1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/ UNDERTAKING

1.1. Product identifier

Mixture identification: AMMONIA IN METHANOL (6N / 13%w)
UFI: F8X2-HQM5-C20P-1PES

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended use:
Non-aqueous solvent with basic pH

1.3. Details of the supplier of the safety data sheet

Company:
Gases: Research Innovation & Technology SLU.
C/ Consell de Cent, 419 Principal 1 y 2 - 08009 (Barcelona)
Tel: 93/272.14.00 Fax: 93/215.38.08

Competent person responsible for the safety data sheet:
gmartin@grit.es

1.4. Emergency telephone number
+ 34 630 215 910 (24h)

2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

EC regulation criteria 1272/2008 (CLP)

Danger, Flam. Liq. 2, Highly flammable liquid and vapour.

Danger, Acute Tox. 3, Toxic if swallowed.

Danger, Acute Tox. 3, Toxic in contact with skin.

Danger, Acute Tox. 3, Toxic if inhaled.

Danger, Skin Corr. 1B, Causes severe skin burns and eye damage.

Danger, Eye Dam. 1, Causes serious eye damage.

Danger, STOT SE 1, Causes damage to organs.

Adverse physicochemical, human health and environmental effects:
No other hazards

2.2. Label elements

Hazard pictograms:

Danger

Hazard statements:
H225 Highly flammable liquid and vapour.
H301+H311+H331 Toxic if swallowed, in contact with skin or if inhaled.
H314 Causes severe skin burns and eye damage.
H370 Causes damage to organs.

Precautionary statements:
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 Wear protective gloves and eye protection.
P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P311 IF exposed or concerned: Call a POISON CENTER.
P310 Immediately call a POISON CENTER.
P370+P378 I In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403+P233 Store in a well-ventilated place. Keep container tightly closed.

Special Provisions:
None
Contains
methanol
ammonia, anhydrous
2.3. Other hazards

Other Hazards:
No other hazards

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances
N.A.

3.2. Mixtures
Hazardous components within the meaning of the CLP regulation and related classification:

Qty	Name	Ident. Number	Classification
>= 80% - < 90%	methanol	Index number: 603-001-00-X CAS: 67-56-1 EC: 200-659-6 REACH No.: 01-2119433307-44	2.6/2 Flam. Liq. 2 H225 3.1/3/Oral Acute Tox. 3 H301 3.1/3/Dermal Acute Tox. 3 H311 3.1/3/Inhal Acute Tox. 3 H331 3.8/1 STOT SE 1 H370
>= 12.5% - < 15%	ammonia, anhydrous	Index number: 007-001-00-5 CAS: 7664-41-7 EC: 231-635-3 REACH No.: 01-2119488876-14	2.2/2 Flam. Gas 2 H221 2.5 Press. Gas H280 3.2/1B Skin Corr. 1B H314 4.1/A1 Aquatic Acute 1 H400 3.1/3/Inhal Acute Tox. 3 H331

SECTION 4: First aid measures

4.1. Description of first aid measures
In case of skin contact:
Immediately take off all contaminated clothing.
OBTAIN IMMEDIATE MEDICAL ATTENTION.
Remove contaminated clothing immediately and dispose off safely.
After contact with skin, wash immediately with soap and plenty of water.
In case of eyes contact:
After contact with the eyes, rinse with water with the eyelids open for a sufficient length of time, then consult an opthalmologist immediately.
Protect uninjured eye.
In case of Ingestion:
Do NOT induce vomiting.
Give nothing to eat or drink.
In case of Inhalation:
If breathing is irregular or stopped, administer artificial respiration.
In case of inhalation, consult a doctor immediately and show him packing or label.
4.2. Most important symptoms and effects, both acute and delayed
None
4.3. Indication of any immediate medical attention and special treatment needed
In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible).
Treatment: Treat symptomatically.

5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media
Suitable extinguishing media:
Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Extinguishing media which must not be used for safety reasons:
DO NOT use a direct water jet to extinguish.
5.2. Special hazards arising from the substance or mixture

Do not inhale explosion and combustion gases.
Burning produces heavy smoke.

5.3. Advice for firefighters

Use suitable breathing apparatus .
Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
Move undamaged containers from immediate hazard area if it can be done safely.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Wear personal protection equipment.
Remove all sources of ignition.
Wear breathing apparatus if exposed to vapours/dusts/aerosols.
Provide adequate ventilation.
Use appropriate respiratory protection.
See protective measures under point 7 and 8.

6.2. Environmental precautions

Do not allow to enter into soil/subsoil. Do not allow to enter into surface water or drains.
Retain contaminated washing water and dispose it.
In case of gas escape or of entry into waterways, soil or drains, inform the responsible authorities.
Suitable material for taking up: absorbing material, organic, sand

6.3. Methods and material for containment and cleaning up

Wash with plenty of water.

6.4. Reference to other sections

See also section 8 and 13

7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Avoid contact with skin and eyes, inhalation of vapours and mists.
Use localized ventilation system.
Don't use empty container before they have been cleaned.
Before making transfer operations, assure that there aren't any incompatible material residuals in the containers.
Contamined clothing should be changed before entering eating areas.
Do not eat or drink while working.
See also section 8 for recommended protective equipment.

7.2. Conditions for safe storage, including any incompatibilities

Always keep in a well ventilated place.
Store at below 10 °C is recommended. Keep away from unguarded flame and heat sources. Avoid direct exposure to sunlight.
Keep away from food, drink and feed.
Incompatible materials:
None in particular.
Instructions as regards storage premises:
Cool and adequately ventilated.

7.3. Specific end use(s)

None in particular

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

methanol - CAS: 67-56-1

EU - TWA(8h): 260 mg/m3, 200 ppm - Notes: Skin
ACGIH - TWA(8h): 200 ppm - STEL: 250 ppm - Notes: Skin, BEI - Headache, eye dam, dizziness, nausea

ammonia, anhydrous - CAS: 7664-41-7

EU - TWA(8h): 14 mg/m3, 20 ppm - STEL: 36 mg/m3, 50 ppm
ACGIH - TWA(8h): 25 ppm - STEL: 35 ppm - Notes: Eye dam, URT irr

DNEL Exposure Limit Values

methanol - CAS: 67-56-1

Worker Professional: 40 mg/kg - Consumer: 8 µg/Kg bw/day - Exposure: Human Dermal - Frequency: Long Term, systemic effects
Worker Professional: 260 mg/m3 - Consumer: 50 mg/m3 - Exposure: Human Inhalation - Frequency: Long Term, systemic effects
Worker Professional: 260 mg/m3 - Consumer: 50 mg/m3 - Exposure: Human Inhalation - Frequency: Long Term, local effects
Consumer: 8 mg/kg bw/day

PNEC Exposure Limit Values
8.2. Exposure controls
Eye protection:
Eye glasses with side protection.
Protection for skin:
Use clothing that provides comprehensive protection to the skin, e.g. cotton, rubber, PVC or viton.
Protection for hands:
Rubber nitrilo: thickness> 0.45 mm Time of perforation> 480 min (EN 374)
Respiratory protection:
Filtering device (DIN EN 147).
Thermal Hazards:
None
Environmental exposure controls:
None

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Properties	Value	Method:	Notes:
Appearance and colour:	Colorless liquid	--	--
Odour:	Ammonia	--	--
Odour threshold:	N.A.	--	--
pH:	14	--	--
Melting point / freezing point:	N.A.	--	--
Initial boiling point and boiling range:	N.A.	--	--
Flash point:	< 23ºC ° C	--	--
Evaporation rate:	N.A.	--	--
Solid/gas flammability:	N.A.	--	--
Upper/lower flammability or explosive limits:	7.3 % 36% (methanol)	--	--
Vapour pressure:	N.A.	--	--
Vapour density:	N.A.	--	--
Relative density:	0.781 g/ml	--	--
Solubility in water:	Soluble	--	--
Solubility in oil:	N.A.	--	--
Partition coefficient (n-octanol/water):	N.A.	--	--
Auto-ignition temperature:	N.A.	--	--
Decomposition temperature:	N.A.	--	--
Viscosity:	N.A.	--	--
Explosive properties:	N.A.	--	--
Oxidizing properties:	N.A.	--	--

9.2. Other information

Properties	Value	Method:	Notes:
Miscibility:	N.A.	--	--
Fat Solubility:	N.A.	--	--
Conductivity:	N.A.	--	--
Substance Groups relevant properties	N.A.	--	--

SECTION 10: Stability and reactivity

10.1. Reactivity
Stable under normal conditions
10.2. Chemical stability
Stable under normal conditions
10.3. Possibility of hazardous reactions
None
10.4. Conditions to avoid
Stable under normal conditions.
10.5. Incompatible materials
Avoid contact with oxidizing materials. The product could ignite.
10.6. Hazardous decomposition products

COx, NOx

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Toxicological information of the product:

AMMONIA IN METHANOL (6M/13%w)

a) acute toxicity

The product is classified: Acute Tox. 3 H301;Acute Tox. 3 H311;Acute Tox. 3 H331

ATEmix - Oral 114,943 mg/kg

ATEmix - Dermal 344,828 mg/kg

b) skin corrosion/irritation

The product is classified: Skin Corr. 1B H314

c) serious eye damage/irritation

The product is classified: Eye Dam. 1 H318

d) respiratory or skin sensitisation

Not classified

Based on available data, the classification criteria are not met

e) germ cell mutagenicity

Not classified

Based on available data, the classification criteria are not met

f) carcinogenicity

Not classified

Based on available data, the classification criteria are not met

g) reproductive toxicity

Not classified

Based on available data, the classification criteria are not met

h) STOT-single exposure

The product is classified: STOT SE 1 H370

i) STOT-repeated exposure

Not classified

Based on available data, the classification criteria are not met

j) aspiration hazard

Not classified

Based on available data, the classification criteria are not met

Toxicological information of the main substances found in the product:

methanol - CAS: 67-56-1

a) acute toxicity:

Test: LD50 - Route: Oral - Species: Rat > 1187 mg/Kg bw

Test: LC50 - Route: Inhalation - Species: Rat 128.2 mg/l - Duration: 4h

Test: LD50 - Route: Skin - Species: Rabbit 17100 mg/Kg bw

b) skin corrosion/irritation:

Test: Skin Irritant - Route: Skin - Species: Rabbit Negative

c) serious eye damage/irritation:

Test: Eye Irritant - Species: Rabbit Negative

SECTION 12: Ecological information

12.1. Toxicity

Adopt good working practices, so that the product is not released into the environment.

Amonia in Methanol (6M/13%w)

Not classified for environmental hazards

Based on available data, the classification criteria are not met

methanol - CAS: 67-56-1

a) Aquatic acute toxicity:

Endpoint: LC50 - Species: Fish 15400 mg/l - Duration h: 96

Endpoint: EC50 - Species: Daphnia > 10000 mg/l - Duration h: 48

Endpoint: EC50 - Species: Algae > 22000 mg/l - Duration h: 96

b) Aquatic chronic toxicity:

Endpoint: NOEC - Species: Fish > 7900 mg/l - Duration h: 200

12.2. Persistence and degradability

None

methanol - CAS: 67-56-1

Biodegradability: Readily biodegradable - %: 71.5-95 - Notes: 5 -20 d

12.3. Bioaccumulative potential

methanol - CAS: 67-56-1

Bioaccumulation: Not bioaccumulative - Test: BCF - Bioconcentrantion factor 4.5

Bioaccumulation: Not bioaccumulative - Test: Kow - Partition coefficient -0.77

12.4. Mobility in soil
methanol - CAS: 67-56-1
Mobility in soil: Mobile
12.5. Results of PBT and vPvB assessment
vPvB Substances: None - PBT Substances: None
12.6. Other adverse effects
None

13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods
Recover, if possible. Send to authorised disposal plants or for incineration under controlled conditions. In so doing, comply with the local and national regulations currently in force.

14. TRANSPORT INFORMATION

14.1. UN number

ADR-UN Number:	3286
IATA-UN Number:	3286
IMDG-UN Number:	3286

14.2. UN proper shipping name

ADR-Shipping Name:	FLAMMABLE LIQUID, TOXIC, CORROSIVE, N.O.S. (ammonia, anhydrous, methanol)
IATA-Shipping Name:	FLAMMABLE LIQUID, TOXIC, CORROSIVE, N.O.S. (ammonia, anhydrous, methanol)
IMDG-Shipping Name:	FLAMMABLE LIQUID, TOXIC, CORROSIVE, N.O.S. (ammonia, anhydrous, methanol)

14.3. Transport hazard class(es)

ADR-Class:	3
IATA-Class:	3
IMDG-Class:	3

14.4. Packing group

ADR-Packing Group:	II
IATA-Packing group:	II
IMDG-Packing group:	II

14.5. Environmental hazards

ADR-Enviromental Pollutant:	No
IMDG-Marine pollutant:	No

14.6. Special precautions for user

ADR-Subsidiary risks:	6.1 + 8
ADR-S.P.:	274
ADR-Transport category (Tunnel restriction code):	2 (D/E)
IATA-Passenger Aircraft:	352
IATA-Subsidiary risks:	6.1 + 8
IATA-Cargo Aircraft:	363
IATA-S.P.:	-
IATA-ERG:	3CP
IMDG-EmS:	F-E , S-C
IMDG-Subsidiary risks:	6.1 + 8
IMDG-Stowage and handling:	Category B
IMDG-Segregation:	Clear of living quarters. Segregation as for class 3 but "away from" class 4.1.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
N.A.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
Dir. 98/24/EC (Risks related to chemical agents at work)
Dir. 2000/39/EC (Occupational exposure limit values)
Regulation (EC) n. 1907/2006 (REACH)

Regulation (EC) n. 1272/2008 (CLP)
Regulation (EC) n. 790/2009 (ATP 1 CLP) and (EU) n. 758/2013
Regulation (EU) n. 2015/830
Regulation (EU) n. 286/2011 (ATP 2 CLP)
Regulation (EU) n. 618/2012 (ATP 3 CLP)
Regulation (EU) n. 487/2013 (ATP 4 CLP)
Regulation (EU) n. 944/2013 (ATP 5 CLP)
Regulation (EU) n. 605/2014 (ATP 6 CLP)
Regulation (EU) n. 2015/1221 (ATP 7 CLP)
Regulation (EU) n. 2016/918 (ATP 8 CLP)
Regulation (EU) n. 2016/1179 (ATP 9 CLP)
Regulation (EU) n. 2017/776 (ATP 10 CLP)
Regulation (EU) n. 2018/669 (ATP 11 CLP)
Regulation (EU) n. 2018/1480 (ATP 13 CLP)
Regulation (EU) n. 2019/521 (ATP 12 CLP)
Regulation (EU) n. 2020/217 (ATP 14 CLP)
Regulation (EU) n. 2020/878

Restrictions related to the product or the substances contained according to Annex XVII Regulation (EC) 1907/2006 (REACH) and subsequent modifications:

Restrictions related to the product:
Restriction 3
Restriction 40

Restrictions related to the substances contained:
Restriction 69

Where applicable, refer to the following regulatory provisions :
Directive 2012/18/EU (Seveso III)
Regulation (EC) nr 648/2004 (detergents).
Dir. 2004/42/EC (VOC directive)

Provisions related to directive EU 2012/18 (Seveso III):
Seveso III category according to Annex 1, part 1
Product belongs to category: P5c, H2, H3

15.2. Chemical safety assessment
A chemical safety assessment has been carried out for the substances in the mixture.

SECTION 16: Other information

Full text of phrases referred to in Section 3:
H225 Highly flammable liquid and vapour.
H301 Toxic if swallowed.
H311 Toxic in contact with skin.
H331 Toxic if inhaled.
H370 Causes damage to organs.
H221 Flammable gas.
H280 Contains gas under pressure; may explode if heated.
H314 Causes severe skin burns and eye damage.
H400 Very toxic to aquatic life.

Hazard class and hazard category	Code	Description
Flam. Gas 2	2.2/2	Flammable gas, Category 2
Press. Gas	2.5	Gases under pressure
Flam. Liq. 2	2.6/2	Flammable liquid, Category 2
Acute Tox. 3	3.1/3/Dermal	Acute toxicity (dermal), Category 3
Acute Tox. 3	3.1/3/Inhal	Acute toxicity (inhalation), Category 3
Acute Tox. 3	3.1/3/Oral	Acute toxicity (oral), Category 3
Skin Corr. 1A	3.2/1A	Skin corrosion, Category 1A
Skin Corr. 1B	3.2/1B	Skin corrosion, Category 1B
Eye Dam. 1	3.3/1	Serious eye damage, Category 1
STOT SE 1	3.8/1	Specific target organ toxicity - single exposure, Category 1
Aquatic Acute 1	4.1/A1	Acute aquatic hazard, category 1

Paragraphs modified from the previous revision:

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]:

Classification according to Regulation (EC) Nr. 1272/2008	**Classification procedure**
Flam. Liq. 2, H225	On basis of test data
Acute Tox. 3, H301	Calculation method
Acute Tox. 3, H311	Calculation method
Acute Tox. 3, H331	Calculation method
Skin Corr. 1B, H314	On basis of test data (pH)
Eye Dam. 1, H318	On basis of test data (pH)
STOT SE 1, H370	Calculation method

This document was prepared by a competent person who has received appropriate training.

Main bibliographic sources:

ECDIN - Environmental Chemicals Data and Information Network - Joint Research Centre, Commission of the European Communities

SAX's DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS - Eight Edition - Van Nostrand Reinold

The information contained herein is based on our state of knowledge at the above-specified date. It refers solely to the product indicated and constitutes no guarantee of particular quality.
It is the duty of the user to ensure that this information is appropriate and complete with respect to the specific use intended.

This MSDS cancels and replaces any preceding release.

ADR:	European Agreement concerning the International Carriage of Dangerous Goods by Road.
CAS:	Chemical Abstracts Service (division of the American Chemical Society).
CLP:	Classification, Labeling, Packaging.
DNEL:	Derived No Effect Level.
EINECS:	European Inventory of Existing Commercial Chemical Substances.
GefStoffVO:	Ordinance on Hazardous Substances, Germany.
GHS:	Globally Harmonized System of Classification and Labeling of Chemicals.
IATA:	International Air Transport Association.
IATA-DGR:	Dangerous Goods Regulation by the "International Air Transport Association" (IATA).
ICAO:	International Civil Aviation Organization.
ICAO-TI:	Technical Instructions by the "International Civil Aviation Organization" (ICAO).
IMDG:	International Maritime Code for Dangerous Goods.
INCI:	International Nomenclature of Cosmetic Ingredients.
KSt:	Explosion coefficient.
LC50:	Lethal concentration, for 50 percent of test population.
LD50:	Lethal dose, for 50 percent of test population.
PNEC:	Predicted No Effect Concentration.
RID:	Regulation Concerning the International Transport of Dangerous Goods by Rail.
STEL:	Short Term Exposure limit.
STOT:	Specific Target Organ Toxicity.
TLV:	Threshold Limiting Value.
TWA:	Time-weighted average
WGK:	German Water Hazard Class.

ANNEX I: EXPOSURE ESCENARIOUS

Chemical name	Methanol
CAS No.	67-56-1
INDEX No.	603-001-00-X
EC No.	200-659-6
Registration number(s)	01-2119433307-44

Number of the ES: 1	Manufacture of the substance/Use as an intermediate product/Use as a process substance

Scenario description

Manufacture of the substance or use as an intermediate or process chemical, or extraction agent. Includes recycling/recovery, material transfers, maintenance, storage and cargo (including marine and barges, road cars, rail cars and bulk containers), sampling and laboratory activities.

List of usage descriptors

Use sector [SU]	SU3 Industrial Manufacturing. SU 8 Large-scale bulk chemical manufacturing (including petroleum products) SU 9 Manufacture of fine chemicals
Product category [PC]	--
Process Categories [PROC]	PROC1: Use in closed processes, unlikely exposure PROC2: Use in closed and continuous processes with controlled occasional exposure -PROC3: Use in closed batch processes (synthesis or formulation) PROC 3: Use in closed batch process (synthesis or formulation), industrial environment. PROC 4: Use in batch process and other processes (synthesis) where there is possibility of exposure, industrial environment. PROC 8a Transfer of substance or preparation (loading/unloading) from/to ships/large containers in non-dedicated installations, industrial or non-industrial environment. PROC8b: Transfer of substances or preparations (loading/unloading) from or to ships or large containers in specialized facilities PROC9: Transfer of substance or preparation to small containers (dedicated filling line, including heavy), industrial environment PROC15: Use as a laboratory reagent
Description of emission categories to the environment [ERC]	ERC1 - manufacture of substance ERC 4 - Use of non-reactive technology aids in industrial sites (not part of articles) ERC 6a - Use of intermediate substances.

2. Conditions of use affecting exposure

2.1 Control of worker exposure for PROC 1,2,3 and 4

Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
	Palm of a hand (240 cm2)		Relevant for PROC 1 and 3

Exposed body skin parts	Palm of both hands (480 cm2)		Relevant for PROC 2 and 4
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
No.			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	No		Relevant for PROC 1
	Yes		Effectiveness: 90% Relevant for PROC 2, 3 and 4
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		

2.2 Control of worker exposure for PROC 8a and 8b

Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm both hands (480 cm2)		Relevant to PROC 8b
	Both hands (960 cm2)		Relevant to PROC 8a
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	Yes		Effectiveness: 90% Relevant to PROC 8a
	Yes		Effectiveness: 97% Relevant to PROC 8b
Organizational measures to prevent/limit emissions, dispersion and exposure			

			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		
2.3 Control of worker exposure for PROC 15			
Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm of a hand (240cm2)		
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	Yes		Effectiveness: 90%
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		

3 Exposure estimation and reference to its source

Health	**Environment**
It has been employed ECETOC TRA tool to estimate exposures in the workplace unless otherwise indicated	We used the hydrocarbon block method to calculate environmental exposure to the Petrorisk model.

4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The UI works within the limits set by the ES, although the proposed risk management measures, described above, are met or the downstream user can demonstrate for himself that his operational conditions and his risk management measures established are adequate. This has to be done by showing that skin exposure and inhalation are limited to a level below the respective DNEL (since the processes and activities are covered by the ECs listed above) as follows. If no measurement data is available the UI can make use of an appropriate scale tool, such as the ECETOC TRA v2 model.

Skin exposure: ECETOC TRA v2 (with modifications)

Important note: By demonstrating safe use when comparing long-term exposure estimates with DNEL, acute DNEL is also covered (according to the R.14 guide, acute exposure levels can be obtained by multiplying the estimates of long-term exposure by a factor of 2).

Number of the ES: 2	Distribution of the substance

Scenario description

Distribution of the substance.
Cargo (including marine vessels and ships, rail/road car and CIB cargo) and repackaging (including drums and small packages) of the substance, including distribution and laboratory activities

List of usage descriptors

Use sector [SU]	SU3 Industrial Manufacturing. SU 8 Large-scale bulk chemical manufacturing (including petroleum products) SU 9 Manufacture of fine chemicals
Product category [PC]	--
Process Categories [PROC]	PROC1: Use in closed processes, unlikely exposure PROC2: Use in closed and continuous processes with controlled occasional exposure -PROC3: Use in closed batch processes (synthesis or formulation) PROC 3: Use in closed batch process (synthesis or formulation), industrial environment. PROC 4: Use in batch process and other processes (synthesis) where there is possibility of exposure, industrial environment. PROC 8a Transfer of substance or preparation (loading/unloading) from/to ships/large containers in non-dedicated installations, industrial or non-industrial environment. PROC8b: Transfer of substances or preparations (loading/unloading) from or to ships or large containers in specialized facilities PROC9: Transfer of substance or preparation to small containers (dedicated filling line, including heavy), industrial environment
Description of emission categories to the environment [ERC]	ERC1 - manufacture of substance ERC 2 - Mixing formulation

2. Conditions of use affecting exposure

2.1 Control of worker exposure for PROC 1,2,3 and 4

Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm of a hand (240 cm2)		Relevant for PROC 1 and 3
	Palm of both hands (480 cm2)		Relevant for PROC 2 and 4

Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
No.			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	No		Relevant for PROC 1
	Yes		Effectiveness: 90% Relevant for PROC 2, 3 and 4
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		

2.2 Control of worker exposure for PROC 8a and 8b

Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm both hands (480 cm2)		Relevant to PROC 8b and 9
	Both hands (960 cm2)		Relevant to PROC 8a
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	Yes		Effectiveness: 90% Relevant for PROC 8a and 9
	Yes		Effectiveness: 97% Relevant to PROC 8b
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			

Use of adequate respiratory protection	No		

3 Exposure estimation and reference to its source

Health	Environment
It has been employed ECETOC TRA tool to estimate exposures in the workplace unless otherwise indicated	We used the hydrocarbon block method to calculate environmental exposure to the Petrorisk model.

4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The UI works within the limits set by the ES, although the proposed risk management measures, described above, are met or the downstream user can demonstrate for himself that his operational conditions and his risk management measures established are adequate. This has to be done by showing that skin exposure and inhalation are limited to a level below the respective DNEL (since the processes and activities are covered by the ECs listed above) as follows. If no measurement data is available the UI can make use of an appropriate scale tool, such as the ECETOC TRA v2 model.

Skin exposure: ECETOC TRA v2 (with modifications)

Important note: By demonstrating safe use when comparing long-term exposure estimates with DNEL, acute DNEL is also covered (according to the R.14 guide, acute exposure levels can be obtained by multiplying the estimates of long-term exposure by a factor of 2).

Number of the ES: 3	Formulation and (re)packaging of the substance and mixtures

Scenario description

Formulation, packaging and repackaging of the substance and its mixtures in batch or continuous operations, including storage, material transfers, mixing, large and small-scale packaging, maintenance and laboratory activities Associated.

List of usage descriptors

Use sector [SU]	SU3 Industrial Manufacturing. SU 10 Formulation
Product category [PC]	--
Process Categories [PROC]	PROC1: Use in closed processes, unlikely exposure PROC2: Use in closed and continuous processes with controlled occasional exposure -PROC3: Use in closed batch processes (synthesis or formulation) PROC 3: Use in closed batch process (synthesis or formulation), industrial environment. PROC 4: Use in batch process and other processes (synthesis) where there is possibility of exposure, industrial environment. PROC 8a Transfer of substance or preparation (loading/unloading) from/to ships/large containers in non-dedicated installations, industrial or non-industrial environment. PROC8b: Transfer of substances or preparations (loading/unloading) from or to ships or large containers in specialized facilities PROC9: Transfer of substance or preparation to small containers (dedicated filling line, including heavy), industrial environment PROC15: Use as a laboratory reagent
Description of emission categories to the environment [ERC]	ERC2 Mixing formulation

2. Conditions of use affecting exposure

2.1 Control of worker exposure for PROC 1,2,3 and 4

Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm of a hand (240 cm2)		Relevant for PROC 1 and 3
	Palm of both hands (480 cm2)		Relevant for PROC 2 and 4
Other operational conditions given that affect worker exposure			

Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
No.			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	No		Relevant for PROC 1
	Yes		Effectiveness: 90% Relevant for PROC 2, 3 and 4
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		
2.2 Control of worker exposure for PROC 8a and 8b			
Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm both hands (480 cm2)		Relevant to PROC 8b and 9
	Both hands (960 cm2)		Relevant to PROC 8a
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	Yes		Effectiveness: 90% Relevant for PROC 8th and 9th
	Yes		Effectiveness: 97% Relevant to PROC 8b
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		

2.3 Control of worker exposure for PROC 15			
Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm of a hand (240cm2)		
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	Yes		Effectiveness: 90%
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		

3 Exposure estimation and reference to its source

Health	Environment
It has been employed ECETOC TRA tool to estimate exposures in the workplace unless otherwise indicated	We used the hydrocarbon block method to calculate environmental exposure to the Petrorisk model.

4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The UI works within the limits set by the ES, although the proposed risk management measures, described above, are met or the downstream user can demonstrate for himself that his operational conditions and his risk management measures established are adequate. This has to be done by showing that skin exposure and inhalation are limited to a level below the respective DNEL (since the processes and activities are covered by the ECs listed above) as follows. If no measurement data is available the UI can make use of an appropriate scale tool, such as the ECETOC TRA v2 model.

Skin exposure: ECETOC TRA v2 (with modifications)

Important note: By demonstrating safe use when comparing long-term exposure estimates with DNEL, acute DNEL is also covered (according to the R.14 guide, acute exposure levels can be obtained by multiplying the estimates of long-term exposure by a factor of 2).

Number of the ES: 4	Use as a laboratory reagent in industrial environments.

Scenario description

Use as a laboratory reagent in industrial environments.
Use of the substance in the laboratory, including transfers of material and cleaning equipment.

List of usage descriptors

Use sector [SU]	SU3 Industrial Manufacturing.
Product category [PC]	--
Process Categories [PROC]	PROC10: Application by roller or brush PROC15: Use as a laboratory reagent
Description of emission categories to the environment [ERC]	ERC 4 - Use of non-reactive technology aids in industrial sites (not part of articles)

2. Conditions of use affecting exposure

2.1 Control of worker exposure for PROC 1,2,3 and 4

Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	80	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Both hands (960 cm2)		
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
No.			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	Yes		Effectiveness: 90%
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			

Use of adequate respiratory protection	No		
2.2 Control of worker exposure for PROC 15			
Frequency and duration of exposure			
Exposure duration	> 4	Hours/day	
Frequency of exposure	240	Days/year	
Product Features			
Fitness	Liquid		
Concentration of the substance in the product	100	%	
Vapour pressure of the substance	169.27	Hpa	
Quantities used			
			Not relevant in ECETOC TRA
Human factors not influenced by risk management			
Exposed body skin parts	Palm of a hand (240cm2)		
Other operational conditions given that affect worker exposure			
Domain	Industrial		
Indoor/Outdoor	interior		
Technical conditions and process-level measures (source) to prevent release			
Technical conditions and measures to control dispersion from source to worker			
Appropriate comprehensive local ventilation	Yes		Effectiveness: 90%
Organizational measures to prevent/limit emissions, dispersion and exposure			
			Not relevant in ECETOC TRA
Conditions and measures related to personal protection, hygiene and health assessment			
Use of adequate respiratory protection	No		

3 Exposure estimation and reference to its source

Health	Environment
It has been employed ECETOC TRA tool to estimate exposures in the workplace unless otherwise indicated	We used the hydrocarbon block method to calculate environmental exposure to the Petrorisk model.

4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The UI works within the limits set by the ES, although the proposed risk management measures, described above, are met or the downstream user can demonstrate for himself that his operational conditions and his risk management measures established are adequate. This has to be done by showing that skin exposure and inhalation are limited to a level below the respective DNEL (since the processes and activities are covered by the ECs listed above) as follows. If no measurement data is available the UI can make use of an appropriate scale tool, such as the ECETOC TRA v2 model.

Skin exposure: ECETOC TRA v2 (with modifications)

Important note: By demonstrating safe use when comparing long-term exposure estimates with DNEL, acute DNEL is also covered (according to the R.14 guide, acute exposure levels can be obtained by multiplying the estimates of long-term exposure by a factor of 2).

Chemical name	Ammonia
CAS No.	7664-41-7
INDEX No.	007-001-00-5
EC No.	231-635-3
Registration number(s)	01-2119488876-14-0000

Number of the ES: 1	Manufacture of the substance
Scenario description	
Production	
List of usage descriptors	
Use sector [SU]	SU3 Industrial Manufacturing. SU 8 Large-scale bulk chemical manufacturing (including petroleum products) SU 9 Manufacture of fine chemicals SU 20 Health services
Product category [PC]	--
Process Categories [PROC]	PROC1: Use in closed processes, unlikely exposure PROC2: Use in closed and continuous processes with controlled occasional exposure - PROC3: Use in closed batch processes (synthesis or formulation) PROC 8a Transfer of substance or preparation (loading/unloading) from/to ships/large containers in non-dedicated installations, industrial or non-industrial environment. PROC8b: Transfer of substances or preparations (loading/unloading) from or to ships or large containers in specialized facilities
Description of emission categories to the environment [ERC]	ERC1 - manufacture of substance

2. Conditions of use affecting exposure

2.1 Control of worker exposure for PROC 1

Use descriptors covered	PROC1: Use in closed process, no likelihood of exposure. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor, Outdoor
Risk Management Measures	
Provide basic employee training to prevent/minimize exposures.	

2.2 Control of worker exposure for PROC 2

Use descriptors covered	PROC2: Use in closed, continuous process with occasional controlled exposure. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor
2.3 Control of worker exposure for PROC 8a	
Use descriptors covered	PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.4 Control of worker exposure for PROC 8b	
Use descriptors covered	PROC8b: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at dedicated facili-ties Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.5 Control of worker exposure for PROC 9	
Use descriptors covered	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC8a: Transfer of substance or preparation
	(charging/discharging) from/to ves-sels/large containers at non-dedicated facilities Use domain: industrial
Operational conditions	
Physical state	gaseous

Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

3 Exposure estimation and reference to its source

3.1 Risk Management Measures

Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative
	Exposure is considered negligible.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.34 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.05
	The short-term exposure value corresponds to the long-term value.

3.2 Risk Management Measures PROC 2

Provide basic employee training to prevent/minimize exposures.

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)

Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.

Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.

Wear suitable respiratory protection.	Effectiveness: 95 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.24 mg/m³
Risk Characterization Ratio (RCR)	0.09
	The short-term exposure value corresponds to the long-term value.

3.3 Risk Management Measures PROC 8a

Provide basic employee training to prevent/minimize exposures.

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)

Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.

Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.

Provide extract ventilation to points where emissions occur (LEV).

Wear suitable respiratory protection.	Effectiveness: 95 %
In case no respiratory protection is used:, Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	0.89 mg/m³
Risk Characterization Ratio (RCR)	0.06
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.14 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.02
	The short-term exposure value corresponds to the long-term value.

3.4 Risk Management Measures PROC 8b

Provide basic employee training to prevent/minimize exposures.
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.

Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	8.85 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.

3.5 Risk Management Measures PROC 9

Provide basic employee training to prevent/minimize exposures.
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.

Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %

Exposure estimate and reference to its source	
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	6.2 mg/m³
Risk Characterization Ratio (RCR)	0.44
	The short-term exposure value corresponds to the long-term value.
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	3.72 mg/m³
Risk Characterization Ratio (RCR)	0.27
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.

4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For scaling see: http://www.ecetoc.org/tra

PROC : Process Categories
SU : Sectors of use
PC : Product Categories
ERC : Environmental Release Categories
RCR : Risk characterisation ratios
DNEL : derived no-effect level (DNEL)
PNEC : Predicted No Effect Concentration (PNEC)

Number of the ES: 2	Use in/as Formulation

Scenario description

Use in/as Formulation

List of usage descriptors	
Use sector [SU]	SU1: Agriculture, forestry, fishery SU2: Mining, SU3: Industrial Manufacturing. SU10: Formulation SU24: Scientific research and development
Product category [PC]	--
Process Categories [PROC]	PROC1: Use in closed processes, unlikely exposure PROC2: Use in closed and continuous processes with controlled occasional exposure – PROC3: Use in closed batch processes (synthesis or formulation) PROC5: Mixing or blending in batch processes PROC 8a Transfer of substance or preparation (loading/unloading) from/to ships/large containers in non-dedicated installations, industrial or non-industrial environment. PROC8b: Transfer of substances or preparations (loading/unloading) from or to ships or large containers in specialized facilities PROC 9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC 15: Use as laboratory reagent
Description of emission categories to the environment [ERC]	ERC2 : Formulation into mixture

2.1 Control of worker exposure for PROC 1

Use descriptors covered	PROC1: Use in closed process, no likelihood of exposure. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor, Outdoor
Risk Management Measures	
Provide basic employee training to prevent/minimize exposures.	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative
	Exposure is considered negligible.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.34 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.05
	The short-term exposure value corresponds to the long-term value.

2.2 Control of worker exposure for PROC 2

Use descriptors covered	PROC2: Use in closed, continuous process with occasional controlled exposure. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.3 Control of worker exposure for PROC 3

Use descriptors covered	PROC3: Use in closed batch process (synthesis or formulation). PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC2: Use in closed, continuous process with occasional controlled exposure. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.4 Control of worker exposure for PROC 2

Use descriptors covered	PROC2: Use in closed, continuous process with occasional controlled exposure. PROC3: Use in closed batch process (synthesis or formulation). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.5 Control of worker exposure for PROC 3-4

Use descriptors covered	PROC3: Use in closed batch process (synthesis or formulation). PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises. Use domain: industrial
Operational conditions	

Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
	ammonia Content: >= 0 % - <= 25 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.6 Control of worker exposure for PROC 3	
Use descriptors covered	PROC3: Use in closed batch process (synthesis or formulation). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor
2.7 Control of worker exposure for PROC 5	
Use descriptors covered	PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week

Indoor/Outdoor	Indoor
2.8 Control of worker exposure for PROC 13	
Use descriptors covered	PROC13: Treatment of articles by dipping and pouring. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.9 Control of worker exposure for PROC 5	
Use descriptors covered	PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia
	Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.10 Control of worker exposure for PROC 4	
Use descriptors covered	PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor
2.11 Control of worker exposure for PROC 5	
Use descriptors covered	PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %

Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.12 Control of worker exposure for PROC 5

Use descriptors covered	PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.13 Control of worker exposure for PROC 4-5

Use descriptors covered	PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.14 Control of worker exposure for PROC 7

Use descriptors covered	PROC7: Industrial spraying Use domain: industrial Aerosol formation is not covered within the CES
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.15 Control of worker exposure for PROC 8a

Use descriptors covered	PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	240 min 5 days per week
Indoor/Outdoor	Outdoor

2.16 Control of worker exposure for PROC 8a

Use descriptors covered	PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.17 Control of worker exposure for PROC 8a

Use descriptors covered	PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.18 Control of worker exposure for PROC 8a

Use descriptors covered	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities Use domain: industrial
Operational conditions	
Physical state	gaseous

Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.19 Control of worker exposure for PROC 8a

Use descriptors covered	PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.20 Control of worker exposure for PROC 9

Use descriptors covered	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.21 Control of worker exposure for PROC 9

Use descriptors covered	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC8a: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at dedicated facili-ties Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid

Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.22 Control of worker exposure for PROC 8b

Use descriptors covered	PROC8b: Transfer of substance or preparation (charging/discharging) from/to ves-sels/large containers at dedicated facili-ties Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.23 Control of worker exposure for PROC 9

Use descriptors covered	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.24 Control of worker exposure for PROC 9	
Use descriptors covered	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.25 Control of worker exposure for PROC 9	
Use descriptors covered	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor
2.26 Control of worker exposure for PROC 10	
Use descriptors covered	PROC10: Roller application or brushing PROC13: Treatment of articles by dipping and pouring. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.27 Control of worker exposure for PROC 10	
Use descriptors covered	PROC10: Roller application or brushing PROC13: Treatment of articles by dipping and pouring. Use domain: industrial
Operational conditions	

Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.28 Control of worker exposure for PROC 10

Use descriptors covered	PROC10: Roller application or brushing PROC13: Treatment of articles by dipping and pouring. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.29 Control of worker exposure for PROC 11

Use descriptors covered	PROC11: Non industrial spraying Use domain: industrial Aerosol formation is not covered within the CES
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.30 Control of worker exposure for PROC 13

Use descriptors covered	PROC13: Treatment of articles by dipping and pouring. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.31 Control of worker exposure for PROC 13	
Use descriptors covered	PROC13: Treatment of articles by dipping and pouring. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor
2.32 Control of worker exposure for PROC 15	
Use descriptors covered	PROC15: Use a laboratory reagent. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.33 Control of worker exposure for PROC 15	
Use descriptors covered	PROC15: Use a laboratory reagent. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor
2.34 Control of worker exposure for PROC 19	
Use descriptors covered	PROC19: Hand-mixing with intimate contact and only PPE available. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa

Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.35 Control of worker exposure for PROC 19

Use descriptors covered	PROC19: Hand-mixing with intimate contact and only PPE available. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.36 Control of worker exposure for PROC 20

Use descriptors covered	PROC20: Heat and pressure transfer fluids in dispersive use but closed systems Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.37 Control of worker exposure for PROC 20

Use descriptors covered	PROC20: Heat and pressure transfer fluids in dispersive use but closed systems Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Outdoor

2.38 Control of worker exposure for PROC 20

Use descriptors covered	PROC20: Heat and pressure transfer fluids in dispersive use but closed systems Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 25 %
Physical state	liquid
Vapour pressure of the substance during use	50 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

2.39 Control of worker exposure for PROC 2

Use descriptors covered	PROC2: Use in closed, continuous process with occasional controlled exposure. Use domain: industrial
Operational conditions	
Concentration of the substance	ammonia Content: >= 0 % - <= 100 %
Physical state	gaseous
Vapour pressure of the substance during use	8600 hPa
Duration and Frequency of activity	480 min 5 days per week
Indoor/Outdoor	Indoor

3 Exposure estimation and reference to its source

3.1 Risk Management Measures PROC 1

Provide basic employee training to prevent/minimize exposures.

Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative
	Exposure is considered negligible.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.34 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.05
	The short-term exposure value corresponds to the long-term value.

3.2 Risk Management Measures PROC 2

Provide basic employee training to prevent/minimize exposures.

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)

Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.

Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.24 mg/m³
Risk Characterization Ratio (RCR)	0.09
	The short-term exposure value corresponds to the long-term value.

3.3 Risk Management Measures PROC 3

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).	
Exposure estimate and reference to its source	
PROC2	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	4.38 mg/m³
Risk Characterization Ratio (RCR)	0.31
	The short-term exposure value corresponds to the long-term value.
PROC2, PROC3	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	The calculated exposure value is negligibly low.
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	8.75 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.
PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day

Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.

3.4 Risk Management Measures PROC 2

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Exposure estimate and reference to its source	
PROC2	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.53 mg/m³
Risk Characterization Ratio (RCR)	0.11
	The short-term exposure value corresponds to the long-term value.
PROC2	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
PROC3	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	3.06 mg/m³
Risk Characterization Ratio (RCR)	0.22
	The short-term exposure value corresponds to the long-term value.
PROC3	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.34 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.05
	The short-term exposure value corresponds to the long-term value.

3.5 Risk Management Measures PROC 3-4

Provide basic employee training to prevent/minimize exposures.
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.

Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).	
Exposure estimate and reference to its source	
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	7.08 mg/m³
Risk Characterization Ratio (RCR)	0.51
	The short-term exposure value corresponds to the long-term value.
PROC3	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	The calculated exposure value is negligibly low.
PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.

3.6 Risk Management Measures PROC 3

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	2.48 mg/m³
Risk Characterization Ratio (RCR)	0.18
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.34 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.05
	The short-term exposure value corresponds to the long-term value.

3.7 Risk Management Measures PROC 5

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
In case no respiratory protection is used:, Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	0.89 mg/m³
Risk Characterization Ratio (RCR)	0.06
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	Exposure is considered negligible.

3.8 Risk Management Measures PROC 13

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
In case no respiratory protection is used:, Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	0.89 mg/m³
Risk Characterization Ratio (RCR)	0.06
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1

	The short-term exposure value corresponds to the long-term value.

3.9 Risk Management Measures PROC 5

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	8.85 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.

3.10 Risk Management Measures PROC 4

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	
Exposure estimate and reference to its source	
PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	2.48 mg/m³
Risk Characterization Ratio (RCR)	0.18
	The short-term exposure value corresponds to the long-term value.
PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day

Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
PROC5	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	6.2 mg/m³
Risk Characterization Ratio (RCR)	0.44
	The short-term exposure value corresponds to the long-term value.
PROC5	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.

3.11 Risk Management Measures PROC 5

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
In case no respiratory protection is used:, Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.09 mg/m³
Risk Characterization Ratio (RCR)	0.08
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	Exposure is considered negligible.

3.12 Risk Management Measures PROC 5

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %

Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	10.94 mg/m³
Risk Characterization Ratio (RCR)	0.78
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.

3.13 Risk Management Measures PROC 4-5

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 90 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	3.06 mg/m³
Risk Characterization Ratio (RCR)	0.22
	The short-term exposure value corresponds to the long-term value.
PROC4	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
PROC5	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	7.66 mg/m³
Risk Characterization Ratio (RCR)	0.55
	The short-term exposure value corresponds to the long-term value.
PROC5	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic

Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.

3.14 Risk Management Measures PROC 7

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
In case no respiratory protection is used:, Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.09 mg/m³
Risk Characterization Ratio (RCR)	0.08
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	2.14 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.32
	The short-term exposure value corresponds to the long-term value.

3.15 Risk Management Measures PROC 8a

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 90 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	9.19 mg/m³
Risk Characterization Ratio (RCR)	0.66

	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	4.29 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.

3.16 Risk Management Measures PROC 8a

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
In case no respiratory protection is used:, Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	0.89 mg/m³
Risk Characterization Ratio (RCR)	0.06
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.14 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.02
	The short-term exposure value corresponds to the long-term value.

3.17 Risk Management Measures PROC 8a

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker

	Worker - inhalative, long-term - local
Exposure estimate	8.85 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.

3.18 Risk Management Measures PROC 8a

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	6.2 mg/m³
Risk Characterization Ratio (RCR)	0.44
	The short-term exposure value corresponds to the long-term value.
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	3.72 mg/m³
Risk Characterization Ratio (RCR)	0.27
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.

3.19 Risk Management Measures PROC 8a

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves.	
Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Use suitable eye protection.	Effectiveness: 95 %
In case no respiratory protection is used:, Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.09 mg/m³
Risk Characterization Ratio (RCR)	0.08
	The short-term exposure value corresponds to the long-term value.
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.14 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.02
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	0.88 mg/m³
Risk Characterization Ratio (RCR)	0.06
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.

3.20 Risk Management Measures PROC 9

Provide basic employee training to prevent/minimize exposures.
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)

Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Exposure estimate and reference to its source	
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	10.94 mg/m³
Risk Characterization Ratio (RCR)	0.78
	The short-term exposure value corresponds to the long-term value.
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
PROC9	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	8.75 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.
PROC9	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.

3.21 Risk Management Measures PROC 9

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	7.66 mg/m³
Risk Characterization Ratio (RCR)	0.55

	The short-term exposure value corresponds to the long-term value.
PROC8a	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	4.59 mg/m³
Risk Characterization Ratio (RCR)	0.33
	The short-term exposure value corresponds to the long-term value.
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
PROC9	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	6.13 mg/m³
Risk Characterization Ratio (RCR)	0.44
	The short-term exposure value corresponds to the long-term value.
PROC9	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.

3.22 Risk Management Measures PROC 8b

Provide basic employee training to prevent/minimize exposures.
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.
Provide extract ventilation to points where emissions occur (LEV).
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).

Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic

Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	3.19 mg/m³
Risk Characterization Ratio (RCR)	0.23
	The short-term exposure value corresponds to the long-term value.

3.23 Risk Management Measures PROC 9

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
Reduce duration of activity to less than 240 min	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	0.71 mg/m³
Risk Characterization Ratio (RCR)	0.05
	The short-term exposure value corresponds to the long-term value.

3.24 Risk Management Measures PROC 9

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic

Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	7.08 mg/m³
Risk Characterization Ratio (RCR)	0.51
The short-term exposure value corresponds to the long-term value.	

3.25 Risk Management Measures PROC 9

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker Worker - inhalative, long-term - local
Exposure estimate	4.96 mg/m³
Risk Characterization Ratio (RCR)	0.35
	The short-term exposure value corresponds to the long-term value.

3.26 Risk Management Measures PROC 10

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
Reduce duration of activity to less than 240 min, In case no respiratory protection is used:	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker Worker - dermal, long-term - systemic
Exposure estimate	0.69 mg/kg bw/day

Risk Characterization Ratio (RCR)	0.1
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.09 mg/m³
Risk Characterization Ratio (RCR)	0.08
	The short-term exposure value corresponds to the long-term value.

3.27 Risk Management Measures PROC 10

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	2.74 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.4
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	10.94 mg/m³
Risk Characterization Ratio (RCR)	0.78
	The short-term exposure value corresponds to the long-term value.

3.28 Risk Management Measures PROC 10

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
PROC13	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local

Exposure estimate	7.66 mg/m³
Risk Characterization Ratio (RCR)	0.55
	The short-term exposure value corresponds to the long-term value.
PROC10	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	2.74 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.4
	The short-term exposure value corresponds to the long-term value.
PROC10	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	7.66 mg/m³
Risk Characterization Ratio (RCR)	0.55
	The short-term exposure value corresponds to the long-term value.
PROC13	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.

3.29 Risk Management Measures PROC 11

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
Wear suitable respiratory protection.	Effectiveness: 95 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	2.14 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.32
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	8.76 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.

3.30 Risk Management Measures PROC 13

Provide basic employee training to prevent/minimize exposures.

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	8.85 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The short-term exposure value corresponds to the long-term value.

3.31 Risk Management Measures PROC 13

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.37 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	6.2 mg/m³
Risk Characterization Ratio (RCR)	0.44
	The short-term exposure value corresponds to the long-term value.

3.32 Risk Management Measures PROC 15

Provide basic employee training to prevent/minimize exposures.

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	The calculated exposure value is negligibly low.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	3.54 mg/m³
Risk Characterization Ratio (RCR)	0.25
	The short-term exposure value corresponds to the long-term value.

3.33 Risk Management Measures PROC 15

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	The calculated exposure value is negligibly low.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	4.38 mg/m³
Risk Characterization Ratio (RCR)	0.31
	The short-term exposure value corresponds to the long-term value.
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

3.34 Risk Management Measures PROC 19

Provide basic employee training to prevent/minimize exposures.

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	The calculated exposure value is negligibly low.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	10.94 mg/m³
Risk Characterization Ratio (RCR)	0.78
	The short-term exposure value corresponds to the long-term value.

3.35 Risk Management Measures PROC 19

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Use suitable chemically resistant gloves.	Effectiveness: 90 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.41 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.2
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	7.66 mg/m³
Risk Characterization Ratio (RCR)	0.55
	The short-term exposure value corresponds to the long-term value.

3.36 Risk Management Measures PROC 20

Provide basic employee training to prevent/minimize exposures.

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	0.14 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.02
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	7.08 mg/m³
Risk Characterization Ratio (RCR)	0.51
	The short-term exposure value corresponds to the long-term value.

3.37 Risk Management Measures PROC 20

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Wear suitable respiratory protection.	Effectiveness: 95 %
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
Exposure estimate	1.71 mg/kg bw/day
Risk Characterization Ratio (RCR)	0.03
	The short-term exposure value corresponds to the long-term value.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	1.24 mg/m³
Risk Characterization Ratio (RCR)	0.09
	The short-term exposure value corresponds to the long-term value.

3.38 Risk Management Measures PROC 20

Provide basic employee training to prevent/minimize exposures.	

Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	The calculated exposure value is negligibly low.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	8.75 mg/m³
Risk Characterization Ratio (RCR)	0.63
	The calculated exposure value is negligibly low.

3.39 Risk Management Measures PROC 2

Provide basic employee training to prevent/minimize exposures.	
Sample via a closed loop or other system to avoid exposure. Ensure that the worker is in a seperated (control) room with independent air supply Ensure material transfers are under containment or extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)	
Use suitable eye protection. Use suitable chemically resistant gloves. Wear suitable face shield Wear suitable coveralls to prevent exposure to the skin.	
Personal measures have to be applied in case of potential exposure only., Risk Management Measures are based on qualitative risk characterisation.	
Provide extract ventilation to points where emissions occur (LEV).	
In case no suitable local exhaust ventilation is present:, Wear a suitable respiratory protection with adequate effectiveness (95%).	
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Worker
	Worker - dermal, long-term - systemic
	The calculated exposure value is negligibly low.
Assessment method	ECETOC TRA v2.0 Worker
	Worker - inhalative, long-term - local
Exposure estimate	3.54 mg/m³
Risk Characterization Ratio (RCR)	0.25
	The short-term exposure value corresponds to the long-term value.

4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For scaling see: http://www.ecetoc.org/tra
PROC : Process Categories SU : Sectors of use

PC : Product Categories
ERC : Environmental Release Categories
RCR : Risk characterisation ratios
DNEL : derived no-effect level (DNEL)
PNEC : Predicted No Effect Concentration (PNEC)