	o prevent releas	se			
Not relevant						
Technical conditions and measures to control	_	source toward	s the worker			
Appropriate local exhaust ventilation	No					
Organisational measures to prevent /limit rele						
			s. Regular cleaning of equipment and work area.			
Supervision in place to check that the RMMs in pl						
Conditions and measures related to personal	i	ene and health e	evaluation			
Use of suitable respiratory protection	No					
Use of suitable chemical resistant gloves in						
combination with basic employee training						
Use of suitable eye protection						
Control of workers exposure for PROC 9						
Title information related to contributing scena	rio					
Workers related free short title	Transfer of subsincluding weighi		ration into small containers (dedicated filling line,			
Use descriptor covered	PROC 9	<i>31</i>				
Processes, tasks, activities covered		of flakes into ema	all containers			
	Transfer, filling of flakes into small containers Tool used: ECETOC TRA Worker (v2.0)					
		TOC TRA Works	er (v2 0)			
Exposure Assessment Method Product characteristic		TOC TRA Worke	er (v2.0)			



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Physical state	Solid	Operation conditions: at ambient temperature			
Concentration of substance	100	%			
Dustiness	Low				
Vapour pressure of the substance	0.00013 (corresponds to ambient temperature)	hPa			
Amounts used					
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure	> 4 hours	per day			
Frequency of exposure	≤ 240	days/year			
Other given operational conditions affecting v	vorkers exposure				
Location	Indoor				
Domain	Industrial				
Technical conditions and measures at proces	s level (source) to prevent releas	se			
Not relevant					
Technical conditions and measures to control	dispersion from source towards	s the worker			
Appropriate local exhaust ventilation	No				
Organisational measures to prevent /limit rele	ases, dispersion and exposure				
Avoiding frequent and direct contact with substar					
Supervision in place to check that the RMMs in p					
Conditions and measures related to personal	protection, hygiene and health e	valuation			
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection	Cross reference to Qualitative Exposure Assessment				

Exposure Estimation

Estimated exposure for workers

Route of exposure	Concentration	าร	Justification
	Value	Unit	
Long-term exposure, local, inhalative – PROC2 (liquid)	4.72	mg/m³	
Long-term exposure, local, inhalative – PROC8b (liquid)	3.3	mg/m³	
Long-term exposure, local, inhalative – PROC8b (solid)	0.5	mg/m³	
Long-term exposure, local, inhalative – PROC 9 (solid)	0.1	mg/m³	





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Name(s) of contributing worker scenarios and corresponding PROCS PROC 5: Mixing or blending in batch processes for formulation of preparations and corresponding PROCs PROC 9: Transfer of substance or preparation (charging/discharging) fror vessels/large containers at decicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filline, including weighing) PROC 9: Transfer of substance or preparation into small containers (dedicated filline, including weighing) PROC 9: Transfer of substance or preparation into small containers (dedicated filline, including weighing) PROC 9: Title information related to contributing scenario PROC 3 PROC 3: Title information related to contributing scenario PROC 3 Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of substance Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of blends (mixing of solids, plasticizers), Caprolactam included in polymer matrix Preparation of solids, plasticizers), Caprolactam included in polymer matrix Preparation of solids, plasticizers), Caprolactam included in polymer matrix Preparation of solids, plasticizers), Caprolactam included polymer matrix Preparation of solids, plasticizers), Caprolactam i	3. Exposure Scenario 3: Industrial fo	ormu	lation of solid preparations				
List of all use descriptors related to the life cycle stage Name of contributing environmental scenario and corresponding ERC	Number of the ES	3					
List of all use descriptors related to the life cycle stage Name of contributing environmental scenario and corresponding ERC	Title of exposure scenario	Ind	Industrial formulation- solid preparations				
Scenario and corresponding ERC	List of all use descriptors related to the	·					
PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for expositions and corresponding PROCs and the process and corresponding PROCs and contributing exposure scenarios and corresponding PROCs (a). Which is processed in the processes for formulation of preparations articles (mullistage and/or significant con-lact) PROC 9: Transfer of substance or preparation into small containers (dedicated failities PROC 9: Transfer of substance or preparation into small containers (dedicated failities PROC 9: Transfer of substance or preparation into small containers (dedicated failities PROC 9: Transfer of substance or preparation into small containers (dedicated failities PROC 9: Transfer of substance or preparation into small containers (dedicated failities PROC 9: Transfer of substance or preparation into small containers (dedicated failities processes)		For	mulation of preparation (ERC 2)				
Name(s) of contributing worker scenarios and corresponding PROCs PROC 5: Mixing or blending in batch processes for formulation of preparations articles (multistage and/or significant con-tact) PROC 8b: Transfer of substance or preparation into small containers (dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated facilities including weighing)	scenario and corresponding ERC						
Control of workers exposure for PROC 3 Title Information related to contributing scenario Workers related free short title Use in closed batch process (formulation) Use descriptor covered PROC 3 Processes, tasks, activities covered PROC 3 Processes, tasks, activities covered PROC 3 Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 % Dustiness Low Vapour pressure of the substance TRA 5-25 % Dustiness Low Vapour pressure of the substance O.0013 (corresponds to ambient temperature) Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure 5 4 hours/day Frequency of exposure 5 4 hours/day Frequency of exposure 5 240 days/year Other given operational conditions affecting workers exposure Location Industrial Technical conditions and measures at process level (source) to prevent release Not relevant 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 Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work a Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable chemical resistant gloves Use of suitable	scenarios and corresponding PROCs	PRI arti PRI ves PRI line	PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant con-tact) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling				
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Use in closed batch process (formulation)	•						
Use descriptor covered		cena					
Processes, tasks, activities covered Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Concentration of substance TRA 5-25 Wapour pressure of the substance Used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Concentration of substance TRA 5-25 Wapour pressure of the substance Used: Concentration of substance Used:				mulation)			
polymer matrix poly	Use descriptor covered						
Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 National State Transport of the substance Transport of the substance Transport of the substance Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Prequency of exposure Location Domain Indoors Domain Indoors Domain Industrial Technical conditions and measures at process level (source) to prevent release Not relevant 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 Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work at Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable chemical resistant gloves Use of	Processes, tasks, activities covered		polymer matrix				
Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 % Usatiness Low Vapour pressure of the substance 0.0013 (corresponds to ambient temperature) Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure ≥ 4 hours/day Frequency of exposure ≤ 240 days/year Other given operational conditions affecting workers exposure Location Industrial Technical conditions and measures at process level (source) to prevent release Not relevant 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 Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work at Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable respiratory protection Use of suitable expiratory protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure are provent of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Exposure Assessment Method Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 Na Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 Low	•		Tool used: ECETOC TRA Worke	er (v2.0)			
Concentration of substance				T			
Dustiness Low Quour pressure of the substance Quou'id (corresponds to ambient temperature) hPa	· ·						
Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Sequency of exposure Sequenc			TRA 5-25	%			
Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure > 4 hours/day Frequency of exposure > 24 days/year Other given operational conditions affecting workers exposure Location Indoors Domain Industrial Technical conditions and measures at process level (source) to prevent release Not relevant 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 Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work at supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hyglene and health evaluation Use of suitable respiratory protection No Use of suitable exportection Cross reference to Qualitative Exposure Assessment Use of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure are properly measured in contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure are properly measured in contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure are properly measured in contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure are properly matrix Tool used: ECETOC TRA Worker (v2.0) Processes, tasks, activities covered PROC 4 Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Tool used: ECETOC TRA Worker (v2.0)	Dustiness		-				
Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure				hPa			
Duration of exposure							
Duration of exposure							
Technical conditions and measures at process level (source) to prevent release Not relevant Technical conditions and measures at process level (source) to prevent release Not relevant 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 Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work at Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure aris polymer matrix Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Concentration of substance TRA 5-25 Dustiness Dustiness				T			
Other given operational conditions affecting workers exposure Indoors Industrial	· · · · · · · · · · · · · · · · · · ·						
Location Indoors Domain Industrial Technical conditions and measures at process level (source) to prevent release Not relevant 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 Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work at Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable respiratory protection No Use of suitable chemical resistant gloves Cross reference to Qualitative Exposure Assessment Use of suitable eye protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure are used escriptor covered PROC 4 Processes, tasks, activities covered PROC 4 Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 % Dustiness Low				days/year			
Domain	<u> </u>	ing w	•				
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Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work at Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure arise. Use descriptor covered PROC 4 Processes, tasks, activities covered Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 Modern Stephanic Process (synthesis) where opportunity for exposure arise a							
Supervision in place to check that the RMMs in place are being used correctly and OCs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure aris Use descriptor covered PROC 4 Processes, tasks, activities covered Processes, tasks, activities covered Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 Dustiness Low	Organisational measures to prevent /limit	rele	ases, dispersion and exposure	- Danielan ela cuin en ef a cuin en est a culturale cons			
Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable respiratory protection Use of suitable chemical resistant gloves Use of suitable eye protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure aris Use descriptor covered PROC 4 Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Dustiness Low							
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Use of suitable chemical resistant gloves Use of suitable eye protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure arise use descriptor covered Processes, tasks, activities covered Processes, tasks, activities covered Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Concentration of substance TRA 5-25 Dustiness Cross reference to Qualitative Exposure Assessment Solid Operation conditions: ambient temperature TRA 5-25 We Dustiness		Jiidi		TAIMANUTI			
Use of suitable eye protection Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure arise use descriptor covered Processes, tasks, activities covered Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 Dustiness Low							
Control of workers exposure for PROC 4 Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure arise. PROC 4 Processes, tasks, activities covered Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix. Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 Dustiness Low	· ·		Cross reference to Qualitative Ex	xposure Assessment			
Title information related to contributing scenario Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure arise. PROC 4 Processes, tasks, activities covered Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 Dustiness Low							
Workers related free short title Use in batch and other process (synthesis) where opportunity for exposure arise. PROC 4 Processes, tasks, activities covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Dustiness Use in batch and other process (synthesis) where opportunity for exposure arise. Processes (synthesis) where opportunity for exposure arise. Processes, tasks, activities covered Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Operation conditions: ambient temperature TRA 5-25 Bustiness Low		cena	rio				
Use descriptor covered PROC 4 Processes, tasks, activities covered Preparation of blends (mixing of solids/plasticizers), Caprolactam included polymer matrix Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Solid Operation conditions: ambient temperature Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 % Dustiness Low	Workers related free short title		Use in batch and other process (synthesis) where opportunity for exposure arises			
Processes, tasks, activities covered polymer matrix Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 % Dustiness Low	Use descriptor covered		PROC 4				
Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic Solid Operation conditions: ambient temperature Physical state Solid Operation conditions: ambient temperature Concentration of substance TRA 5-25 % Dustiness Low	Processes, tasks, activities covered	Preparation of blends (mixing of solids/plasticizers), Caprolactam included in polymer matrix					
Product characteristicPhysical stateSolidOperation conditions: ambient temperatureConcentration of substanceTRA 5-25%DustinessLow	Exposure Assessment Method						
Concentration of substance TRA 5-25 % Dustiness Low							
Concentration of substance TRA 5-25 % Dustiness Low	Physical state		Solid	Operation conditions: ambient temperature			
Dustiness Low	•		TRA 5-25				
Vanour procesure of the substance 0.0013 (corresponds to ambient hips	Dustiness						
vapoui pressure or the substance 0.00 to (corresponds to ambient tira	Vapour pressure of the substance		0.0013 (corresponds to ambient	hPa			



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AZOT	1				
	temperature)				
Amounts used					
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure	> 4 hou	ırs per day			
Frequency of exposure	≤ 240 day	s/year			
Other given operational conditions affecting	workers exposure				
Location	Indoors				
Domain	Industrial				
Technical conditions and measures at proces	ss level (source) to pre	event releas	se		
Not relevant					
Technical conditions and measures to control	ol dispersion from sou	rce towards	s the worker		
Appropriate local exhaust ventilation	No				
Organisational measures to prevent /limit rele	eases, dispersion and	exposure			
			s. Regular cleaning of equipment and work area.		
Supervision in place to check that the RMMs in p					
Conditions and measures related to persona	protection, hygiene a	nd health e	valuation		
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves in		l l			
combination with basic employee training	Cross reference to Q	ualitative Ex	posure Assessment		
Use of suitable eye protection					
Control of workers exposure for PROC 5					
Title information related to contributing scen	ario				
Workers related free short title	Mixing or blending in (multistage and/or signal)		esses for formulation of preparations and articles tact)		
Use descriptor covered	PROC 5				
Processes, tasks, activities covered	Preparation of blends polymer matrix	Preparation of blends (mixing of solids/plasticizers), Caprolactam included in			
Exposure Assessment Method	Tool used: ECETOC	TRA Worke	r (v2.0)		
Product characteristic					
Physical state	Solid		Operation conditions: ambient temperature		
Concentration of substance	TRA 5-25		%		
Dustiness	Low		70		
Vapour pressure of the substance	0.0013 (corresponds to ambient temperature)		hPa		
Amounts used	1				
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure	> 4 hours		per day		
Frequency of exposure	≤ 240		days/year		
Other given operational conditions affecting	workers exposure		and the second s		
Location	Indoor				
Domain	Industrial				
Technical conditions and measures at proces		event releas	se		
Not relevant	22 .370. (000.00) to pro		· ·		
Technical conditions and measures to control	ol dispersion from sou	rce towards	s the worker		
	No	. Jo Lowalus	, and worker		
Appropriate local exhaust ventilation		OVDOCUES			
Organisational measures to prevent /limit rele			s. Regular cleaning of equipment and work area.		
Supervision in place to check that the RMMs in p					
Conditions and measures related to personal					
		iiu iicailii e	variacii (1)		
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves	Cross reference to Qualitative Exposure Assessment				
•	Use of suitable eye protection				
Use of suitable eye protection					
Use of suitable eye protection Control of workers exposure for PROC 8b					
Use of suitable eye protection			tion (about a disabout a No. 10		
Use of suitable eye protection Control of workers exposure for PROC 8b Title information related to contributing scen Workers related free short title	Transfer of substanc containers at dedicat		tion (charging/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8b Title information related to contributing scen	Transfer of substanc containers at dedicat PROC 8b	ed facilities	tion (charging/discharging) from/to vessels/large		





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	Tool used: ECETOC TRA W	orker (v2 ())
Exposure Assessment Method Product characteristic	1001 4004. 202100 114.11	oner (*2.0)
Physical state	Solid	Operation conditions: ambient temperature
Concentration of substance	TRA 5-25	%
Dustiness	Low	70
	0.0013 (corresponds to	
Vapour pressure of the substance	ambient temperature)	hPa
Amounts used		
Not relevant in ECETOC TRA		
Frequency and duration of use/exposure	-	-
Duration of exposure	> 4 hours	per day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting	workers exposure	
Location	Indoor	
Domain	Industrial	
Technical conditions and measures at proces	ss level (source) to prevent re	elease
Not relevant	, , ,	
Technical conditions and measures to control	ol dispersion from source tow	vards the worker
Appropriate local exhaust ventilation	No	
Organisational measures to prevent /limit rele	eases, dispersion and exposi	ure
		nases. Regular cleaning of equipment and work area.
Supervision in place to check that the RMMs in p		
Conditions and measures related to personal	protection, hygiene and hea	Ith evaluation
Use of suitable respiratory protection	No	
Use of suitable chemical resistant gloves in		<u>.</u>
combination with basic employee training	Cross reference to Qualitativ	re Exposure Assessment
Use of suitable eye protection		
Control of workers exposure for PROC 9		
Title information related to contributing scen	ario	
Workers related free short title	Transfer of substance or pre including weighing)	paration into small containers (dedicated filling line,
Use descriptor covered	PROC 9	
Processes, tasks, activities covered	Transfer/filling dedicate follow polymer matrix	wing preparation of blends, Caprolactam included in
Exposure Assessment Method	Tool used: ECETOC TRA W	orker (v2.0)
Product characteristic		
Physical state	Solid	Operation conditions: ambient temperature
Concentration of substance	TRA 5-25	%
Dustiness	Low	
Vapour pressure of the substance	0.0013 (corresponds to	hPa
vapoui pressure of the substance	ambient temperature)	III a
Amounts used		
Not relevant in ECETOC TRA		
Frequency and duration of use/exposure		
Duration of exposure	> 4 hours	per day
Frequency of exposure	≤ 240	days/year
Other given operational conditions affecting	workers exposure	
Location	Indoor	
Domain	Industrial	
Technical conditions and measures at proces	ss level (source) to prevent re	elease
Not relevant		
Technical conditions and measures to control	dispersion from source tow	vards the worker
Appropriate local exhaust ventilation	No	
Organisational measures to prevent /limit rele		
Avoiding frequent and direct contact with substa Supervision in place to check that the RMMs in p Conditions and measures related to personal	place are being used correctly a	
Use of suitable respiratory protection	No	
Use of suitable chemical resistant gloves in		
combination with basic employee training	Cross reference to Qualitativ	re Exposure Assessment



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Revision date: 01.05.2020 Version 4.2



Exposure Estimation

Estimated exposure for workers

Route of exposure	Concer	ntrations	Justification
	Value	Unit	
Long-term exposure, local, inhalative - PROC 3	0.06	mg/m³	
Long-term exposure, local, inhalative – PROC 4	0.3	mg/m³	
Long-term exposure, local, inhalative – PROC 5	0.3	mg/m³	
Long-term exposure, local, inhalative – PROC 8b	0.3	mg/m³	
Long-term exposure, local, inhalative – PROC 9	0.06	mg/m³	





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Workers related free short title

Processes, tasks, activities covered

Use descriptor covered

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Number of the ES	4				
Title of exposure scenario		ustrial/professional formulation of	f liquid preparations		
List of all use descriptors related to the life cycle stage		3, 22; PROC 2, 3, 4, 5, 8a, 8b, 9;	· · ·		
Name of contributing environmental scenario and corresponding ERC	For	mulation of preparation (ERC 2)			
	PR	OC 3: Use in closed batch proces			
Name(s) of contributing worker scenarios and corresponding PROCs	aris PRI arti PRI ves PRI ves PRI	PROC 4: Use in batch and other process (synthesis) where opportunity for exposur arises PROC 5: Mixing or blending in batch processes for formulation of preparations an articles (multistage and/or significant con-tact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/t vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/t vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated fillin line, including weighing)			
Contributing exposure scenario controlli	ng w	orker exposure for PROC 2, 3, 4	4, 5, 8a, 8b and 9		
Control of workers exposure for PROC 2					
Title information related to contributing s	cena	rio			
Workers related free short title		Use in closed, continuous proce	ess with occasional controlled exposure		
Use descriptor covered		PROC 2			
Processes, tasks, activities covered	Storage of liquid Caprolactam for formulation in closed container/bulk w sampling.				
Exposure Assessment Method	Tool used: ECETOC TRA Worker (v2.0)				
Product characteristic					
Physical state		Liquid	Operation conditions: temperature 90 °C		
Concentration of substance		100	%		
Fugacity		Low			
Vapour pressure of the substance		1.0 (corresponds to 90 °C)	hPa		
Amounts used					
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure			T		
Duration of exposure		> 4	hours/day		
Frequency of exposure		≤ <u>240</u>	days/year		
Other given operational conditions affect	ing w	•			
Location		Indoors			
Domain		Industrial			
Technical conditions and measures at pr	oces	s level (source) to prevent relea	ase		
Not relevant	1 1	diamanaian farana arang tanan	de the suredess		
Technical conditions and measures to co	ntroi	<u> </u>	as the worker		
Local exhaust ventilation required		No			
Organisational measures to prevent /limit					
			ses. Regular cleaning of equipment and work area.		
Supervision in place to check that the RMMs Conditions and measures related to pers					
Use of suitable respiratory protection	Oliai	No	evaluation		
Use of suitable chemical resistant gloves in		140			
combination with basic employee training		Cross reference to Qualitative E	Exposure Assessment		
Use of suitable eye protection			•		
Best practice advise					
Probing/sampling with considerable vapor routside, LEV or breathing protection) are rec			herwise appropriate risk reduction measures (e.g.		
Control of workers exposure for PROC 3					
Title information related to contributing s	cena	rio			
Workers related from short title	CEIId	Lisa in classed batch process (s)	th: f -t: \		

Use in closed batch process (synthesis or formulation)

Covers formulation of all types of products (e.g. mixing of preparations and/or

PROC 3





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AZOI	repackaging).			
Exposure Assessment Method		ETOC TRA Worke	or (v2 0)	
Product characteristic	1001 useu. ECI	LIOCINA WORK	i (VZ.U)	
Physical state	Liquid		Operation	on conditions: temperature 90°C
Concentration of substance	TRA 5-25		%	on conditions, temperature 90 C
Fugacity	Low		70	
• •	_	do to 00°C/	hPa	
Vapour pressure of the substance Amounts used	1.0 (correspond	us 10 90 °C)	пРа	
Not relevant in ECETOC TRA				
Frequency and duration of use/exposure				
Duration of exposure	15 min – 1h	per day		
	≤ 240			
Frequency of exposure Other given operational conditions affecting		days/year		
Location	Indoors	i e	1	
Domain Took pingle and distance and management at a pro-	Industrial	4		
Technical conditions and measures at proces	ss level (source)	to prevent relea	se	
Not relevant	1.11.			
Technical conditions and measures to control	_	m source toward	s the work	er
Appropriate local exhaust ventilation	No			
Organisational measures to prevent/limit rele			- D '	
Avoiding frequent and direct contact with substa Supervision in place to check that the RMMs in p				
				ea
Conditions and measures related to personal		iene and nealth (valuation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in	No			
combination with basic employee training	Cross reference	o to Ouglitative Fr	(DOOLING AG	accoment
Use of suitable eye protection	_ Closs reference	e to Qualitative Ex	xposure As	sessment
Control of workers exposure for PROC 4				
Title information related to contributing scen	ario			
Workers related free short title		nd other present	'avathania\	where apportunity for avecause asiaca
		nd other process (synthesis)	where opportunity for exposure arises
Use descriptor covered	PROC 4	manufacture of	o chomic	cal where significant opportunity for
Processes, tasks, activities covered	exposure arise		narging, sa	mpling or discharge of material, and
Exposure Assessment Method		ETOC TRA Worke		suit iii exposure
Product characteristic	1001 d3cd. E01	LTOO TIVE WORK	71 (42.0)	
Physical state	Liquid		Operation	on conditions: temperature 90°C
Concentration of substance	TRA 1-5		%	on conditions, temperature 30 G
Fugacity	Low		/0	
Vapour pressure of the substance	1 (corresponds	to 00°C\	hPa	
Amounts used	i (corresponds	5 10 90 C)	ПРа	
Not relevant in ECETOC TRA	Industrial	Profession	nal	
Frequency and duration of use/exposure	Domain	Domain		
Duration of exposure	1- 4 hours	15min – 1h	1	per day
Frequency of exposure	≤ 240	≤ 240		days/year
Other given operational conditions affecting				, , ,
Location	Indoor	Indoor		
Domain	Industrial	Profession	al	
Technical conditions and measures at proces				
Not relevant	(
Technical conditions and measures to control	ol dispersion from	m source toward	s the work	er
Appropriate local exhaust ventilation	No			
Organisational measures to prevent /limit rele		n and exposure	1	
Avoiding frequent and direct contact with substa			s. Regular	cleaning of equipment and work area
Supervision in place to check that the RMMs in p				
Conditions and measures related to personal				
Use of suitable respiratory protection	No			
	1.10		1	
Use of suitable chemical resistant dioves in				
Use of suitable chemical resistant gloves in combination with basic employee training	Cross reference	e to Qualitative F	xposure As	sessment
combination with basic employee training Use of suitable eye protection	Cross reference	e to Qualitative Ex	xposure As	sessment



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AZOI						
Control of workers exposure for PROC 5						
Title information related to contributing scen		h = 1 = 1	((modelie e de e		
Workers related free short title	(multistage and/or sig			mulation of preparations and articles		
Use descriptor covered	PROC 5					
Processes, tasks, activities covered				ducts or articles using technologies rocess is in stages and provides the		
1 10000000, table, activities obvoica		opportunity for significant contact at any stage				
Exposure Assessment Method	Tool used: ECETOC			-		
Product characteristic						
Physical state	Liquid		Operation	conditions: 90°C		
Concentration of substance	TRA 1-5		%			
Fugacity	Low					
Vapour pressure of the substance	1 (corresponds to 90°	°C)	hPa			
Amounts used						
Not relevant in ECETOC TRA	1					
Frequency and duration of use/exposure	Industrial Domain	Profession Domain	onal			
Duration of exposure	1- 4 hours	15min – 1	h	per day		
Frequency of exposure	≤ 240	≤ 240		days/year		
Other given operational conditions affecting		I				
Location	Indoor	Indoor				
Domain	Industrial	Profession				
Technical conditions and measures at proces	ss level (source) to pre	vent releas	se			
Not relevant						
Technical conditions and measures to contro	•	rce toward	s the worke	r		
Appropriate local exhaust ventilation	No					
Organisational measures to prevent /limit rele			a. Damilar a			
Avoiding frequent and direct contact with substa Supervision in place to check that the RMMs in p						
Conditions and measures related to personal				4.		
Use of suitable respiratory protection	No		l			
Use of suitable chemical resistant gloves in	1.10		1			
combination with basic employee training	Cross reference to O	Cross reference to Qualitative Exposure Assessment				
		uaiilalive ⊏ <i>i</i>		3001110111		
Use of suitable eye protection	Oross reference to Q	ualitative EX	•			
Use of suitable eye protection Control of workers exposure for PROC 8a		ualitative EX	•			
Use of suitable eye protection	ario					
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scenarios workers related free short title	ario Transfer of substance containers at non-dec	e or prepara	ation (chargi	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scenarious related free short title Use descriptor covered	ario Transfer of substance containers at non-dec	e or prepara	ation (chargi			
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scenarious related free short title Use descriptor covered Processes, tasks, activities covered	ario Transfer of substance containers at non-decent PROC 8a e.g. sampling	e or prepara	ation (chargi			
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scend Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method	ario Transfer of substance containers at non-dec	e or prepara	ation (chargi			
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic	ario Transfer of substance containers at non-dec PROC 8a e.g. sampling Tool used: ECETOC	e or prepara	ation (chargination)	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scend Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state	ario Transfer of substance containers at non-decent PROC 8a e.g. sampling Tool used: ECETOC	e or prepara	ation (chargination) ities ir (v2.0) Operation			
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scene Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance	ario Transfer of substance containers at non-decent processes and e.g. sampling Tool used: ECETOC Liquid TRA 1-5	e or prepara	ation (chargination)	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scene Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity	ario Transfer of substance containers at non-decentary processing the containers at non-decentary process. The containers are not	e or prepara dicated facil TRA Worke	ation (charginities or (v2.0) Operation %	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance	ario Transfer of substance containers at non-decent processes and e.g. sampling Tool used: ECETOC Liquid TRA 1-5	e or prepara dicated facil TRA Worke	ation (chargination) ities ir (v2.0) Operation	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scend Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used	ario Transfer of substance containers at non-decentary processing the containers at non-decentary process. The containers are not	e or prepara dicated facil TRA Worke	ation (charginities or (v2.0) Operation %	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA	ario Transfer of substance containers at non-decentary con	e or prepara dicated facil TRA Worke	ation (charginaties or (v2.0) Operation % hPa	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scend Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure	ario Transfer of substance containers at non-decenders at no-decenders at non-decenders at no-decenders at no-decender	e or prepara dicated facil TRA Worke	operation hPa	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scend Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure	ario Transfer of substance containers at non-decenders at no-decenders at non-decenders at non-decenders at no-decenders at	e or prepara dicated facil TRA Worke °C) Professi Domain < 15 min	operation hPa	ng/discharging) from/to vessels/large conditions: 90°C		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure	ario Transfer of substance containers at non-decentainers at non	e or prepara dicated facil TRA Worke	operation hPa	ng/discharging) from/to vessels/large		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting	ario Transfer of substance containers at non-decentainers at non-decentary containers at non-decentary container	e or prepara dicated facil TRA Worke °C) Profess Domain < 15 min ≤ 240	operation hPa	ng/discharging) from/to vessels/large conditions: 90°C		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting to the substance of the substan	ario Transfer of substance containers at non-decentainers at non-decentary containers at non-decentary containers. Liquid TRA 1-5 Low 1 (corresponds to 90 Industrial Domain 15 min - 1 hours ≤ 240 workers exposure Indoor	e or prepara dicated facil TRA Worke °C) Profess Domain < 15 min ≤ 240 Indoor	operation hPa hation (charging in the charging in the chargi	ng/discharging) from/to vessels/large conditions: 90°C		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting to Location Domain	ario Transfer of substance containers at non-dec PROC 8a e.g. sampling Tool used: ECETOC Liquid TRA 1-5 Low 1 (corresponds to 90 Industrial Domain 15 min - 1 hours ≤ 240 workers exposure Indoor Industrial	e or prepara dicated facil TRA Worke °C) Professi Domain < 15 min < 240 Indoor Professies	ation (charginaties or (v2.0) Operation % hPa ional	ng/discharging) from/to vessels/large conditions: 90°C		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting to the control of the conditions and measures at process	ario Transfer of substance containers at non-dec PROC 8a e.g. sampling Tool used: ECETOC Liquid TRA 1-5 Low 1 (corresponds to 90 Industrial Domain 15 min - 1 hours ≤ 240 workers exposure Indoor Industrial	e or prepara dicated facil TRA Worke °C) Professi Domain < 15 min < 240 Indoor Professies	ation (charginaties or (v2.0) Operation % hPa ional	ng/discharging) from/to vessels/large conditions: 90°C		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting to Location Domain Technical conditions and measures at process	ario Transfer of substance containers at non-decentainers at no-	e or prepara dicated facil TRA Worke °C) Profess Domain < 15 min < 240 Indoor Profession Profession event release	ation (chargination (v2.0) Operation % hPa ional	ng/discharging) from/to vessels/large conditions: 90°C per day days/year		
Use of suitable eye protection Control of workers exposure for PROC 8a Title information related to contributing scent Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure Other given operational conditions affecting to the control of the conditions and measures at process	ario Transfer of substance containers at non-decentainers at no-	e or prepara dicated facil TRA Worke °C) Profess Domain < 15 min < 240 Indoor Profession Profession event release	ation (chargination (v2.0) Operation % hPa ional	ng/discharging) from/to vessels/large conditions: 90°C per day days/year		



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Avoiding frequent and direct contact with substa				ing of equipment and work area.		
Supervision in place to check that the RMMs in p						
Conditions and measures related to personal	protection, hygiene and	d health e	valuation			
Use of suitable respiratory protection	No					
Use of suitable chemical resistant gloves in						
combination with basic employee training	Cross reference to Qua	Cross reference to Qualitative Exposure Assessment				
Use of suitable eye protection						
Control of workers exposure for PROC 8b						
Title information related to contributing scena	ario					
Workers related free short title			tion (charging/di	scharging) from/to vessels/large		
Use descriptor covered	PROC 8b	i idollitioo				
Processes, tasks, activities covered	Sampling					
Exposure Assessment Method	Tool used: ECETOC T	RA Worke	r (v2 0)			
Product characteristic	1001 d3Cd. L0L100 1	V V V V O I K C	1 (VZ.0)			
Physical state	Liquid		Operation cond	Nitions: 00°C		
Concentration of substance	TRA 1-5		%	ditions. 90 C		
	•		70			
Fugacity	Low					
Vapour pressure of the substance	1 (corresponds to 90°C	:)	hPa			
Amounts used						
Not relevant						
Frequency and duration of use/exposure	Industrial Domain	Profess	sional Domain			
Duration of exposure	1-4 hours	15min -	- 1h	per day		
Frequency of exposure	≤ 240	≤ 240		days/year		
Other given operational conditions affecting	workers exposure					
Location	Indoor	Indoor				
Domain	Industrial	Profess	ional			
Technical conditions and measures at proces						
Not relevant	o lovol (oculto) to piot	01111101041				
Technical conditions and measures to contro	l dispersion from source	e toward	s the worker			
Appropriate local exhaust ventilation	No	o tomana.	S tillo Worker			
Organisational measures to prevent /limit rele		vnosuro				
Avoiding frequent and direct contact with substa			e Pegular clean	ing of equipment and work area		
Supervision in place to check that the RMMs in p				ing of equipment and work area.		
Conditions and measures related to personal						
	No	ı ilcaitii c	valuation			
Use of suitable respiratory protection Use of suitable chemical resistant gloves in	INO					
combination with basic employee training	Cross reference to Qua	litativa Ev	nocura Accacem	pent		
Use of suitable eye protection		illialive L	posure Assessir	ient		
Control of workers exposure for PROC 9						
Title information related to contributing scena	ario					
Workers related free short title		or prepara	ation into small of	containers (dedicated filling line,		
Use descriptor covered	PROC 9					
Processes, tasks, activities covered		down	<u> </u>			
i ioocooco, iaono, activitico COVEIEU	Maintenance and clean down					
Fynnsure Assessment Method		RA Marka	r (v/2 (1)			
Exposure Assessment Method Product characteristic	Tool used: ECETOC T	RA Worke	r (v2.0)			
Product characteristic	Tool used: ECETOC T	RA Worke	, ,	Nitions: 90 °C		
Product characteristic Physical state	Tool used: ECETOC T	RA Worke	Operation cond	ditions: 90 °C		
Product characteristic Physical state Concentration of substance	Tool used: ECETOC T Liquid TRA 1-5	RA Worke	, ,	ditions: 90 °C		
Product characteristic Physical state Concentration of substance Fugacity	Tool used: ECETOC T Liquid TRA 1-5 Low		Operation cond	ditions: 90 °C		
Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance	Tool used: ECETOC T Liquid TRA 1-5		Operation cond	ditions: 90 °C		
Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used	Tool used: ECETOC T Liquid TRA 1-5 Low		Operation cond	ditions: 90 °C		
Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA	Tool used: ECETOC T Liquid TRA 1-5 Low 1 (corresponds to 90 °C)	C)	Operation cond % hPa	ditions: 90 °C		
Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure	Tool used: ECETOC T Liquid TRA 1-5 Low 1 (corresponds to 90 °C) Industrial Domain	C)	Operation cond % hPa sional Domain			
Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure	Tool used: ECETOC T Liquid TRA 1-5 Low 1 (corresponds to 90 °C Industrial Domain 1-4 hours	Profess	Operation cond % hPa sional Domain	ditions: 90 °C		
Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure Frequency of exposure	Tool used: ECETOC T Liquid TRA 1-5 Low 1 (corresponds to 90 °C Industrial Domain 1-4 hours ≤ 240	C)	Operation cond % hPa sional Domain			
Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant in ECETOC TRA Frequency and duration of use/exposure Duration of exposure	Tool used: ECETOC T Liquid TRA 1-5 Low 1 (corresponds to 90 °C Industrial Domain 1-4 hours ≤ 240	Profess	Operation cond % hPa sional Domain	per day		



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Domain	Industrial	Professional				
Technical conditions and measures at proces	s level (source) to preve	ent release				
Not relevant						
Technical conditions and measures to control dispersion from source towards the worker						
Appropriate local exhaust ventilation	No					
Organisational measures to prevent /limit releases, dispersion and exposure						
		ual phases. Regular cleaning of equipment and work area.				
Supervision in place to check that the RMMs in p						
Conditions and measures related to personal	protection, hygiene and	I health evaluation				
Use of suitable respiratory protection	No					
Use of suitable chemical resistant gloves in						
combination with basic employee training	Cross reference to Qualitative Exposure Assessment					
Use of suitable eye protection						

Exposure Estimation

Estimated exposure for workers PROC2 and 3

Route of exposure	Concentrati	Justification	
	Value	Unit	
Long-term exposure, local, inhalative – PROC2	4.72	mg/m³	
Long-term exposure, local, inhalative - PROC3	1.69	mg/m³	

Estimated exposure for workers - PROC 4, 5, 8a, 8b, 9

Route of exposure	Concentrations			Justification
	Industrial Domain	Professional Domain	Unit	
Long-term exposure, local, inhalativer – PROC4	2.83	1.89	mg/m³	
Long-term exposure, local, inhalativer - PROC5	2.83	1.89	mg/m³	
Long-term exposure, local, inhalativer – PROC8a	1.89	2.36	mg/m³	
Long-term exposure, local, inhalativer – PROC8b	2.83	1.89	mg/m³	
Long-term exposure, local, inhalativer – PROC9	2.83	1.89	mg/m³	



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5. Exposure Scenario 5: Use as intermediate

Number of the EO	-				
Number of the ES	5				
Title of exposure scenario	Use	e as intermediate			
List of all use descriptors related to the life cycle stage		3, 8, 9; PROC 1, 2, 3, 4, 8b and 9; E	·		
Name of contributing environmental scenario and corresponding ERC		ustrial use resulting in manufacture C6a)	e of another substance (use of intermediates)		
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (syn-thesis) where opportunity for exposure arises PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)				
Contributing exposure scenario controllin	g wo	rker exposure for PROC 1, 2, 3, 4,	8b and 9		
Control of workers exposure for PROC 1		-			
Title information related to contributing so	enar	io			
Workers related free short title	Use in closed process, no likelihood of exposure				
Use descriptor covered		PROC 1	a or orbodulo		
Processes, tasks, activities covered	Use of the substance in high integrity contained system where little exists for exposures, e.g. any sampling via closed loop systems				
Exposure Assessment Method		Tool used: ECETOC TRA Worker			
Product characteristic		1001 d3ed. LOL 100 TRA WOIREI	(vz.v)		
Physical state		Liquid	Operation conditions: temperature ca. 90°C		
Concentration of substance		100	%		
Fugacity		Low	/6		
			hPa		
Vapour pressure of the substance Amounts used	1.0 (corresponds to ca. 90°C) hPa				
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure		. 4	hours/dov		
		> 4 ≤ 240	hours/day		
Frequency of exposure		S 240	days/year		
Other given operational conditions affection	ng w	orkers exposure			
Location		Indoors			
Domain		Industrial			
Technical conditions and measures at pro	cess	level (source) to prevent release			
Not applicable – closed system					
Technical conditions and measures to cor	itrol	dispersion from source towards t	he worker		
Local exhaust ventilation required		No			
Organisational measures to prevent /limit	relea	ses, dispersion and exposure			
Not relevant in ECETOC TRA					
Conditions and measures related to perso	nal p		lluation		
Use of suitable respiratory protection		No			
Control of workers exposure for PROC 2					
Title information related to contributing so	enar				
Workers related free short title			with occasional controlled exposure		
Use descriptor covered		PROC 2			
Processes, tasks, activities covered		minimizing emissions. Occasional sampling and equipment breakage			
Exposure Assessment Method		Tool used: ECETOC TRA Worker			
Product characteristic					
Physical state		Liquid	Operation conditions: temperature ca. 90°C		
Concentration of substance		100	%		
Fugacity		Low			
		1.0 (corresponds to ca. 90 °C)	hPa		



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AZOT					
Amounts used					
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure	> 4	hours/day			
Frequency of exposure	≤ 240	days/year			
Other given operational conditions affecting v	workers exposure				
Location	Indoors				
Domain	Industrial				
Technical conditions and measures at proces	s level (source) to	prevent release			
Not relevant					
Technical conditions and measures to contro	I dispersion from	source towards t	he worker		
Local exhaust ventilation required	No				
Organisational measures to prevent /limit rele	eases, dispersion	and exposure			
Avoiding frequent and direct contact with substant					
Supervision in place to check that the RMMs in p					
Conditions and measures related to personal	protection, hygie	ne and health eva	luation		
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves	Cross reference to Qualitative Exposure Assessment				
Use of suitable eye protection	Cioss reference	to Qualitative Exp	Osule Assessifient		
Best practice advise					
Probing/sampling with considerable vapor releas		ed 1h/day. Otherv	vise appropriate risk reduction measures (e.g.		
outside, LEV or breathing protection) are recomm	nended.	· .	<u> </u>		
Control of workers exposure for PROC 3					
Title information related to contributing scena	ario				
Workers related free short title		atch process (synth	nesis or formulation)		
Use descriptor covered	Use in closed batch process (synthesis or formulation) PROC 3				
Ose descriptor covered	Batch manufacture where the predominant handling is in a contained manne				
Processes, tasks, activities covered	e.g. through enclosed transfers, but where some opportunity for contact with				
Frocesses, tasks, activities covered	chemicals occurs, e.g. through sampling				
Evnesure Assessment Method					
Exposure Assessment Method	1001 used: ECE	TOC TRA Worker	(V2.U)		
Product characteristic	T		T-2		
Physical state	Liquid		Operation conditions: temperature ca. 90°C		
Concentration of substance	100		%		
Fugacity	Low				
Vapour pressure of the substance	1.0 (correspond	s to 90 °C)	hPa		
Amounts used					
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure	> 4 h		per day		
Frequency of exposure	≤ 240		days per year		
	-		days per year		
Other given operational conditions affecting	_	!			
Location	Indoors				
Domain	Industrial				
Technical conditions and measures at proces	s level (source) to	prevent release			
Not relevant					
Technical conditions and measures to contro	I dispersion from	source towards t	he worker		
Appropriate local exhaust ventilation	No				
Organisational measures to prevent /limit rele		and exposure			
Avoiding frequent and direct contact with substat			Pegular cleaning of equipment and work area		
Supervision in place to check that the RMMs in p					
Conditions and measures related to personal	1	ne and nealth eva	iiuaiiUII		
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves	Cross reference	to Qualitative Evo	osure Assessment		
Use of suitable eye protection	01000 1016161106	Qualitative Exp	COS. 5 / NOOCOMOTA		
Control of workers exposure for PROC 4					
Title information related to contributing scena	ario				
Workers related free short title	Use in batch an	d other process (sy	nthesis) where opportunity for exposure		
Hoo descriptor assessed	arises				
Use descriptor covered	PROC 8b		all and all orders of the second of the seco		
Processes, tasks, activities covered	exposure arises	s, e.g. during char	chemical where significant opportunity for ging, sampling or discharge of material, and sely to result in exposure		
	when the nature	, or the design is lik	to result in expusure		



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AZOI	T= · · · ======		()	
Exposure Assessment Method	Tool used: ECETOC	IRA Worke	r (v2.0)	
Product characteristic	T		I	
Physical state	Liquid		Operation conditions: temperature ca. 90°C	
Concentration of substance	100		%	
Fugacity	Low			
Vapour pressure of the substance	1 (corresponds to ca.	. 90°C)	hPa	
Amounts used				
Not relevant in ECETOC TRA				
Frequency and duration of use/exposure	1			
Duration of exposure	> 4 hours	per day		
Frequency of exposure	≤ 240	days/year		
Other given operational conditions affecting w				1
Location	Indoor			
Domain	Industrial			
Technical conditions and measures at process	s level (source) to pre	vent release	9	
Not relevant				
Technical conditions and measures to control	-	ce towards	the worker	<u> </u>
Appropriate local exhaust ventilation	No No			
Organisational measures to prevent /limit relea				
Avoiding frequent and direct contact with substan				
Supervision in place to check that the RMMs in place				
Conditions and measures related to personal puse of suitable respiratory protection	No	iu neaith e\	aiudliUII	
Use of suitable chemical resistant gloves	INU			
Use of suitable eye protection	Cross reference to Q	ualitative Ex	posure Ass	essment
Control of workers exposure for PROC 8b	<u> </u>			
Title information related to contributing scenar	rio			
	Transfer of subs	tance or	preparatio	n (charging/discharging) from
Workers related free short title	vessels/large contain			
Use descriptor covered	PROC 8b			
Processes, tasks, activities covered		o dust, var		ng, bagging in dedicated facilities or spillage, and cleaning
Exposure Assessment Method	Tool used: ECETOC		r (v2.0)	
Product characteristic				
Physical state	Liquid		Operation	conditions: temperature ca. 90°C
Concentration of substance	100		%	
Fugacity	Low			
Vapour pressure of the substance	1 (corresponds to ca.	. 90 °C)	hPa	
Amounts used				
Not relevant in ECETOC TRA				
Frequency and duration of use/exposure				
Duration of exposure	15min - 1h		per day	
Frequency of exposure	≤ 240		days/year	
Other given operational conditions affecting w	orkers exposure			
Location	Indoors			
Domain	Industrial			
Technical conditions and measures at process	s level (source) to pre	vent release	9	
Not relevant				
Technical conditions and measures to control	dispersion from sour	ce towards	the worker	
Appropriate local exhaust ventilation	No			
Organisational measures to prevent /limit release				
Avoiding frequent and direct contact with substan-				
Supervision in place to check that the RMMs in place				
Conditions and measures related to personal p	protection, hygiene ar	nd health ev	aluation	
Use of suitable respiratory protection	No			
Use of suitable chemical resistant gloves	Cross reference to Q	ualitative Ev	nosure Ass	essment
Use of suitable eye protection	Sioss ferenciality to Q	Janialive EX	Posuie Maa	Common
Control of workers exposure for PROC 9				
Title information related to contributing scenar	rio			
		· · · · · · · · · · · · · · · · · · ·		



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Workers related free short title		Transfer of substance or preparation into small containers (dedicated filling line,		
Use descriptor covered		including weighing) PROC 9		
Processes, tasks, activities covered	Maintenance, clean down			
Exposure Assessment Method	Tool used: ECETOC TRA World	ker (v2.0)		
Product characteristic		(12.0)		
Physical state	Liquid	Operation conditions: temperature ca. 90°C		
Concentration of substance	TRA 1-5	%		
Fugacity	Low			
Vapour pressure of the substance	1 (corresponds to ca. 90°C)	hPa		
Amounts used	·	·		
Not relevant in ECETOC TRA				
Frequency and duration of use/exposure				
Duration of exposure	15 min - 1 hours	per day		
Frequency of exposure	≤ 240	days/year		
Other given operational conditions affecting	g workers exposure			
Location	Indoors			
Domain	Industrial			
Technical conditions and measures at pro-	cess level (source) to prevent relea	ase		
Not relevant				
Technical conditions and measures to con	trol dispersion from source toward	ds the worker		
Appropriate local exhaust ventilation	No			
Organisational measures to prevent /limit r				
Avoiding frequent and direct contact with subsupervision in place to check that the RMMs i		es. Regular cleaning of equipment and work area. OCs followed.		
Conditions and measures related to person	nal protection, hygiene and health	evaluation		
Use of suitable respiratory protection	No			
Use of suitable chemical resistant gloves	Cross reference to Qualitative	Exposure Assessment		
Use of suitable eye protection	Cross reference to Qualitative	Exposure Assessment		

Exposure Estimation

Estimated exposure for workers

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, local, inhalative - PROC1	0.047	mg/m³	
Long-term exposure, local, inhalative – PROC2	4.72	mg/m³	
Long-term exposure, local, inhalative – PROC3	1.41	mg/m³	
Long-term exposure, local, inhalative – PROC4	2.36	mg/m³	
Long-term exposure, local, inhalative – PROC8b	4.72	mg/m³	
Long-term exposure, local, inhalative – PROC9	4.72	mg/m³	





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6. Exposure Scenario 6: Use of caprolactam as monomer for polyamide, polymers, thermoplastics

Number of the CC	_				
Number of the ES	6				
Title of exposure scenario List of all use descriptors related to the	Use of caprolactam as monomer for polyamide, polymers, thermoplastics				
life cycle stage	SU3, 12; PROC 1, 2, 3, 8b; ERC 6c, PC32				
Name of contributing environmental	Ind	Industrial use of monomers for manufacture of thermo-plastics (ERC6c)			
scenario and corresponding ERC		. , , ,			
Name(s) of contributing worker scenarios and corresponding PROCs	PRO PRO PRO	PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities			
Contributing exposure scenario controllin	ng wo	orker exposure for	or PROC 1, 2, 3,	8b	
Control of workers exposure for PROC 1					
Title information related to contributing s	cena	rio			
Workers related free short title			ocess, no likeliho	ood of exposure	
Use descriptor covered		PROC 1		o o o o o o o o o o o o o o o o o o o	
Processes, tasks, activities covered			n closed system,	250°C	
Exposure Assessment Method			TOC TRA Worke		
Product characteristic		1001 0360. LOL	TOO THA WOIKE	(VZ.O)	
Physical state		Liquid		Operation conditions: temperature ca. 250°C	
Concentration of substance		100		%	
				/0	
Fugacity Vapour pressure of the substance		High 700 (correspond	lo to on 250°C\	hPa	
Amounts used		700 (correspond	is to ca. 250 C)	IIIra	
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
		. 1		houre/dov	
Duration of exposure		> 4		hours/day	
Frequency of exposure Other given operational conditions affect	in a 11	≤ 240		days/year	
	ing w		;		
Location		Indoors			
Domain		Industrial			
Technical conditions and measures at pro	oces	s ievei (source) t	o prevent releas	Se	
Not applicable – closed system					
Technical conditions and measures to co	ntrol	dispersion from	source towards	s the worker	
Local exhaust ventilation required		No			
Organisational measures to prevent /limit	rele	ases, dispersion	and exposure		
Not relevant					
Conditions and measures related to person	onal	protection, hygie	ne and health e	valuation	
Use of suitable respiratory protection		No			
Control of workers exposure for PROC 2					
Title information related to contributing s	cena	rio			
Workers related free short title		Use in closed, c	ontinuous proces	ss with occasional controlled exposure	
Use descriptor covered		PROC 2			
Processes, tasks, activities covered		Spinning and co	oling of the unex	tracted melt	
Exposure Assessment Method			TOC TRA Worke		
Product characteristic				,	
Physical state		Liquid		Operation conditions: temperature ca. 250°C	
Concentration of substance	TRA 1-5			%	
Fugacity	High				
Vapour pressure of the substance		700 (correspond	ls to ca. 250°C)	hPa	
Amounts used		. 22 (22/10000110		1	
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure		> 4 h	hours per day		
Frequency of exposure		≤ 240	days/year		
Other given operational conditions affect	ina w	_		1	
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Location	Indoors					
Domain	Industrial					
		Se				
Not relevant	Technical conditions and measures at process level (source) to prevent release					
Technical conditions and measures to contro	I dispersion from source towards	s the worker				
Appropriate local exhaust ventilation	Yes	Effectiveness: 90 %				
Organisational measures to prevent /limit rele		Ellectiveriess. 90 /6				
Avoiding frequent and direct contact with substant		s Regular cleaning of equipment and work area				
Supervision in place to check that the RMMs in p						
Conditions and measures related to personal						
Use of suitable respiratory protection	No					
Use of suitable chemical resistant gloves	1					
Use of suitable eye protection	Cross reference to Qualitative Ex	xposure Assessment				
Best practice advise						
Probing/sampling with considerable vapor release	se should not exceed 1h/day. Other	erwise appropriate risk reduction measures (e.g.				
outside, LEV or breathing protection) are recomm	nended.					
Control of workers exposure for PROC 3						
Title information related to contributing scena	ario					
Workers related free short title	Use in closed batch process (syn	thesis or formulation)				
Use descriptor covered	PROC 3	·				
Processes, tasks, activities covered	Mixing and feeding of batch vess	el				
Exposure Assessment Method	Tool used: ECETOC TRA Worke					
Product characteristic		. (1–13)				
Physical state	Liquid	Operation conditions: temperature ca. 90°C				
Concentration of substance	100	%				
Fugacity	Low	7				
Vapour pressure of the substance	1 (corresponds to ca. 90 °C)	hPa				
Amounts used	1 (corresponds to ca. 50 °C)	i ii a				
Not relevant in ECETOC TRA						
Frequency and duration of use/exposure						
Duration of exposure	15min - 1h	per day				
Frequency of exposure	≤ 240	days/year				
Other given operational conditions affecting v		uays/year				
Location	Indoors					
Domain	Industrial					
Technical conditions and measures at proces						
	is level (source) to prevent releas					
Not relevant	l diamanaian fuana aasuua tassaada	a tha sugarlean				
Technical conditions and measures to contro		s the worker				
Appropriate local exhaust ventilation						
Organisational measures to prevent /limit rele						
Avoiding frequent and direct contact with substan						
Supervision in place to check that the RMMs in p						
Conditions and measures related to personal		vaiualiUII				
Use of suitable respiratory protection	No					
Use of suitable chemical resistant gloves in	Cross reference to Overlitative For	vnocuro Accocement				
combination with basic employee training Use of suitable eye protection	Cross reference to Qualitative Ex	posure Assessment				
Control of workers exposure for PROC 8b: Op	peration conditions at 90°C					
Title information related to contributing scena						
The information related to contributing scena		ation (charging/discharging) from/to vessels/large				
Workers related free short title	containers at dedicated facilities	dion (charging/discharging) non/to vesseis/large				
Use descriptor covered	PROC 8b					
Processes, tasks, activities covered						
Exposure Assessment Method	Sampling Tool used: ECETOC TRA Worker (v2.0)					
Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0) Product characteristic						
	Liquid	Operation conditions: temperature 00°C				
Physical state	Liquid	Operation conditions: temperature 90°C				
Concentration of substance	100	%				
Fugacity	Low	LD-				
Vapour pressure of the substance	1 (corresponds to 90°C)	hPa				
Amounts used						
Not relevant in ECETOC TRA						



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Frequency and duration of use/exposure				
Duration of exposure	15min-1h	per day		
Frequency of exposure	≤ 240	days/year		
Other given operational conditions affecting workers exposure				
Location	Indoors			
Domain	Industrial			
Technical conditions and measures at proces	s level (source) to prevent relea	se		
Not relevant	. , .			
Technical conditions and measures to control	I dispersion from source toward	Is the worker		
Appropriate local exhaust ventilation	No			
Organisational measures to prevent /limit rele	ases, dispersion and exposure	1		
		es. Regular cleaning of equipment and work area.		
Supervision in place to check that the RMMs in p				
Conditions and measures related to personal	protection, hygiene and health	evaluation		
Use of suitable respiratory protection	No			
Use of suitable chemical resistant gloves in				
combination with basic employee training	Cross reference to Qualitative E	xposure Assessment		
Use of suitable eye protection				
Control of workers exposure for PROC 8b: Op				
Title information related to contributing scena	ario			
Workers related free short title	Transfer of substance or prepar containers at dedicated facilities	ation (charging/discharging) from/to vessels/large		
Use descriptor covered	PROC 8b			
Processes, tasks, activities covered	Sampling, handling of unextracted	ed polyamide melt, cooling down		
Exposure Assessment Method	Tool used: ECETOC TRA Worke	er (v2.0)		
Product characteristic		. ,		
Physical state	Liquid	Operation conditions: at 250°C		
Concentration of substance	TRA 1-5	%		
Fugacity	High			
Vapour pressure of the substance	700 (corresponds to 250°C)	hPa		
Amounts used		•		
Not relevant				
Frequency and duration of use/exposure				
Duration of exposure	1-4 hours	per day		
Frequency of exposure	≤ 240	days/year		
Other given operational conditions affecting v	vorkers exposure	1 * *		
Location	Indoors			
Domain	Industrial			
Technical conditions and measures at proces		se		
Minimisation of manual phases. Avoidance of cor				
Technical conditions and measures to control				
		Effectiveness: 97 %		
Appropriate local exhaust ventilation	Yes	(as PROC relates to dedicated facilities)		
Organisational measures to prevent /limit rele	ases, dispersion and exposure	,		
•	· · ·	es. Regular cleaning of equipment and work area.		
Supervision in place to check that the RMMs in p				
Conditions and measures related to personal				
Use of suitable respiratory protection	No			
Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection	Cross reference to Qualitative E	xposure Assessment		
OGO OF GUILLONG CYC PTOLEGUIOTT	555 of Sultable Cyc protection			



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Exposure Estimation

Estimated exposure for workers

Louinated expedition workers			1
Route of exposure	Concei	ntrations	Justification
	Value	Unit	
Long-term exposure, local, inhalative - PROC1	0.047	mg/m³	
Long-term exposure, local, inhalative – PROC2	4.72	mg/m³	
Long-term exposure, local, inhalative – PROC3	2.83	mg/m³	
Long-term exposure, local, inhalative – PROC8b (90°C)	4.72	mg/m³	
Long-term exposure, local, inhalative – PROC8b (250°C)	2.55	mg/m³	





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7. Exposure Scenario 7: Use of caprolactam as monomer for resins

Number of the ES	T -7				
	+	7			
Title of exposure scenario	Use of caprolactam as monomer for resins				
List of all use descriptors related to the life cycle stage	SU3;	SU3; PROC 1, 2, 3, 8b; ERC 6c			
Name of contributing environmental scenario and corresponding ERC		Industrial use of monomers for manufacture of thermo-plastics (ERC6c)			
		PROC 1: Use in closed process, no likelihood of exposure			
Name(s) of contributing worker			ocess with occasional controlled exposure		
scenarios and corresponding PROCs		C 3: Use in closed batch process (or preparation (charging/discharging) from/to		
		els/large containers at dedicated fa			
Contributing exposure scenario controlling					
Control of workers exposure for PROC 1					
Title information related to contributing s	cenari	0			
Workers related free short title		Use in closed process, no likelihoo	od of exposure		
Use descriptor covered		PROC 1	'		
Processes, tasks, activities covered		Use of the substances in high in exists for exposures, e.g. any sam	ntegrity contained system where little potential		
Exposure Assessment Method		Tool used: ECETOC TRA Worker			
Product characteristic	ı				
Physical state	l l	Liquid	Operation conditions: temperature ca. 250°C		
Concentration of substance		100	%		
Fugacity	ı	High			
Vapour pressure of the substance		700 (corresponds to ca. 250°C)	hPa		
Amounts used		,			
Not relevant in ECETOC TRA					
Frequency and duration of use/exposure					
Duration of exposure		> 4	hours/day		
Frequency of exposure		≤ 240	days/year		
Other given operational conditions affect					
Location		ndoors			
Domain		Industrial			
Technical conditions and measures at pro	ocess	level (source) to prevent release	9		
Not applicable – closed system			the consider.		
Technical conditions and measures to co			tne worker		
Local exhaust ventilation required		No			
Organisational measures to prevent /limit releases, dispersion and exposure Not relevant					
Conditions and measures related to person	onal nr	rotaction, bygione and health ev	valuation		
•	Ī	· • • • • • • • • • • • • • • • • • • •	aiuatioil		
Use of suitable respiratory protection Control of workers exposure for PROC 2		No			
Title information related to contributing s	cenari	0			
Workers related free short title			s with occasional controlled exposure		
Use descriptor covered		PROC 2	Socialistici controlled expeditio		
Processes, tasks, activities covered	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions e.g. spinning and cooling of the unextracted melts. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages.				
Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0)					
Product characteristic					
Physical state	Liquid Operation conditions: temperature ca. 10				
Concentration of substance	-	TRA 1-5	%		
Fugacity	High				
Vapour pressure of the substance					
Amounts used					
Not relevant					
Frequency and duration of use/exposure					
Duration of exposure	;	> 4 h hours per day			



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Frequency of exposure	≤ 240 days/yea	r		
Other given operational conditions affecting v	vorkers exposure			
Location	Indoors			
Domain	Industrial			
Technical conditions and measures at proces	s level (source) to prevent	release	9	
Not relevant	, , ,			
Technical conditions and measures to control	dispersion from source to	wards	the worker	
Appropriate local exhaust ventilation	Yes		Effectiveness: 90%	
Organisational measures to prevent /limit rele	ases, dispersion and expo	sure		
Avoiding frequent and direct contact with substar Supervision in place to check that the RMMs in p	nce. Minimisation of manual	phases.		
Conditions and measures related to personal				
Use of suitable respiratory protection	No			
Use of suitable chemical resistant gloves	Cross reference to Qualita	ive Evn	ocura Assassment	
Use of suitable eye protection	Closs reference to Qualita	ive Exp	Josuie Assessifietti	
Best practice advise				
Probing/sampling with considerable vapor release outside, LEV or breathing protection) are recommendated as a second control of the control o		Otherwi	ise appropriate risk reduction measures (e.g.	
Control of workers exposure for PROC 3				
Title information related to contributing scena				
Workers related free short title	Use in closed batch proces	s (synth	hesis or formulation)	
Use descriptor covered	PROC 3			
Processes, tasks, activities covered	Mixing and feeding			
Exposure Assessment Method	Tool used: ECETOC TRA	Vorker	(v2.0)	
Product characteristic				
Physical state	Liquid		Operation conditions: temperature ca. 90°C	
Concentration of substance	100		%	
Fugacity	Low			
Vapour pressure of the substance	1 (corresponds to ca. 90°C)	hPa	
Amounts used	(,		
Not relevant in ECETOC TRA				
Frequency and duration of use/exposure				
Duration of exposure	15min - 1h		per day	
Frequency of exposure	≤ 240		days/year	
Other given operational conditions affecting v	vorkers exposure		1	
Location	Indoors			
Domain	Industrial			
Technical conditions and measures at proces		release	9	
Not relevant	o level (course) to prevent	1010400	.	
Technical conditions and measures to control	dispersion from source to	wards	the worker	
Appropriate local exhaust ventilation	No	, war ao	ino worker	
Organisational measures to prevent /limit rele	2 3 4	SIIFA		
Avoiding frequent and direct contact with substar			Regular cleaning of equipment and work area	
Supervision in place to check that the RMMs in p				
Conditions and measures related to personal				
Use of suitable respiratory protection	No			
Use of suitable chemical resistant gloves in		l I		
combination with basic employee training	Cross reference to Qualita	ive Exp	oosure Assessment	
Use of suitable eye protection		<u>–</u> p		
Control of workers exposure for PROC 8b				
Title information related to contributing scenario				
Workers related free short title			ion (charging/discharging) from/to vessels/large	
Use descriptor covered	PROC 8b			
Processes, tasks, activities covered	Sampling	<u> </u>		
Exposure Assessment Method	Tool used: ECETOC TRA	Norker	(v2.0)	
Product characteristic	1		\/	
Physical state	Liquid		Operation conditions: temperature 90°C	
Concentration of substance	100		%	
Fugacity	Low		//	
Vapour pressure of the substance	1 (corresponds to 90°C)		hPa	
vapoui pressure oi irie substatice	i (coneaponas to 30 C)		III U	



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Amounts used			
Not relevant in ECETOC TRA			
Frequency and duration of use/exposure			
Duration of exposure	15min-1h	per day	
Frequency of exposure	≤ 240	days/year	
Other given operational conditions affecting w	orkers exposure		
Location	Indoors		
Domain	Industrial		
Technical conditions and measures at proces	s level (source) to prevent releas	se	
Not relevant			
Technical conditions and measures to control	dispersion from source towards	s the worker	
Appropriate local exhaust ventilation	No		
Organisational measures to prevent /limit rele			
Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work area. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.			
Conditions and measures related to personal protection, hygiene and health evaluation			
Use of suitable respiratory protection	No		
Use of suitable chemical resistant gloves in combination with basic employee training			
Use of suitable eye protection			

Exposure Estimation

Estimated exposure for workers

Estimated expectate for workers					
Route of exposure	Concei	ntrations	Justification		
	Value	Unit			
Long-term exposure, local, inhalative - PROC1	0.047	mg/m³			
Long-term exposure, local, inhalative – PROC2	4.72	mg/m³			
Long-term exposure, local, inhalative – PROC3	2.83	mg/m³			
Long-term exposure, local, inhalative – PROC8b	4.72	mg/m³			



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Number of the ES	8			
Title of exposure scenario	Use of caprolactam as monomer for thermo hardened resins			
List of all use descriptors related to the				
life cycle stage	SU3; PROC 1, 3, 8a and 8b; ERC 6c			
Name of contributing environmental	Industrial use of monomers for manufacture of thermo-plastics (ERC6c)			
scenario and corresponding ERC				
			ikelihood of exposure	
Name(a) of contributing worker	PROC 3: Use in clo	sed batch proces	s (synthesis or formulation)	
Name(s) of contributing worker scenarios and corresponding PROCs	vessels/large conta		e or preparation (charging/discharging) from/to	
Scenarios and corresponding Picocs			or preparation (charging/discharging) from/to	
	vessels/large conta			
Contributing exposure scenario controlli				
Control of workers exposure for PROC 1	<u>.</u>			
Title information related to contributing s	cenario			
Workers related free short title		process, no likelih	ood of exposure	
Use descriptor covered	PROC 1	, , , , , , , , , , , , , , , , , , , ,		
-		bstances in high	integrity contained system where little potential	
Processes, tasks, activities covered			ampling via closed loop systems	
Exposure Assessment Method		ETOC TRA Worke		
Product characteristic				
Physical state	Liquid		Operation conditions: temperature ca. 100°C	
Concentration of substance	100		%	
Fugacity	Low			
Vapour pressure of the substance	2 (corresponds	s to ca. 100°C)	hPa	
Amounts used				
Not relevant				
Frequency and duration of use/exposure				
Duration of exposure	> 4		hours/day	
Frequency of exposure	≤ 240		days/year	
Other given operational conditions affect		re		
	Location Indoors			
Domain Industrial				
Technical conditions and measures at pro	ocess level (source)	το prevent relea	ISE	
Not applicable – closed system	ntual diaments of		le the weater	
Technical conditions and measures to co		m source toward	is the worker	
Local exhaust ventilation required	No			
Organisational measures to prevent /limit	releases, dispersio	n and exposure		
Not relevant Conditions and measures related to person	anal protoction by	ione and health	evaluation	
<u>.</u>	i	iene anu neaith (evaluatiOII	
Use of suitable respiratory protection	No			
Control of workers exposure for PROC 3				
Title information related to contributing s				
Workers related free short title		batch process (sy	nthesis or formulation)	
Use descriptor covered	PROC 3			
Drangen tooks activities			predominant handling is in a contained manner,	
Processes, tasks, activities covered	e.g. through enclosed transfers, but where some opportunity for contact with chemicals occurs, e.g. through sampling			
Exposure Assessment Method	•			
Product characteristic	•			
Physical state	Liquid		Operation conditions: temperature ca. 100°C	
Concentration of substance	100		%	
Fugacity	Low		,~	
Vapour pressure of the substance		s to ca. 100°C)	hPa	
Amounts used	2 (corresponds to ca. 100°C) hPa			
Not relevant in ECETOC TRA				
	15min - 1h		per day	



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SAFETY DATA SHEET

(according to Regulation (EC) No 1907/2006 (REACH), ANNEX II)

CAPROLACTAM



Content Section Section Indoors Industrial	712-0-1	1		
Industrial	Frequency of exposure	≤ 240	days/year	
Domain	Other given operational conditions affecting v	vorkers exposure		
Technical conditions and measures at process level (source) to prevent release Not relevant Technical conditions and measures to control dispersion from source towards the worker Appropriate local exhaust ventilation Organisational measures to prevent //imit releases, dispersion and exposure Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work area Supervision in place to check that the RNMs in place are being used correctly and COs followed. Conditions and measures related to personal protection, hygiene and health evaluation Use of suitable respiratory protection Control of workers exposure for PROC 8a Title information related to contributing scenario Workers related free short title Control of workers exposure for PROC 8a Title information related to contributing scenario Workers related free short title Control of workers exposure for PROC 8a Title information related to contributing scenario Workers related free short title Control of workers exposure for PROC 8a Title information related to contributing scenario Workers related free short title Control of workers exposure for PROC 8a Title information related to contributing scenario Workers related free short title Control of workers exposure Use descriptor covered Filling in non-dedicated facilities Filling in non-dedicated facilities Veryour pressure of the substance 100	Location	Indoors		
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combination with basic employee training Use of suitable vep protection	Use of suitable respiratory protection	No		
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Processes, tasks, activities covered Filling in non-dedicated facilities	Use descriptor covered			
Tool used: ECETOC TRA Worker (v2.0)				
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	rugacity	LOW		



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Vapour pressure of the substance	2 (corresponds to 100°C)	hPa			
Amounts used					
Not relevant					
Frequency and duration of use/exposure	Frequency and duration of use/exposure				
Duration of exposure	15min-1h	per day			
Frequency of exposure	≤ 240	days/year			
Other given operational conditions affecting v	vorkers exposure				
Location	Indoors				
Domain	Industrial				
Technical conditions and measures at process level (source) to prevent release					
Not relevant					
Technical conditions and measures to control	dispersion from source toward	s the worker			
Appropriate local exhaust ventilation	No				
Organisational measures to prevent /limit rele	ases, dispersion and exposure				
Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work area. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.					
Conditions and measures related to personal protection, hygiene and health evaluation					
Use of suitable respiratory protection	No				
Use of suitable chemical resistant gloves in combination with basic employee training Cross reference to Qualitative Exposure Assessment					
Use of suitable eye protection					

Exposure Estimation

Estimated exposure for workers

Estimated exposure for workers				
Route of exposure	Concentratio	ns	Justification	
	Value	Unit		
Long-term exposure, local, inhalative – PROC1	0.047	mg/m³		
Long-term exposure, local, inhalative - PROC3	2.83	mg/m³		
Long-term exposure, local, inhalative – PROC8a	0.05	mg/m³		
Long-term exposure, local, inhalative – PROC8b	4.72	mg/m³		





(according to Regulation (EC) No 1907/2006 (REACH), ANNEX II)

CAPROLACTAM

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9. Exposure Scenario 9: Use of caprolactam as plasticizer for polyamide



Number of the ES	9		
Title of exposure scenario	Use of caprolactam as plasticizer for polyamide		
List of all use descriptors related to the life cycle stage	SU3; PROC 2, 3, 8b and 14; ERC 5		
Name of contributing environmental scenario and corresponding ERC	Industrial use resulting in inclusion into or onto a matrix (ERC5)		
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation		
Contributing exposure scenario controlli	Contributing exposure scenario controlling worker exposure for PROC 2, 3, 8b and 14		
Control of workers exposure for PROC 2			

Title information related to contributing scenario Workers related free short title Use in closed, continuous process with occasional controlled exposure Use descriptor covered PROC 2 Continuous process but where the design philosophy is not specifically aimed at Processes, tasks, activities covered minimizing emissions. Occasional exposure will arise e.g. through maintenance, sampling and equipment breakages **Exposure Assessment Method** Tool used: ECETOC TRA Worker (v2.0)

Exposure Assessment metrica	1001 dood: E0E100 1101 Worker	1001 docu. 202100 1101 Wolker (V2.0)		
Product characteristic				
Physical state	Liquid	Operation conditions: temperature ca. 250°C		
Concentration of substance	TRA 1-5	%		
Fugacity	High			
Vapour pressure of the substance	700 (corresponds to ca. 250°C)	hPa		
Amounts used				

Not relevant in ECETOC TRA Frequency and duration of use/exposure

Duration of exposure > 4 hours/day Frequency of exposure ≤ 240 days/year

Other given operational conditions affecting workers exposure

Location	Indoors
Domain	Industrial

Technical conditions and measures at process level (source) to prevent release

Not relevant

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

Organisational measures to prevent /limit releases, dispersion and exposure

Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work area. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.

Conditions and measures related to personal protection, hygiene and health evaluation Lies of cuitable recairatory protection

Ose of suitable respiratory protection	NO	
Use of suitable chemical resistant gloves in		
combination with basic employee training	Cross reference to Qualitative	e Exposure Assessment
Use of suitable eye protection		•

Best practice advise

Probing/sampling with considerable vapor release should not exceed 1h/day. Otherwise appropriate risk reduction measures (e.g. outside, LEV or breathing protection) are recommended.

Contro	l of wo	kers e	xposure	for	PROC 3
--------	---------	--------	---------	-----	--------

Control of workers exposure for PROC 3				
Title information related to contributing scenario				
Workers related free short title	Norkers related free short title Use in closed batch process (synthesis or formulation)			
Use descriptor covered	e descriptor covered PROC 3			
Processes, tasks, activities covered	ered Mixing and feeding of pellets			
Exposure Assessment Method	Tool used: ECETOC TRA Worker (v2.0)			
Product characteristic				
Physical state	Solid	Operation conditions: ambient temperature		
Concentration of substance	100	%		
Dustiness	Low			



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Vapour pressure of the substance	0.0013 (corresponds to	hPa	
· ·	ambient temperature)	1 4	
Amounts used			
Not relevant in ECETOC TRA			
Frequency and duration of use/exposure	1		
Duration of exposure	>4h	per day	
Frequency of exposure	≤ 240	days/year	
Other given operational conditions affecting	-	<u></u>	
Location	Indoors		
Domain	Industrial		
Technical conditions and measures at proces	ss level (source) to prevent relea	ise	
Not relevant			
Technical conditions and measures to contro	I dispersion from source toward	ds the worker	
Appropriate local exhaust ventilation	No		
Organisational measures to prevent /limit rele	eases, dispersion and exposure		
Avoiding frequent and direct contact with substa	nce. Minimisation of manual phase	es. Regular cleaning of equipment and work area.	
Supervision in place to check that the RMMs in p	place are being used correctly and	OCs followed.	
Conditions and measures related to personal	protection, hygiene and health	evaluation	
Use of suitable respiratory protection	No		
Use of suitable chemical resistant gloves in			
combination with basic employee training	Cross reference to Qualitative E	xposure Assessment	
Use of suitable eye protection			
Control of workers exposure for PROC 8b			
Title information related to contributing scena	ario		
Workers related free short title	Transfer of substance or prepar containers at dedicated facilities	ration (charging/discharging) from/to vessels/large	
Use descriptor covered	PROC 8b		
Processes, tasks, activities covered	Granulation and transfer/filling in dedicated facilities, 60°C		
Exposure Assessment Method	, ,		
Product characteristic	1.00.0000.202.00	0. (12.0)	
Physical state	Solid	Operation conditions: temperature 60°C	
Concentration of substance	TRA 1-5	%	
Dustiness	low	70	
Vapour pressure of the substance	< 1 (corresponds to 60 °C)	hPa	
Amounts used	< 1 (corresponds to oo 'C)	III a	
Not relevant in ECETOC TRA			
Frequency and duration of use/exposure			
Duration of exposure	> 4 h	per day	
Frequency of exposure	≤ 240	days/year	
Other given operational conditions affecting	•		
Location	indoors		
Domain	Industrial		
Technical conditions and measures at proces	ss level (source) to prevent relea	ise	
Not relevant			
Technical conditions and measures to contro	I dispersion from source toward	ds the worker	
Appropriate local exhaust ventilation	No		
Organisational measures to prevent /limit rele	eases, dispersion and exposure		
Avoiding frequent and direct contact with substa Supervision in place to check that the RMMs in p		es. Regular cleaning of equipment and work area. OCs followed.	
Conditions and measures related to personal			
Use of suitable respiratory protection	No		
Use of suitable chemical resistant gloves in		I .	
combination with basic employee training	Cross reference to Qualitative E	xposure Assessment	
Use of suitable eye protection		1	
Control of workers exposure for PROC 14	<u> </u>		
Title information related to contributing scena	ario		
Workers related free short title	Production of preparations or	articles by tabletting, compression, extrusion,	
Use descriptor covered	pelletisation PROC 8b		
•		t ambient town and the many continues COSC	
Droopees tooks setivities covered	Dollotiootion under celdet- : - +		
Processes, tasks, activities covered Exposure Assessment Method	Pelletisation under cold water at Tool used: ECETOC TRA Work	•	



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Product characteristic				
Physical state	Solid	Operation conditions: temperature max. 60°C		
Concentration of substance	TRA 1-5	%		
Dustiness	Low			
Vapour pressure of the substance	< 1 (corresponds to 60°C)	hPa		
Amounts used				
Not relevant in ECETOC TRA				
Frequency and duration of use/exposure				
Duration of exposure	> 4 h	per day		
Frequency of exposure	≤ 240	days/year		
Other given operational conditions affecting v	vorkers exposure			
Location	Indoors			
Domain	Industrial			
Technical conditions and measures at process level (source) to prevent release				
Not relevant				
Technical conditions and measures to control	dispersion from source towards	s the worker		
Appropriate local exhaust ventilation	No			
Organisational measures to prevent/limit relea	ases, dispersion and exposure			
		s. Regular cleaning of equipment and work area.		
Supervision in place to check that the RMMs in p				
Conditions and measures related to personal protection, hygiene and health evaluation				
Use of suitable respiratory protection	No			
Use of suitable chemical resistant gloves in		·		
combination with basic employee training	Cross reference to Qualitative Exposure Assessment			
Use of suitable eye protection				

Exposure Estimation

Estimated exposure for workers

Estilliated exposure for workers				
Route of exposure	Concentrations		Justification	
	Value	Unit		
Long-term exposure, local, inhalative – PROC2	4.72	mg/m³		
Long-term exposure, local, inhalative - PROC3	0.1	mg/m³		
Long-term exposure, local, inhalative – PROC8b	0.1	mg/m³		
Long-term exposure, local, inhalative – PROC14	0.02	mg/m³		



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Name(s) of contributing worker

Workers related free short title

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10. Exposure Scenario 10: Use of caprolactam in leather tanning, finishing, impregnation, coatings and paints Number of the ES Title of exposure scenario Use of caprolactam in leather tanning, finishing, impregnation, coatings and paints List of all use descriptors related to the SU3, 22; PROC 10, 13; ERC 6b life cycle stage Name of contributing environmental Industrial use of reactive processing aids (ERC 6b) scenario and corresponding ERC

PROC 10: Roller application or brushing

Roller application or brushing

PROC 13: Treatment of articles by dipping and pouring

Contributing exposure scenario controlling worker exposure for PROC 10, 13

Control	of workers ex	posure for	PROC 10
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scenarios and corresponding PROCs

Title information related to contributing scenario

Use descriptor covered	PROC 10	
Processes, tasks, activities covered	Low energy spreading of e.g. coatings	
Exposure Assessment Method	Tool used: ECETOC TRA Worke	r (v2.0)

Product characteristic

1 Todact characteristic		
Physical state	Liquid	Operation conditions: at ambient temperatures
Concentration of substance	TRA 1-5	%
Fugacity	Low	
Vapour pressure of the substance	0.0013 (corresponds to 90°C)	hPa

Amounts used

Not relevant in ECETOC TRA

L	Frequency and duration of use/exposure	Industrial Domain	Professional Domain	
	Duration of exposure	15min – 1h	15min – 1h	per day
I	Frequency of exposure	≤ 240	≤ 240	days/year
ſ	Other given operational conditions affecting w	orkers exposure	_	_

Location	Indoor	Indoor
Domain	Industrial	Professional

Technical conditions and measures at process level (source) to prevent release

Not relevant

Technical conditions and measures to control dispersion from source towards the worker

Appropriate local exhaust ventilation No

Organisational measures to prevent /limit releases, dispersion and exposure

Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work area. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.

Conditions and measures related to personal protection, hygiene and health evaluation

Use of suitable respiratory protection	No	
Use of suitable chemical resistant gloves in		
combination with basic employee training	Cross reference to Qualitative Ex	posure Assessment
Use of suitable eve protection		

Control of workers exposure for PROC 13

Title information related to contributing scenario

Workers related free short title	Treatment of articles by dipping and pouring			
Use descriptor covered	PROC 13			
Processes, tasks, activities covered Immersion operations (low energy application onto a surface)				
Exposure Assessment Method Tool used: ECETOC TRA Worker (v2.0)				
Product characteristic				
Dh	1.5 3.4	On another and different to and heart to an another		

Physical state	Liquid	Operation conditions: at ambient temperatures
Concentration of substance	TRA 1-5	%
Fugacity	Low	
Vapour pressure of the substance	0.0013 (corresponds to 90°C)	hPa

Amounts used

Not relevant in ECETOC TRA			
Frequency and duration of use/exposure	Industrial Domain	Professional Domain	
Duration of exposure	15min – 1h	15min – 1h	per day
Frequency of exposure	≤ 240	≤ 240	days/year
Other given operational conditions affecting v	vorkers exposure		
Location	Indoor	Indoor	
Domain	Industrial	Professional	



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Technical conditions and measures at process level (source) to prevent release			
Not relevant			
Technical conditions and measures to control dispersion from source towards the worker			
Appropriate local exhaust ventilation No			
Organisational measures to prevent /limit releases, dispersion and exposure			
Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work area.			
Supervision in place to check that the RMMs in place are being used correctly and OCs followed.			
Conditions and measures related to personal	protection, hygiene and health e	evaluation	
Use of suitable respiratory protection	No		
Use of suitable chemical resistant gloves in			
combination with basic employee training	Cross reference to Qualitative Ex	cposure Assessment	
Use of suitable eye protection			

Exposure Estimation

Estimated exposure for workers – PROC 10, 13

Route of exposure	Concentrations			Justification
	Industrial Domain	Professional Domain	Unit	
Long-term exposure, local, inhalative - PROC10	2.83	4.72	mg/m³	
Long-term exposure, local, inhalative – PROC13	2.83	2.83	mg/m³	





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11. Exposure Scenario 11: Use as I	abora	atory chemical		
Number of the ES	11			
Title of exposure scenario	Use as laboratory chemical			
List of all use descriptors related to the life cycle stage	SU 22; PROC 15; ERC 8c, PC21			
Name of contributing environmental scenario and corresponding ERC	Wide dispersive indoor use resulting in inclusion into or onto a matrix (ERC 8c)			
Name(s) of contributing worker	Use as laboratory reagent			
scenarios and corresponding PROCs				
Contributing exposure scenario controlli		<u>-</u>		
Control of workers exposure for PROC 1				
Title information related to contributing	scen	1		
Workers related free short title		Use as laboratory reagent		
Use descriptor covered		PROC 15		
Processes, tasks, activities covered		Analytical work in the lab		
Exposure Assessment Method		Tool used: ECETOC TRA Work	xer (v2.0)	
Product characteristic				
Physical state		Solid	Operation conditions: ambient temperature	
Concentration of substance		100	%	
Dustiness		Low		
Vapour pressure of the substance		0.0013 (corresponds to	hPa	
· · ·		ambient temperature)	THI C	
Amounts used				
Not relevant in ECETOC TRA				
Frequency and duration of use/exposure)			
Duration of exposure		> 4h	per day	
Frequency of exposure		≤ 240	days/year	
Other given operational conditions affect	ting v	workers exposure		
Location		Indoors		
Domain		Professional		
Technical conditions and measures at pr	oces	ss level (source) to prevent rele	ease	
Not relevant				
Technical conditions and measures to co	ontro	I dispersion from source towar	rds the worker	
Appropriate local exhaust ventilation		No		
Organisational measures to prevent/limit	rele	ases, dispersion and exposure		
			ses. Regular cleaning of equipment and work area.	
Supervision in place to check that the RMM				
Conditions and measures related to pers	onal	nace are being used correctly and	d OCs followed.	
i conditione and incacated telated to pers	Ollai			
•	Oliai			
Use of suitable respiratory protection Use of suitable chemical resistant gloves in		protection, hygiene and health		
Use of suitable respiratory protection		protection, hygiene and health	n evaluation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in		protection, hygiene and health No	n evaluation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training		No Cross reference to Qualitative E	n evaluation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection	5 (liq	protection, hygiene and health No Cross reference to Qualitative E	n evaluation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1	5 (liq	protection, hygiene and health No Cross reference to Qualitative E	n evaluation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario	n evaluation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title	5 (liq	Protection, hygiene and health No Cross reference to Qualitative Equid) ario Use as laboratory reagent PROC 15	n evaluation	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent	evaluation Exposure Assessment	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing such workers related free short title Use descriptor covered Processes, tasks, activities covered	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab	evaluation Exposure Assessment	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work	Exposure Assessment Ser (v2.0)	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab	evaluation Exposure Assessment	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid	Exposure Assessment Ser (v2.0) Operation conditions: 90°C	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid 100 Low 1 (corresponds to ambient	Exposure Assessment Ser (v2.0) Operation conditions: 90°C	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid 100 Low	Exposure Assessment Ser (v2.0) Operation conditions: 90°C %	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid 100 Low 1 (corresponds to ambient	Exposure Assessment Ser (v2.0) Operation conditions: 90°C %	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid 100 Low 1 (corresponds to ambient	Exposure Assessment Ser (v2.0) Operation conditions: 90°C %	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant Frequency and duration of use/exposure	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid 100 Low 1 (corresponds to ambient temperature)	Exposure Assessment Ser (v2.0) Operation conditions: 90°C % hPa	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant Frequency and duration of use/exposure Duration of exposure	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid 100 Low 1 (corresponds to ambient temperature) > 4h	exposure Assessment Ser (v2.0) Operation conditions: 90°C % hPa per day	
Use of suitable respiratory protection Use of suitable chemical resistant gloves in combination with basic employee training Use of suitable eye protection Control of workers exposure for PROC 1 Title information related to contributing s Workers related free short title Use descriptor covered Processes, tasks, activities covered Exposure Assessment Method Product characteristic Physical state Concentration of substance Fugacity Vapour pressure of the substance Amounts used Not relevant Frequency and duration of use/exposure	5 (liq	protection, hygiene and health No Cross reference to Qualitative E uid) ario Use as laboratory reagent PROC 15 Analytical work in the lab Tool used: ECETOC TRA Work Liquid 100 Low 1 (corresponds to ambient temperature) > 4h ≤ 240	Exposure Assessment Ser (v2.0) Operation conditions: 90°C % hPa	



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Location	Indoors		
Domain	Professional		
Technical conditions and measures at process level (source) to prevent release			
Not relevant			
Technical conditions and measures to control dispersion from source towards the worker			
Appropriate local exhaust ventilation	Yes	Effectiveness 80%	
Organisational measures to prevent /limit releases, dispersion and exposure			
Avoiding frequent and direct contact with substance. Minimisation of manual phases. Regular cleaning of equipment and work area.			
Supervision in place to check that the RMMs in place are being used correctly and OCs followed.			
Conditions and measures related to personal protection, hygiene and health evaluation			
Use of suitable respiratory protection	No		
Use of suitable chemical resistant gloves in	Cross reference to Qualitative Exposure Assessment		
combination with basic employee training			
Use of suitable eye protection			

Exposure Estimation

Estimated exposure for workers - PROC 15 (solid)

Route of exposure	Concentrations		Justification	
	Value	Unit		
Long-term exposure, local, inhalative	0.1	mg/m³		

Estimated exposure for workers – PROC 15 (liquid)

Route of exposure	Concentrations		Justification
	Value	Unit	
Long-term exposure, local, inhalative	4.72	mg/m³	

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12. Exposure Scenario 12: Consumer use in coatings/paints

<u>General remarks:</u> For the use of coatings, paints and adhesives containing caprolactam the use of ready-to-use products for which no dilution and mixing steps are necessary was assumed.

PC18: To reflect a reasonable worst case scenario, the following assumptions have been made:

- A toner contains 750g of printing ink
- 750g print ink is sufficient to print 8000 pages
- 500 pages per day are printed
- The printing rate is 50 pages per minute

Generally, two steps have been assessed. Refilling of toners (cartridges) (Part A) and the printing process itself (Part B-1 or Part B-2). 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 exposure estimation. The step "Printing process" was calculated using the evaporation model postulating instantaneous release as a worst case. Two possible scenarios were evaluated: Part B-1 and B-2.

Control of consumer exposure for PC 18	and the second s	vo possible scenarios were evaluated. Part 6-1 and 6-2.		
Name of contributing scenario	Use in Printing inks	Use in Printing inks		
Use descriptor covered		SU21, PC 18		
Processes, tasks, activities covered	Refilling of toners (car Printing process – Par Part B-1 - Continuous pages over a period of	Refilling of toners (cartridges) – Part A; Printing process – Part B: Part B-1 - Continuous printing of pages over a longer period of time (e.g. 500 pages over a period of 8 hours) Part B-2 - Printing of a large number of pages at once (e.g. 500 pages within 10 minutes)		
Assessment Method	Cleaning and washing			
Part A. Refilling step		·		
Product characteristic				
Physical state	Liquid			
Concentration of substance	max. 5%			
Vapour pressure of the substance	0.0013 hPa (ambient t	emperature)		
Mol weight matrix	113.16 g/mol	High fraction of water is assumed		
Mass transfer rate	0.284 m/min	Thibodeaux's method ¹ ;		
Amounts used	1 2 2	· · · · · · · · · · · · · · · · · · ·		
Applied amount	750 g			
Frequency and duration of use/exposure	1 0			
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 man	agement			
Type of activity (inhalation rate)	Light activity	See footnote 2		
Other given operational conditions affection	ng workers exposure			
Location	Inside			
Room volume	-	A "personal volume" of 1m ³ is assumed		
Ventilation rate	0.5 per hour	(Default value)		
Release area	20cm ²	(Default value)		
Application temperature	25°C			
Conditions and measures related to inform	nation and behavioural advic	ce to consumers		
Not applicable				
Conditions and measures related to perso	nal protection and hygiene			
Not applicable				
Part B-1. Printing process/8 hours				
Product characteristic				
Physical state	Liquid			
Concentration of substance	max. 5%			
Vapour pressure of the substance	0.0013 hPa			
Amounts used	·			
Applied amount	46.8 g/day	Amount of printing ink needed to print 500 pages		
Frequency and duration of use/exposure				
Duration of exposure	8 hours			
Frequency of exposure	365 days/year	Not relevant for the calculation of the mean concentration on day of exposure		



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Human factors not influenced by risk m	anagement				
Type of activity (inhalation rate)	Light activity				
Other given operational conditions affect	cting workers exposure				
Location	Inside				
Room volume	25 m³	See footnote 3			
Ventilation rate	0.6 per hour	See footnote 4			
Application temperature	25°C				
Organisational measures to prevent /lim	nit releases, dispersion and exp	posure			
Not applicable					
Conditions and measures related to per	sonal protection, hygiene and	health evaluation			
Not applicable					
Part B-2. Printing process / 10 mins					
Product characteristic					
Physical state	Liquid				
Concentration of substance	max. 5%				
Vapour pressure of the substance	0.0013 hPa	0.0013 hPa			
Amounts used					
Applied amount	46.8 g/day	Amount of printing ink needed to print 500 pages			
Frequency and duration of use/exposur	е				
Duration of exposure	10 min				
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 m	anagement				
Type of activity (inhalation rate)	Light activity	See footnote 2			
Other given operational conditions affect	cting workers exposure				
Location	Inside				
Room volume	25m³	See footnote 3			
Ventilation rate	0.6 per hour	See footnote 4			
Application temperature	25°C				
Organisational measures to prevent /lim	nit releases, dispersion and exp	posure			
Not applicable					
Conditions and measures related to per	sonal protection, hygiene and	health evaluation			
Not applicable					
	Fxno4.0 – Consumer Exposure and Untake Mo	lodels - Program Manual, RIVM report 320104004/2005) the Thibodeaux's method			

According to the ConsExpo Manual (Delmaar, J.E. et al., ConsExpo4.0 - Consumer Exposure and Uptake Models - Program Manual. RIVM report 320104004/2005) the Thibodeaux's method is

an approximation for the evaporation of a solute from water. Thus the exposure estimation based on Thibodeaux's method applies for waterbased printing inks.

The type of activity and the corresponding influence do not have direct relevance for the given exposure estimations. However the type of activity is regarded to be considered within the DNEL derivation.

Estimated exposure for consumers for PC18

Calculation tool used: ConsExpo 4.1

Route of exposure	dose/conc	Unit	Justification
Part A. Refilling step			
Long-term exposure, local, inhalative	3.09*10 ⁻⁵	mg/m³	Estimated exposure value is regarded to be negligible and will be disregarded in further assessment (chapter 10)
Long-term exposure, local, dermal	NA	mg/kg bw/d	Quantitative assessment
Long-term exposure, systemic	NA	mg/kg bw/d	See General remarks
Part B-1. Printing process			
Long-term exposure, local, inhalative	0.000412	mg/m³	
Long-term exposure, systemic, dermal	NA	mg/kg bw/d	Quantitative assessment
Long-term exposure, systemic	NA	mg/kg bw/d	See General remarks
Part B-2. Printing process			
Long-term exposure, systemic/local, inhalative	0.0198	mg/m³	
Long-term exposure, systemic, dermal	NA	mg/kg bw/d	Quantitative assessment
Long-term exposure, systemic, oral	NA	mg/kg bw/d	See General remarks

³ A room volume of 25 m³ is postulated. This is considered to represent the worst case for the room volume of a home office (room with workstation and some racks)

⁴ An air exchange rate of 0.6 hour is considered to represent a reasonable average value (Wallace, L.A. et al., 2002. Continuous measurements of air exchange rates in an occupied house for 1 year. The effect of temperature, wind, fans and windows. Journal of Exposure Analysis and Environmental Epidemiology, 12, 296-306; Bremmer, H. J. et al. General Fact Sheet. Limiting conditions and reliability, ventilation, room size, body surface area Updated version for ConsExpo 4. RIVM report 320104002/2006)