SIBUR-KSTOVO LLC

SAFETY DATA SHEET

According to Regulations (EC) 1907/2006 (REACH), (EC) 1272/2008 (CLP) & (EU) 2015/830

HYDROSTABILIZED PETROLEUM PYROCONDENSATE, C9 FRACTION

Version: 3.2
Date created: 26/10/2020

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

1.1. Product identifier

Product form:	Substance
Substance name:	Distillates (petroleum), steam-cracked, C8-12 fraction
EC index No.:	649-411-00-2
EC No.:	270-737-2
CAS-No.:	68477-54-3
REACH registration No:	01-2119492289-23-0002
Formula:	Not applicable
Synonyms:	Distillates (petroleum), cracked, ethylene manuf. by-product, C9-10 fraction
Trade names:	Hydrostabilized petroleum pyrocondensate, C9 fraction, «Top grade» Liquid pyrolysis products, C9 fraction Liquid pyrolysis products (LPP), fraction C9

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

1.2.1. Relevant identified uses

Use of the substance/mixture:	Uses at industrial settings: Distribution Use as an intermediate Formulation Use in Coatings Use as a fuel industrial Polymer production Polymer processing Rubber production and processing Uses by professional workers: Use as a fuel professional Consumer Uses: Use as a fuel *See Section 16 for a complete list of uses for which an ES is provided as an Annex*
Most common technical function of substance:	Intermediates Fuels and fuel additives

1.2.2. Uses advised against

Restrictions on use: Uses other than those given in section 1.2.1 are not recommended unless an assessment is completed, prior to commencement of that use, which demonstrates that the use will be controlled.

1.3. Details of the supplier of the safety data sheet

Only representative

Company name: Gazprom Marketing and Trading France
Address: 68 avenue des Champs-Elysées, 75008, Paris, France
Contact Telephone: +33 1 42 99 73 50
Fax: +33 1 42 99 73 99
Email Address: didier.lebout@gazprom-mt.com

Manufacturer

Company name: SIBUR-KSTOVO LLC
Address: urban Industrial district, residential district, South, a quarter of SIBUR-South passage, 4, building №2, Kstovo, Kstovsky district, Nizhny Novgorod oblast, 607650 Russian Federation
Contact phone: +7 83145 9 49 03
Fax: +7 83145 9 49 10
Email Address: info@sk.sibur.ru
techservice@sibur.ru
Emergency Telephone: +7 83145 9 49 10 (round the clock)

1.4. Emergency telephone number

Country	Official advisory body	Address	Emergency number	Comment
Belgium	Centre Anti-Poisons/Antigifcentrum c/o Hôpital Central de la Base - Reine Astrid	Rue Bruyn 1 1120 Bruxelles/Brussel	+32 70 245 245	Please dial: 070 245 245 for any urgent questions about intoxication (free of charge 24/7), if not accessible, dial: 02 264 96 30 (standard fee)
Croatia	Centar za kontrolu otrovanja Institut za medicinska istraživanja i medicinu rada	Ksaverska Cesta 2 p.p. 291 10000 Zagreb	+385 1 234 8342	
Denmark	Giftlinjen Bispebjerg Hospital	Bispebjerg Bakke 23 2400 København NV	+45 82 12 12 12	
Estonia	Mürgistusteabekeskus	Gonsiori 29 15027 Tallinn	16662 +372 626 93 90	
Finland	Myrkytystietokeskus	Stenbäckinkatu 9 PO BOX 100 29 Helsinki	+358 9 471 977 +358 800 147 111	
Greece	Poisons Information Centre Children's Hospital P&A Kyriakou	11762 Athens	+30 2 10 779 3777	
Greece	Department of Forensic Medicine & Toxicology Aristotle University of Thessaloniki, Medical Faculty	54006 Thessaloniki		
Latvia	Valsts Toksikoloģijas centrs, Saindēšanās un zāļu informācijas centrs	Hipokrāta 2 1038 Rīga	+371 67 04 24 73	
Lithuania	Apsinuodijimų informacijos biuras	Birutės g. 56 8110 Vilnius	+370 5 236 20 52 +370 687 53378	

Luxembourg	Centre Anti-Poisons/Antigifcentrum c/o Hôpital Central de la Base - Reine Astrid	Rue Bruyn 1 1120 Bruxelles/Brussel	+352 8002 5500	
Malta	Medicines & Poisons Info Office	Mater Dei Hospital MSD Msida	+356 2545 6504	
Norway	Giftinformasjonen Helsedirektoratet	P.O. Box 7000 St. Olavs Plass 130 Oslo	+47 22 591300	
Slovakia	Národné toxikologické informačné centrum Univerzitná nemocnica Bratislava, pracovisko Kramáre, Klinika pracovného lekárstva a toxikológie	Limbová 5 833 05 Bratislava	+421 2 54 77 41 66	
Slovenia	Center za klinično toksikologijo in farmakologijo Interna klinika, UKCL	Zaloška cesta 7 1525 Ljubljana	+386 41 650 500	
Sweden	Giftinformationscentralen	Box 60 500 171 76 Stockholm	112 – begär Giftinformation +46 10 456 6700 (Från utlandet)	
Switzerland	Tox Info Suisse	Freiestrasse 16 8032 Zürich	145	(from abroad: +41 44 251 51 51) non urgent inquiry: +41 44 251 66 66
Turkey	Ulusal Zehir Merkezi (UZEM) Refik Saydam Hıfzıssıhha Merkezi Başkanlığı	Cemal Gürsel Cd. No: 18 Sıhhiye Çankaya 06590 Ankara	114	Information is provided to public and medical personnel on poisoning incidents via 114.
United Kingdom	National Poisons Information Service (Birmingham Centre) City Hospital	Dudley Road B18 7QH Birmingham	0344 892 0111	
United Kingdom	National Poisons Information Service (Cardiff Centre) Gwenwyn Ward, Llandough Hospital	Penarth CF64 2XX Cardiff	0344 892 0111	
United Kingdom	National Poisons Information Service Edinburgh Royal Infirmary of Edinburgh	Little France Crescent EH16 4SA Edinburgh	0344 892 0111	
United Kingdom	Guy's & St Thomas' Poisons Unit Medical Toxicology Unit, Guy's & St Thomas' Hospital Trust	Avonley Road SE14 5ER London	+44 20 7188 7188	
United Kingdom	National Poisons Information Service (Newcastle Centre) Regional Drugs and Therapeutics Centre, Wolfson Unit	Claremont Place Newcastle-upon-Tyne NE1 4LP Newcastle	0344 892 0111	
United Kingdom	National Poisons Information Service (Belfast Centre) Royal Victoria Hospital	Grosvenor Road BT12 6BA Belfast	0344 892 0111	

SECTION 2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flam. Liq. 3 H226

Asp. Tox. 1	H304
Skin Irrit. 2	H315
Eye Irrit. 2	H319
Acute Tox.4 (inhalation)	H332
STOT SE 3	H335
Muta.1B	H340
Carc.1A	H350
Repr.2	H361d
STOT RE 1	H372
Aquatic Cronic 2	H411

Full text of hazard classes and H-statements: see section 16.

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP):

GHS02 GHS08 GHS09 GHS07

Signal word (CLP): **Danger**

Hazard statements (CLP):
H226: Flammable liquid and vapour.
H304: May be fatal if swallowed and enters airways.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H332: Harmful if inhaled.
H335: May cause respiratory irritation
H340: May cause genetic defects.
H350: May cause cancer.
H361d: Suspected of damaging the unborn child.
H372: Causes damage to organs through prolonged or repeated exposure (Affected organs: ear. Route of exposure: inhalation)
H411: Toxic to aquatic life with long lasting effects.

Precautionary statements (CLP):
P201: Obtain special instructions before use
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260: Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P273: Avoid release to the environment.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P301+P310: IF SWALLOWED: Immediately call a POISON CENTER/doctor/…
P308 + P313: IF exposed or concerned: Get medical advice/ attention.
P331: Do NOT induce vomiting.
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

EUH-statements: Not applicable

2.3. Other hazards

Other hazards not contributing to the classification:	No other hazards identified.
Assessment PBT / vPvB:	According to Annex XIII of Regulation (EC) No.1907/2006 (REACH): - not fulfilling PBT (persistent/bioaccumulative/toxic) criteria; - not fulfilling vPvB (very persistent/very bioaccummulative) criteria.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Distillates (petroleum), steam-cracked, C8-12 fraction (UVCB)

A complex combination of organic compounds obtained by the distillation of products from a steam cracking process. It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly in the range of C8 through C12.

Name	**Product identifier**	**%**	**Classification [CLP]**
Distillates (petroleum), steam-cracked, C8-12 fraction	(CAS No.) 68477-54-3 (EC No.) 270-737-2 (EC index No.) 649-411-00-2 (REACH-no) 01-2119492289-23-0002	100	H226, H304, H315, H319, H332, H335, H340, H350, H361d, H372, H411
Including substances that affect labelling and classification of the product in accordance with Regulation (EC) No 1272/2008 (CLP).			
Benzene	(CAS No.) 71-43-2 (EC No.) 200-753-7 (EC index No.) 601-020-00-8	0.1-0.5	H225, H304, H315, H319, H340, H350, H372
Styrene	(CAS No.) 100-42-5 (EC No.) 202-851-5 (EC index No.) 601-026-00-0	20.0-22.0	H226, H315, H319, H332, H361d, H372
Dicyclopentadiene	(CAS No.) 77-73-6 (EC No.) 201-052-9 (EC index No.) 601-044-00-9	19.0-22.0	H225, H302, H315, H319, H332, H335, H411
Isoprene	(CAS No.) 78-79-5 (EC No.) 201-143-3 (EC index No.) 601-014-00-5	1.1-2.5	H224, H341, H350, H412
Naphthalene	(CAS No.) 91-20-3 (EC No.) 202-049-5 (EC index No.) 601-052-00-2	0.4-0.9	H302, H351, H400, H410
Toluene	(CAS No.) 108-88-3 (EC No.) 203-625-9 (EC index No.) 601-021-00-3	0.3-0.6	H225, H304, H315, H336, H361d, H373
Ethylbenzene	(CAS No.) 100-41-4 (EC No.) 202-849-4 (EC index No.) 601-023-00-4	1.6-6.1	H225, H304, H332, H373
m-Xylene	(CAS No.) 108-38-3 (EC No.) 203-576-3 (EC index No.) 601-022-00-9	2.6-4.8	H226, H312, H315, H332

o-Xylene	(CAS No.) 95-47-6 (EC No.) 202-422-2 (EC index No.) 601-022-00-9	2.7-3.5	H226, H312, H315, H332
p-Xylene	(CAS No.) 106-42-3 (EC No.) 203-396-5 (EC index No.) 601-022-00-9	1.6-3.1	H226, H312, H315, H332

3.2. Mixtures

Not applicable

SECTION 4. FIRST-AID MEASURES

4.1. Description of first aid measures

First-aid measures general

Immediately remove contaminated clothing. If danger of loss of consciousness, place patient in recovery position and transport accordingly. Apply artificial respiration if necessary.

First aid personnel should pay attention to their own safety. If potential for exposure exists refer to Section 8 for specific personal protective equipment.

First-aid measures after inhalation

If inhaled, remove to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention.

If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

First-aid measures after skin contact

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Obtain medical attention without delay. Wash clothing before reuse. Properly dispose of contaminated leather items, such as shoes, belts, and watchbands. Safety shower should be located in immediate work area.

First-aid measures after eye contact

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

First-aid measures after ingestion

Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe.

Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/effects after inhalation:	Cough, sore throat, headache, nausea, weakness, choking, wheezing, dizziness, difficulty in breathing, chest congestion, shortness of breath, transient central nervous system (CNS) depression. Special hazard: Lung irritation.
Symptoms/effects after skin contact:	Burning sensation, redness, swelling, and/or blisters.

Symptoms/effects after eye contact:	Mild local transient irritation (conjunctival hyperemia and slight chemosis).
Symptoms/effects after ingestion:	Few or no symptoms expected. If any, nausea and diarrhoea might occur.

4.3. Indication of any immediate medical attention and special treatment needed

Advice to physician

Symptoms can appear later.

Treat according to symptoms (decontamination, vital functions), no known specific antidote. Maintain adequate ventilation and oxygenation of the patient. If burn is present, treat as any thermal burn, after decontamination. The decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. If hemolysis is suspected, monitor hemoglobin, hematocrit, plasma free hemoglobin, and urinalysis. Whole blood or packed RBC transfusion may be required in severe cases. Alkalinization of urine with bicarbonate may prevent renal damage.Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Repeated excessive exposure may aggravate preexisting blood disease (anemia).

SECTION 5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media	LARGE FIRE: Use water spray, water fog or foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. SMALL FIRE: Dry powder or carbon dioxide (CO2) extinguisher, dry sand or fire fighting foam.
Unsuitable extinguishing media	Do not use direct water jet. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2. Special hazards arising from the substance or mixture

Fire hazard:	Substance is flammable. Fire fighting equipment must be available. Vapour is denser than air – flashback may be possible over considerable distances.
Explosion hazard:	Vapours may form explosive mixtures with air when the substance is heated above its flash point. Containers may explode under fire conditions - use water spray to cool unopened containers. Do not allow run-off from fire fighting to enter drains or water courses – may cause explosion hazard in drains and may reignite on surface water.
Hazardous decomposition products in case of fire:	Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide. Aromatic hydrocarbons. Smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating.

5.3. Advice for firefighters

Firefighting instructions:	In case of fire: Evacuate the area of all non-essential personnel. Fight fire remotely due to the risk of explosion. Containers exposed to intense heat from fires should be cooled with large quantities of water. Fight fire with normal precautions from a reasonable distance.
Protection during firefighting:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled

	product is expected. Self-Contained Breating Apparatus must be worn when approaching a fire in confined space. Select fire fighter's clothing approved to relevant standards (in EU – EN469).
Further information:	Contaminated extinguishing water must be disposed of in accordance with official regulations.

SECTION 6. ACCIDENTAL RELEASE MEASURE

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures	Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Avoid contact with skin, eyes and clothing. Evacuate unnecessary personnel. Alert emergency personnel.

6.1.2. For emergency responders

Emergency procedures	Isolate area. Stop or contain leak at the source if safe to do so. Avoid direct contact with released material. Stay upwind. Keep unnecessary and unprotected personnel away from the area of spillage. Keep personnel out of low areas. Keep upwind of spill. Ventilate area of leak or spill. No smoking in area. Except in case of small spillages, the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. It is recommended to eliminate all ignition sources if safe to do so (e.g. electricity, sparks, fires, flares). Vapor explosion hazard. Check area with combustible gas detector before re-entering area. Ground and bond all containers and handling equipment. Avoid breathing vapors or mists. Ensure adequate ventilation, especially in confined areas. Use appropriate safety equipment: refer to Section 8. For large spills, warn public of downwind explosion hazard. If required, notify relevant authorities according to all applicable regulations.

6.2. Environmental precautions

Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. Material may float on water and any runoff may create an explosion or fire hazard if ignited. Spills or discharge to natural waterways is likely to kill aquatic organisms.

6.3. Methods and material for containment and cleaning up

Do not let product enter drains. When inside buildings or confined space, ensure adequate ventilation. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). If necessary dike the product with dry earth, sand or similar non-combustible materials. Transfer collected product and other contaminated materials to suitable tanks or containers for recycle, recovery or safe disposal.
Small spills: Collect in suitable and properly labelled containers.
Large spills: Contain spilled material if possible. Pump with explosion-proof equipment. If available, use foam to limit fire risk. Do NOT use absorbent materials such as: Cellulose. Clay. Ground and bond all containers and handling equipment.
Spillages in water or at sea
Prevent further leakage or spillage if safe to do so.

If the Flash Point exceeds the Ambient Temperature by 10 deg C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10 deg C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.
If the spillage contaminates rivers, lakes or drains inform respective authorities.
Spillages on soil
In case of soil contamination, remove contaminated soil for remediation or disposal according to local regulations.

6.4. Reference to other sections

SECTION 8: Exposure controls/personal protection. SECTION 13: Disposal considerations.

SECTION 7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Precautions for safe handling	Do not handle until all safety precautions have been read and understood. Use only in a well-ventilated area. Avoid contact with heat and ignition sources and oxidizing agents. No smoking.Take precautionary measures against static discharges. Use proper bonding and/or grounding procedures. This product can become electrostatically charged, even in bonded or grounded equipment. Handling operations that can promote accumulation of static charges include but are not limited to mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations. Vapour/air-mixtures are explosive at intense warming. Vapors are heavier than air , beware of accumulation in pits and confined spaces. Ignition and/or flash back may occur. Use of non-sparking or explosion-proof equipment may be necessary, depending upon the type of operation. Keep container tightly closed. Containers should be opened only under exhaust ventilation hood. Do not allow splash filling of bulk volumes. Do not use compressed air for transferring, filling, discharging or handling. Handle empty containers with care; vapour residue may be flammable. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers. Cleaning, inspection and maintenance of the internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. The product will float on water and can be reignited on surface water. Dispose of rinse water in accordance with local and national regulations. Avoid ingestion and inhalation Avoid contact with eyes, skin, and clothing.

	Refer to Section 8, EXPOSURE CONTROLS/PERSONAL PROTECTION.
Hygiene measures	Take heed of usual occupational hygiene measures when handling chemical substances. Smoking, eating and drinking should be prohibited. Wash the skin with soap and water before breaks and at the end of work and apply fatty skin-care products after washing. Avoid inhalation of vapour or mist.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	Avoid all possible sources of ignition. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Store in the original container as much as possible. Containers have to be labelled clearly and permanently. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Vapour space above stored liquid may be flammable/explosive unless blanketed with inert gas. Storage installations should be designed with adequate bunds so as to prevent ground and water pollution in case of leaks or spills. Fixed storage containers, transfer containers and associated equipment should be earthed and bonded to prevent accumulation of static charge.
Incompatible materials	Strong oxidizing agents. Refer to Section 10: STABILITY AND REACTIVITY.
Storage area	Store in a segregated and approved area. Store in a cool, dry, well-ventilated area. Minimize sources of ignition, such as static build-up, heat, spark or flame. Keep away from direct sunlight. Store away from incompatible materials, food and drink. Storage area layout, tank design, equipment and operating procedures must comply with the current European, national or local legislation.
Packaging materials	Carbon steel or stainless steel.

7.3. Specific end use(s)

Not applicable.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

8.1.1. Occupational Exposure Limits

For *Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): not established.*

Dicyclopentadiene (3a,4,7,7a-tetrahydro-4,7-mathanoindene) (CAS 77-73-6)

	LTEL TWA ppm	LTEL TWA mg/m³	STEL ppm	STEL mg/m³	Note
European Union					
Austria	0,5	3	1	6	
Belgium	5	27			
Denmark	0,5	2,7	1	5,4	
Finland			1 (1)	5,5 (1)	(1) 15 minutes average value
France	5	30			
Germany (AGS)	0,5	2,7	0,5 (1)	2,7 (1)	(1) 15 minutes average value

Germany (DFG)	0,5	2,7	0,5 (1)	2,7 (1)	(1) 15 minutes average value
Ireland	5	30			
Poland		10			
Spain	5				
Switzerland	0,5	3	0,5	3	
United Kingdom	5	27			

Styrene (CAS 100-42-5)

	LTEL TWA ppm	**LTEL TWA mg/m³**	**STEL ppm**	**STEL mg/m³**	**Note**
Austria	20	85	80	340	
Belgium	25 (1)	108 (1)	50 (1)(2)	216 (1)(2)	(1) Additional indication "D" means that the absorption of the agent through the skin, mucous membranes or eyes is an important part of the total exposure. It can be the result of both direct contact and its presence in the air. (2) 15 minutes average value
Denmark	25	105	25	105	
Finland	20	86	100 (1)	430 (1)	(1) 15 minutes average value
France	23,3	100	46,6 (1)	200 (1)	Restrictive statutory limit values Skin (1) 15 minutes average value
Germany (AGS)	20	86	40 (1)	172 (1)	(1) 15 minutes average value
Germany (DFG)	20	86	40 (1)	172 (1)	(1) 15 minutes average value
Hungary		50		50	
Ireland	20	85	40 (1)	170 (1)	(1) 15 minutes reference period
Latvia		10		30 (1)	(1) 15 minutes average value
Poland		50		200	
Romania	12	50	35 (1)	150 (1)	(1) 15 minutes average value
Spain	20	86	40	172	
Sweden	10	43	20 (1)	86 (1)	(1) 15 minutes average value
Switzerland	20	85	40	170	
United Kingdom	100	430	250	1080	

Benzene (CAS 71-43-2)

	LTEL TWA ppm	**LTEL TWA mg/m³**	**STEL ppm**	**STEL mg/m³**	**Note**
Austria	1	3,2	4	12,8	TRK value (based on technical feasibility)
Belgium	1	3,25			
Denmark	0,5 (1)	1,6 (1)	1,0 (1)(2)	3,2 (1)(2)	Skin (2) 15 minutes average value
European Union	1 (1)	3,25 (1)			(1) Substantial contribution to the total body burden via dermal exposure possible Bold-type: Binding

					Occupational Exposure Limit Value (BOELV)
Finland	1 (1)	3,25 (1)			(1) Binding limit value
France	1	3,25			Restrictive statutory limit values Skin
Germany (AGS)	0,6 (1)	1,9 (1)	4,8 (1)(3)	15,2 (1)(3)	(1) Workplace exposure concentration corresponding to the proposed tolerable cancer risk. (see background document: Germany AGS) (2) Workplace exposure сЬлшгоncentration corresponding to the proposed preliminary acceptable cancer risk. (see background document: Germany AGS) (3) 15 minutes average value
	0,06 (2)	0,2 (2)			
Hungary				3	
Ireland	1	3			
Italy	1	3,25			Skin
Latvia	1	3,25			
Poland		1,6			
Romania	1	3,25			
Spain	1 (1)	3,25 (1)			1) Skin
Sweden	0,5	1,5	3 (1)	9 (1)	(1) 15 minutes average value
Switzerland	0,5	1,6			
The Netherlands		3,25			
Turkey	1	3,25			
United Kingdom	1				
Toluene (CAS 108-88-3)					
	LTEL TWA ppm	**LTEL TWA mg/m³**	**STEL ppm**	**STEL mg/m³**	**Note**
Austria	50	190	100	380	
Belgium	20 (1)	77 (1)	100 (1)(2)	384 (1)(2)	(1) Additional indication "D" means that the absorption of the agent through the skin, mucous membranes or eyes is an important part of the total exposure. It can be the result of both direct contact and its presence in the air. (2) 15 minutes average value
Denmark	25 (1)	94 (1)	50 (1)(2)	188 (1)(2)	(1) Skin (2) 15 minutes average value
European Union	50	192	100 (1)	384 (1)	Indicative Occupational Exposure Limit Value (IOELV). (1) 15 minutes average value
Finland	25	81	100 (1)	380 (1)	(1) 15 minutes average value
France	20	76,8	100 (1)	384 (1)	Bold type: Restrictive statutory limit values Skin (1) 15 minutes average value
Germany (AGS)	50 (1)	190 (1)	200 (1)(2)	760 (1)(2)	(1) 15 minutes average value (2) Skin
Germany (DFG)	50 (1)	190 (1)	200 (1)(2)	760 (1)(2)	(1) Skin (2) 15 minutes average value
Hungary		190		380	
Ireland	50	192	100 (1)	384 (1)	(1) 15 minutes reference period
Italy	50	192			Skin

Latvia	14	50	40 (1)	150 (1)	(1) 15 minutes average value
Poland		100		200	
Romania	50	192	100 (1)	384 (1)	(1) 15 minutes average value
Spain	50 (1)	192 (1)	100 (1)(2)	384 (1)(2)	(1) Skin (2) 15 minutes average value
Sweden	50	192	100 (1)	384 (1)	(1) 15 minutes average value
Switzerland	50	190	200	760	
The Netherlands		150		384	
Turkey	50	192	100 (1)	384 (1)	(1) 15 minutes average value
United Kingdom	50	191	100 (1)	384 (1)	(1) 15 minutes average value
Naphthalene (CAS 91-20-3)					
	LTEL TWA ppm	**LTEL TWA mg/m³**	**STEL ppm**	**STEL mg/m³**	**Note**
Austria	10	50			
Belgium	10 (1)	53 (1)	15 (1)(2)	80 (1)(2)	(1) Additional indication "D" means that the absorption of the agent through the skin, mucous membranes or eyes is an important part of the total exposure. It can be the result of both direct contact and its presence in the air. (2) 15 minutes average
Denmark	10	50	20	100	
Finland	1	5	2 (1)	10 (1)	(1) 15 minutes average value
France	10	50			
Germany (AGS)	0,4 (1)(2)	2 (1)(2)(3)	1,6 (1)(2)(4)	8 (1)(2)(4)	(1) Inhalable fraction and vapour (2) Skin (3) For the abrasives industry, an AGW of 5 mg/m³ applies until 28 February 2023 according to the registered use according to the EU REACH Regulation. (4) 15 minutes average value
Hungary		50			
Ireland	10	50			
Italy	10	50			
Latvia	10	50			
Poland		20		50	
Romania	9,5	50			
Spain	10	53	15	80	Skin
Sweden	10	50	15 (1)	80 (1)	(1) 15 minutes average value
Switzerland	10	50			
The Netherlands		50		80	
Turkey	10	50			
United Kingdom	[10]	[53]	[15]	[80]	The UK Advisory Committee on Toxic Substances has expressed concern that, for the OELs shown in parentheses, health may not be adequately protected because of doubts that the limit was not soundly-based. These OELs were included in the published UK 2002 list and its

					2003 supplement, but are omitted from the published 2005 list.
Xylene, o-, m-, p- or mixed isomers (CAS 108-38-3; 106-42-3; 95-47-6)					
	LTEL TWA ppm	**LTEL TWA mg/m³**	**STEL ppm**	**STEL mg/m³**	**Note**
Austria	50	221	100	442	
Belgium	50 (1)	221 (1)	100 (1)(2)	442 (1)(2)	(1) Additional indication "D" means that the absorption of the agent through the skin, mucous membranes or eyes is an important part of the total exposure. It can be the result of both direct contact and its presence in the air. (2) 15 minutes average value
Denmark	25 (1)	109 (1)	50 (1)(2)	218 (1)(2)	(1) Skin (2) 15 minutes average value
European Union	50	221	100 (1)	442 (1)	Indicative Occupational Exposure Limit Value (IOELV). (1) 15 minutes average value
Finland	50	220	100 (1)	440 (1)	(1) 15 minutes average value
France	50	221	100 (1)	442 (1)	Restrictive statutory limit values Skin (1) 15 minutes average value
Germany (AGS)	100 (1)	440 (1)	200 (1)(2)	880 (1)(2)	(1) Skin (2) 15 minutes average value
Germany (DFG)	50 (1)	220 (1)	100 (1)(2)	440 (1)(2)	(1) Skin (2) 15 minutes average value
Hungary		221		442	
Ireland	50	221	100 (1)	442 (1)	(1) 15 minutes reference period
Italy	50 (1)	221 (1)	100 (1)(2)	442 (1)(2)	(1) Skin (2) 15 minutes average value
Latvia	50	221	100 (1)	442 (1)	(1) 15 minutes average value
Poland		100 (1)		200 (1)(2)	(1) Skin (2) 15 minutes average value
Romania	50	221	100 (1)	442 (1)	(1) 15 minutes average value
Spain	50	221	100	442	
Sweden	50	221	100 (1)	442 (1)	(1) 15 minutes average value
Switzerland	100	435	200	870	
The Netherlands		210		442	
Turkey	50	221	100 (1)	442 (1)	(1) 15 minutes average value
United Kingdom	50	220	100	441	
Ethylbenzene (CAS 100-41-4)					
	LTEL TWA ppm	**LTEL TWA mg/m³**	**STEL ppm**	**STEL mg/m³**	**Note**
Austria	100	440	200	880	
Belgium	20 (1)	87 (1)	125 (1)(2)	551 (1)(2)	(1) Additional indication "D" means that the absorption of the agent through the skin, mucous membranes or eyes is an important part of the total exposure. It can be the result of both direct contact and its presence in the air. (2) 15 minutes average value

Denmark	50 (1)	217 (1)	100 (1)(2)	434 (1)(2)	(1) Skin (2) 15 minutes average value
European Union	100	442	200 (1)	884 (1)	Indicative Occupational Exposure Limit Value (IOELV). (1) 15 minutes average value Bold-type
Finland	50	220	200 (1)	880 (1)	(1) 15 minutes average value
France	20	88,4	100 (1)	442 (1)	Restrictive statutory limit values Skin (1) 15 minutes average value
Germany (AGS)	20 (1)	88 (1)	40 (1)(2)	176 (1)(2)	(1) Skin (2) 15 minutes average value
Germany (DFG)	20 (1)	88 (1)	40 (1)(2)	176 (1)(2)	(1) Skin (2) 15 minutes average value
Hungary		442		884	
Ireland	100	442	200 (1)	884 (1)	(1) 15 minutes reference period
Italy	100	442	200	884	Skin
Latvia	100	442	200 (1)	884 (1)	(1) 15 minutes average value
Poland		200		400	
Romania	100	442	200 (1)	884 (1)	(1) 15 minutes average value
Spain	100	441	200	884	Skin
Sweden	50	220	200 (1)	884 (1)	(1) 15 minutes average value
Switzerland	100	435	100	435	
The Netherlands		215		430	
Turkey	100	442	200 (1)	884 (1)	(1) 15 minutes average value
United Kingdom	100	441	125	552	

Isoprene (2-Methyl-1,3-butadiene) (CAS 78-79-5)

	LTEL TWA ppm	**LTEL TWA mg/m³**	**STEL ppm**	**STEL mg/m³**	**Note**
Germany (AGS)	3	8,4	24 (1)	67,2 (1)	(1) 15 minutes average value
Germany (DFG)	3	8,5	24 (1)	68 (1)	(1) 15 minutes average value
Latvia		40			
Poland		100		300 (1)	(1) 15 minutes average value
Switzerland	3	8,5	24	68	

8.1.2. DNEL/ PNEC values

Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3)

DNEL/DMEL (Workers)	
Acute - systemic effects, dermal	No-threshold effect and/or no dose-response information available
Acute - systemic effects, inhalation	No-threshold effect and/or no dose-response information available
Acute - local effects, dermal	No-threshold effect and/or no dose-response information available
Acute - local effects, inhalation	No-threshold effect and/or no dose-response information available
Long-term - systemic effects, dermal	0.34 mg/kg bw/day
Long-term - systemic effects, inhalation	3.25 mg/m³ (based on BOELV for benzene)
Long-term – local effects, dermal	No-threshold effect and/or no dose-response information available
Long-term- local effects, inhalation	No-threshold effect and/or no dose-response information available

Eyes, local effects	No-threshold effect and/or no dose-response information available

DNEL/DMEL (General population)

This product is used as intermediates, in manufacture and as fuels and hence exposure includes both workers and the general population. These DN(M)ELs address concerns linked to the CMR properties of the marker substances or their potential to cause other long-term health effects leading to an equivalent level of concern.

In general, risk characterization will be based on the premise that a marker substance with a low DN(M)EL present at high concentration in a stream will possess a greater relative hazard potential than a marker substance with a higher DN(M)EL present at the same or lower concentration.

Marker substance	**Indicative concentration** (%)	**Inhalation**		**Dermal**	
		DN(M)EL (mg/m^3)	**Relative hazard potential** (max % ÷ DN(M)EL)	**DN(M)EL** (mg/kg bw/d)	**Relative hazard potential** (max % ÷ DN(M)EL)
Dicyclopentadiene	≤25%	2.3	10.86	0.34	73.5
Benzene	<0.1 to 1	3.25	0.31	23.4	0.04
Isoprene	<0.1 to 3	8.4	0.35	23.7	0.13
Toluene	Up to 1	192	0.005	384	0.003
Naphthalene	Up to 1	50	0.02	72	0.01
Styrene	Up to 25	85	0.29	406	0.06
Xylenes	Up to 15	221	0.07	3182	0.005
Ethylbenzene	Up to 10	77	0.13	180	0.06

Based on this analysis, management of inhalation and dermal hazards associated with the presence of dicyclopentadiene should also provide adequate protection against hazards arising from other marker substances present. However, this conclusion does not consider the relative volatilities of the substances present, and overlooks the fact that benzene is a human carcinogen requiring an appropriate level of control.

Hence, in order to demonstrate safe use in worker exposure scenarios, estimates of inhalation exposure and risk characterisation use benzene as the marker substance (based on its relatively high volatility and carcinogenicity), while estimates of dermal exposure and risk characterisation use DCPD as the marker substance (based on its lower volatility and very low dermal DNEL).

PNEC (water)	
PNEC aqua (freshwater)	For Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available. For Dicyclopentadiene (CAS 77-73-6): 0.057 mg/L
PNEC aqua (marine water)	For Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available. For Dicyclopentadiene (CAS 77-73-6): 0.006 mg/L
PNEC aqua (intermittent, freshwater)	For Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available. For Dicyclopentadiene (CAS 77-73-6): 0.008 mg/L
PNEC (Sediment)	
PNEC sediment (freshwater)	For Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available. For Dicyclopentadiene (CAS 77-73-6): 8.89 mg/kg sediment dw
PNEC sediment (marine water)	For Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available.

	For Dicyclopentadiene (CAS 77-73-6): 0.889 mg/kg sediment dw
PNEC (Soil)	
PNEC soil	For Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available. For Dicyclopentadiene (CAS 77-73-6): 2.5 mg/kg soil dw
PNEC (Oral)	
PNEC oral (secondary poisoning)	This PNEC does not need to be derived as constituents of the substance are not bioaccumulative.
PNEC (STP)	
PNEC sewage treatment plant	For Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available. For Dicyclopentadiene (CAS 77-73-6): 2.2 mg/L

8.2. Exposure controls

Appropriate engineering controls:

Use explosion-proof ventilation equipment. Provide easy access to water supply and eye wash facilities. Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Hand protection:

Chemical resistant protective gloves (EN 374). Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

butyl rubber (butyl) - 0.7 mm coating thickness;
nitrile rubber (NBR) - 0.4 mm coating thickness.

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing. Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Tightly fitting safety goggles. In addition to goggles, wear a face shield if there is a reasonable chance for splash to the face. Equipment should conform to EN 166.

Skin and body protection:

Body protection must be chosen depending on activity and possible exposure, e.g. apron, protecting boots, chemical-protection suit (according to EN 14605 in case of splashes or EN ISO 13982 in case of dust). Possibly a work helmet; anti-static non-slip safety shoes or boots.

Respiratory protection:

Respirator with A filter. Full mask with above mentioned filter according to producers using requirements or self-contained breathing apparatus. Equipment should conform to EN 136 or EN 140 and EN 143.

Environmental exposure controls:

If possible, use in closed systems. If leakage cannot be prevented, the substance needs to be suck off at the emersion point, if possible without danger. Observe the exposure limits, clean exhaust air if needed. If recycling is not practicable, dispose of in compliance with local regulations. Inform the responsible authorities in case of leakage into the atmosphere, or of entry into waterways, soil or drains.

Other information:

Hygiene measures: Observe good industrial hygiene practices. Do not get in eyes. Avoid contact with skin. Wash contaminated clothing before reuse. When using do not smoke. Wash hands before breaks and immediately after handling the product.
For more information please see the relevant exposure scenario in Annex of this SDS

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state at 20 °C and 101.3 kPa	liquid Colour: colourless or yellow to dark brown Odour: aromatic – gasoline like
Melting / freezing point	< -30 °C (ISO 3016 (Pour Point))
Boiling point/range	167 °C to 215 °C at 1013 hPa
Relative density	0.89 – 0.95 g/cm³ at 20°C (DIN 51757)
Vapour pressure	2.0 – 27.6 hPa at 19°C – 20 °C 1.1 – 41.0 hPa at 25°C 4.1 – 79.0 hPa at 34°C °C (OECD 104, EU A.4)
Water solubility	62 - 108 mg/L at 20 °C (OECD TG 105)
Partition coefficient n-octanol/water (log value)	2.8 25 °C (OECD TG 117)
Flash point	36.5 °C - 37 °C at 1013 hPa
Flammability	Flammable liquid, Category 3
Explosive properties	Vapours may form explosive mixtures with air when the substance is heated above its flash point.
Lower explosion limit	ca. 1.3 vol.%
Upper explosion limit	ca 6.0 vol.%
Auto-ignition temperature	409°C to 505 °C at 1013 hPa (read-across)
Oxidising properties	Not available
Viscosity	1.81 mm^2/s at 20 °C (kinematic) 1.33 mm^2/s at 40°C
Granulometry	The study does not need to be conducted if the substance is marketed or used in a non-solid or non-granular form.
Stability in organic solvents and identity of relevant degradation products	Not available
Dissociation constant	Not available

9.2. Other information

Not available.

SECTION 10. STABILITY AND REACTIVITY

10.1. Reactivity

Vapours may form explosive mixture with air. No hazardous reactions if stored and handled as prescribed/indicated.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

Elevated temperatures can cause hazardous polymerization dicyclopentadiene and styrene. Polymerization reaction can lead to decomposition and gas release. This can cause pressure build-up

and/or rupturing of closed containers. Polymerization reaction will increase the temperature. Polymerization can be catalyzed by: Aluminium. Boron. Air. Alkali metal hydroxides. Peroxides.

10.4. Conditions to avoid

Avoid contact with heat, sparks, and open flame. Avoid contact with air (oxygen). Active ingredient decomposes at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems. Avoid static discharge Avoid any source of ignition.

10.5. Incompatible materials

Strong oxidizing agents. Aluminium. Boron. Alkali metal hydroxides. Peroxides.

10.6. Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated. Thermal decomposition or combustion may generate smoke, carbon monoxide, carbon dioxide and aromatic carbon.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute toxicity — CLP classification (Regulation (EC) No 1272/2008):
Acute Tox.4 (inhalation): H332

Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3)	
LD50, oral, rat, male	> 2000 mg/kg bw (equivalent or similar to OECD Guideline 401) (no mortality at highest dose tested)
LC50, inhalation, rat, male/female	> 7.5 g/m³ vapour (whole body) (OECD Guideline 403) (no mortality and no adverse clinical signs subsequent to exposure at only concentration tested)
LD50, dermal, rat, male/female	>2000 mg/kg bw (OECD Guideline 402) (not pose an acute hazard following skin contact)

Additional information

Acute toxicity of the product was estimated by using the following formula: $100/ATE_{mix} = \Sigma c_i / ATE_i$:
ATE (oral) >2000 (low toxicity if swallowed - no classification required)
ATE (dermal) >2000 (low toxicity through the skin contact - no classification required)
ATE (inhalation) < 20 (the product is harmful if inhaled (Acute Tox.4))

Skin corrosion/irritation

Adverse effect observed (irritating).
CLP classification (Regulation (EC) No 1272/2008): Skin Irrit. 2; H315

Additional information

Erythema score:
2.9 of max. 4 (mean) (Time point: 24, 48 and72 hrs) (fully reversible within: 15 days) (moderate to severe erythema)
Edema score:
1.4 of max. 4 (mean) (Time point: 24, 48 and 72 hrs) (fully reversible within: 15 days) (very slight to moderate to severe oedema)
(Rabbit, category approach, test substance: CAS 94733-07-0, OECD Guideline 405)
There are sufficient data on specific components that are present in the product (benzene, dicyclopentadiene, styrene, toluene, xylenes) provide some evidence of skin irritation with controlled exposures to liquid test substances. Based on the hazardous properties of the specific components, the product is considered to be skin irritant and labelled as Skin Irrit. 2, H315 according to Regulation (EC) 1272/2008.

Serious eye damage/irritation	Adverse effect observed (irritating). CLP classification (Regulation (EC) No 1272/2008): Eye irrit.2; H319
Additional information	Cornea score: 0 of max. 4 (mean) (Time point: 24-72 hours) (no corneal effects) Iris score: 0 of max. 2 (mean) (Time point: 24-72 hours) (no iridial effects) Conjunctivae score: 0.3 of max. 3 (mean) (Time point:24-72 hours) (fully reversible within: 72 hours) (mild response in all 3 rabbits at 24 hours) Chemosis score: 0.1 of max. 4 (mean) (Time point: 24-72 hours) (fully reversible within: 72 hours) (mild response in all 3 rabbits at 24 hours) (Rabbits, OECD Guideline 405) The specific components of the product (benzene, styrene, dicyclopentadiene) are classified as Eye Irrit. 2, H319 according to Regulation (EC) 1272/2008. The combined concentration of eye irritating substances in the product will normally exceed the cut-off for classification under CLP (≥10%). Based on the hazardous properties of the specific components, the product is considered to be eye irritant and labelled as Eye irrit.2, H319 according to CLP Regulation (EC) 1272/2008 .
Respiratory or skin sensitisation	No adverse effect observed (not sensitising).
Additional information	Members of category (Resin Oils and Cyclic Dienes) were considered not to be skin sensitisers (Guinea pig, read-across). The specific components benzene, dicyclopentadiene, isoprene, toluene, naphthalene, styrene, xylenes and ethylbenzene are considered not to be skin sensitisers. No data have been found concerning respiratory sensitisation and there are no indications that components within the product are respiratory allergens.
Germ cell mutagenicity	Adverse effect observed (germ cell mutagenicity). CLP classification (Regulation (EC) No 1272/2008): Muta. 1B, H340
Additional information	<u>In vitro genotoxicity studies</u>: Bacterial reverse mutation assay (e.g. Ames test) (gene mutation): negative (OECD Guideline 471, OECD Guideline 472). Mammalian cell gene mutation assay (gene mutation): negative (equivalent or similar to OECD Guideline 476). <u>In vivo genotoxicity studies:</u> Micronucleus assay (chromosome aberration) (mouse): negative (equivalent or similar to OECD Guideline 474). The product contain ≥ 0.1% benzene and ≥ 1% isoprene. Based on the hazardous properties of the specific components, the product is considered to be mutagenic and require labelling for this end-point.
Carcinogenicity	Adverse effect observed (carcinogenicity). CLP classification (Regulation (EC) No 1272/2008): Carc.1A , H350
Additional information	The product contain ≥ 0.1% benzene and ≥ 0.1% isoprene, <1% naphthalene which are classified as carcinogenic.

Based on the hazardous properties of the specific components, the product is considered to be mutagenic and require labelling for this end-point.

Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3)	
NOAEL (carcino-genicity) oral, rat, male/female	50 mg/kg bw/day (EPA OPP 83-5) Test substance – specific component: benzene
NOAEC (carcino-genicity) inhalation, mouse, male/female	28 mg/kg bw/day (equivalent or similar to EPA OPP 83-2) Test substance – specific component: isoprene
NOEL (carcinogenicity) inhalation, human experience	50 mg/m3 (ECHA REACH Guidance R8) Test substance – Specific component: naphthalene

Toxicity for reproduction
Adverse effect observed (Reproductive toxicity).
CLP classification (Regulation (EC) No 1272/2008): Repr.2, H361d (Suspected of damaging the unborn child)

Additional information
The product contains ≥ 3% styrene which is classified as Repr. 2, H361d according to CLP Regulation (EC) 1272/2008.
Based on the hazardous properties of the specific components, the product is considered to be toxic for reproduction and require labelling for this end-point.

Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3)	
NOAEL (effects on fertility), oral, rat, male/female	375 mg/kg bw/day (nominal) (no effects on any reproductive parameter at the highest dose level tested) (OECD Guideline 422) Test substance: CAS 68477-54-3
NOAEL (effects on fertility), oral, rat, male	35 mg/kg bw/day (nominal) (lower body weight and food consumption at 125 mg/kg/day) (OECD Guideline 422) Test substance: CAS 68477-54-3
NOAEL (effects on fertility), oral, rat, female	125 mg/kg bw/day (nominal) (lower body weight and food consumption at 373 mg/kg/day) (OECD Guideline 422) Test substance: CAS 68477-54-3
NOAEC (maternal toxicity), inhalation, rat	2261 mg/m³ air (nominal) (lower maternal body weight gain at 3768 and 4522 mg/m^3) Test substance – specific component: toluene
NOAEL (developmental toxicity), subacute, oral, mouse	125 mg/kg bw/day (nominal) (lower pup body weight on day 4 at 375 mg/kg/day) (OECD TG 422) Test substance: CAS 68477-54-3

STOT-single exposure
Adverse effect observed (respiratory irritation).
CLP classification (Regulation (EC) No 1272/2008): STOT SE 3, H335
The product contains >10% dicyclopentadiene, which is classified as respiratory tract irritant in animals and humans (STOT SE 3, H335).
Based on the hazardous properties of the specific components, the product is classified for this end-point.

Repeated dose toxicity
Adverse effect observed.
Affected organs: ear
Route of exposure: inhalation
CLP classification (Regulation (EC) No 1272/2008): STOT RE 1, H372

Additional information
The product contains >10% styrene, which is classified as STOT RE 1, H372 (Affected organs: ear. Route of exposure: inhalation)

There are substantial data on the repeated dose toxicity of other specific components (benzene, toluene, and ethylbenzene) present in the product which demonstrate significant target organ toxicity.

Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3)	
NOAEL (systemic effect, subacute, toxicity), oral, rat male :	35 mg/kg bw/day (nominal) (lower body weight and food consumption, adverse clinical signs at 125 mg/kg/day) (OECD Guidline 422) Test substance: CAS 68477-54-3
NOAEL (systemic effect, subacute, toxicity), oral, rat, female	125 mg/kg bw/day (nominal) (lower body weight and adverse clinical signs at 375 mg/kg/day) Test substance: CAS 68477-54-3
NOAEC(systemic effect, subacute, toxicity) , inhalation: vapour, rat, male	0.85 mg/L air (nominal) (histopathological changes in the organ of Corti) Remark: for ototoxicity Test substance – the specific component: styrene
NOAEC (subchronic), inhalation (vapour), rat , male/female	4710 mg/m³ air (nominal) (EU Method B.29) Test substance – the specific component: toluene
NOAEC (subchronic), inhalation (vapour), rat , male/female	96 mg/m³ air (nominal) (decreased white blood cell count, percentage of lymphocytes and femoral marrow cellularity at 960 mg/m^3) (OECD Guidline 412) Test substance – the specific component: benzene
Aspiration hazard	Adverse effect observed (aspiration hazard). CLP classification (Regulation (EC) No 1272/2008): Asp. Tox.1, H304
Other effects	The specific components of the product (styrene and toluene are recognised as having neurotoxic activity.

SECTION 12. ECOLOGICAL INFORMATION

12.1. Toxicity

The product is toxic to aquatic life with long lasting effects.
The specific components of the product (dicyclopentadiene, naphthalene, isoprene) are classified as toxic or very toxic to aquatic life according to Regulation (EC) 1272/2008.
Based on the hazardous properties of the specific components, the product is considered to be toxic to aquatic life with long lasting effects and labelled as Aquatic Chronic 2, H411 according to CLP Regulation (EC) 1272/2008 .

Fish (Short-term toxicity)	
LC50 (96h)	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): 6.1 mg/L - *Oncorhynchus mykiss* (freshwater) (equivalent or similar to OECD Guideline 203) Dicyclopentadiene (CAS 77-73-6): 15.7 mg/l - *Ictalurus punctatus* (freshwater) Naphthalene (CAS 91-20-3): 0.11 mg/l - *Oncorhynchus mykiss*(freshwater)
LLC50 (96h)	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): 13.5 mg/L - *Brachydanio rerio* (freshwater) (OECD Guideline 203)

Fish (Long-term toxicity)	
NOEC, 40 d	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available Naphthalene (CAS 91-20-3): 0.37 mg/l -*Oncorhynchus kisutch* (freshwater)
NOEC, 14 d	Dicyclopentadiene (CAS 77-73-6): 0.98 mg/l - *Lepomis macrochirus* (OECD Guideline 204)
Aquatic invertebrates (Short-term toxicity)	
EC50 (48 h)	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): 39 mg/L - *Daphnia magna Straus* (freshwater) (OECD Guidline 202) Dicyclopentadiene (CAS 77-73-6): 0.82 mg/l - *Daphnia magna* (semi-static test) (OECD Guideline 202) Naphthalene (CAS 91-20-3): 1.6 – 24.1 mg/l - *Daphnia magna* (static test)
LC50 (96 h)	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): 1.4 mg/L - *Chaetogammarus marinus (gammarid)*(saltwater) (equivalent or similar to OECD Guideline 202)
Aquatic invertebrates (Long-term toxicity)	
NOEC (21 d)	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available Dicyclopentadiene (CAS 77-73-6): 3.2 mg/l - *Daphnia magna* (Water flea)
Algae and aquatic plants	
NOEC (72 h)	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): 0.37 mg/L - *Pseudokirchnerella subcapitata (freshwater) (*OECD Guideline 201)
NOEC (96 h)	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): 0.94 mg/L - *Pseudokirchnerella subcapitata (freshwater) (*OECD Guideline 201)
ErC50 (72 h)	Naphthalene (CAS 91-20-3): 0.4 mg/l - *Skeletonema costatum (marine diatom)* (growth rate inhibition)
EC50 (96h)	Dicyclopentadiene (CAS 77-73-6): 22 mg/L - *Anabaena flos-aquae* (US EA 1971)
Toxicity to aquatic micro-organisms	
EC10 or NOEC for microorganisms	Distillates (petroleum), steam-cracked, C8-12 fraction (CAS 68477-54-3): Not available Dicyclopentadiene (CAS 77-73-6): 2.2 mg/L - *Pseudomonas putida* (Standard Test Method 172-07)

12.2. Persistence and degradability

Abiotic degradation	Hydrolysis: Not available. Phototransformation in air: Not available. Phototransformation in water: Not available.
Biodegradation	Biodegradation in water: 6.48% after 41 days 43.87% after 56 days (OECD guideline 301F)
Persistence and degradability	The product could not be considered readily biodegradable.

12.3. Environmental distribution

Adsorption soil	Not available.
Volatilization	Not available.

12.4. Bioaccumulative potential

Aquatic bioaccumulation	Using a log Kow range for specific components of 2.68 to 6.96 the calculated values BCF range from 26 to 18000 (QSAR) Bioaccumulation potential of the product is low.
Secondary poisoning	The product is not bioaccumulative and therefore this assessment is not required. The representive structures do not trigger a need for a secondary poisoning assessment.

12.5. Mobility in soil

Biodegradation in soil	Not available.

12.6. Results of PBT and vPvB assessment

Regarding all available data on biotic and abiotic degradation, bioaccumulation and toxicity it can be stated that the substance does not fulfill the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).

12.7. Other adverse effects

Not available.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste disposal recommendations	Waste treatment methods: Disposal required in compliance with all waste management related state and local regulations. The choice of the appropriate method of disposal depends on the product composition by the time of disposal as well as the local statutes and possibilities for disposal. This material is combustible thus may be burned in a chemical incinerator equipped with an afterburner and scrubber. Contaminated packaging: Empty remaining contents. Do not burn, or use a cutting torch on, the empty drum. There is a significant risk of explosion if residues evaporate. Dispose of in accordance with local regulations. Empty contaminated packaging thoroughly. They can be recycled after thorough and proper cleaning. Packaging that cannot be cleaned are to be disposed of in the same manner as the product.
European List of Waste code	The waste code classification is to be carried out according to the European Waste Catalogue (EWC) specifically for each branch of industry and each type of process. Hazard properties: HP3 - Flammable; HP4 - Irritant — skin irritation and eye damage; HP5 - Specific Target Organ Toxicity (STOT)/ Aspiration hazard

HP7 - Carcinogenic

SECTION 14. TRANSPORT INFORMATION

14.1. Land transport (ADR)

UN-No.	1992
Proper Shipping Name	Flammable liquid, Toxic, N.O.S
Chemical name	Distillates (petroleum), steam-cracked, C8-12 fraction
Hazard class:	3
Hazard Identification Number	36
Classification code	FT1
Packing group	III
Hazard label	3+6.1

Special provisions	274
Packing instructions	P001, IBC03, R001
Transport category	3
(Tunnel restriction code)	(D/E)
ADR tank	Tank code: L4BH Special provisions: TU15
Special provisions for carriage	Packages: V12 Loading, unloading and handling: CV13, CV28 Operation: S2
Environmental hazard	Yes

14.2. Railway transport (RID)

UN-No.	1992
Proper Shipping Name	Flammable liquid, Toxic, N.O.S
Chemical name	Distillates (petroleum), steam-cracked, C8-12 fraction
Hazard class:	3
Hazard Identification Number	36
Classification code	FT1
Packing group	III
Hazard label	3+6.1

Special provisions	274
Environmental hazard:	Yes

14.3. Inland waterway transport (ADN)

UN-No.	1992
Proper Shipping Name	Flammable liquid, Toxic, N.O.S
Chemical name	Distillates (petroleum), steam-cracked, C8-12 fraction
Hazard class:	3

Hazard Identification Number	36
Classification code	FT1
Packing group	III
Hazard label	3+6.1+(N2+CMR+F)

Special provisions	274, 802
Environmental hazard:	Yes

14.4. Sea transport (IMDG)

UN-No.	1992
Proper Shipping Name	Flammable liquid, Toxic, N.O.S
Chemical name	Distillates (petroleum), steam-cracked, C8-12 fraction
Hazard class:	3
Packing group:	III
Hazard label	3+6.1

Special provisions	223, 274
Limited and excepted quantity provisions	Limited quantities: 5 L Excepted quantities: E1
Packing Instruction	P001
IBC Instruction	IBC03
Portable tanks and bulk containers	Tank instructions: T7 Provisions: TP1,TP28
EmS	F-E, S-D
Stowage and handling	Category A
Environmental hazard	Marine pollutant

14.5. Air transport (IATA/ICAO)

UN-No.	1992
Proper Shipping Name	Flammable liquid, Toxic, N.O.S
Chemical name	Distillates (petroleum), steam-cracked, C8-12 fraction
Hazard class:	3
Packing group:	III
Hazard label	3+6.1

IATA Special Provisions	A3
Environmental hazard:	Yes

14.6. Special precautions for user

Always transport in closed containers. Ensure that persons transporting the product know what to do in the event of an accident or spillage. For information regarding Exposure Controls/Personal Protection see Section 8 of the SDS

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

IBC code	Applicable
IBC product name	**Noxious liquid, F (6) (n.o.s)** (Liquid pyrolysis products, C9 fraction) ST2, Cat.Y.
Hazard	P
Ship type	2
Tank type	2G
Pollution category	Y

SECTION 15. REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

Authorisations and/or restrictions on use (Annex XVII):

Entry 3 Substances labelled with H304	1. Shall not be used in: - ornamental articles intended to produce light or colour effects by means of different phases, for example in ornamental lamps and ashtrays, - tricks and jokes, - games for one or more participants, or any article intended to be used as such, even with ornamental aspects, 2. Articles not complying with paragraph 1 shall not be placed on the market. 3. Shall not be placed on the market if they contain a colouring agent, unless required for fiscal reasons, or perfume, or both, if they: - can be used as fuel in decorative oil lamps for supply to the general public, and, - present an aspiration hazard and are labelled with R65 or H304, 4. Decorative oil lamps for supply to the general public shall not be placed on the market unless they conform to the European Standard on Decorative oil lamps (EN 14059) adopted by the European Committee for Standardisation (CEN). 5. Without prejudice to the implementation of other Community provisions relating to the classification, packaging and labelling of dangerous substances and mixtures, suppliers shall ensure, before the placing on the market, that the following requirements are met: (a) lamp oils, labelled with R65 or H304, intended for supply to the general public are visibly, legibly and indelibly marked as follows: ‘Keep lamps filled with this liquid out of the reach of children’; and, by 1 December 2010, ‘Just a sip of lamp oil — or even sucking the wick of lamps — may lead to lifethreatening lung damage’; (b) grill lighter fluids, labelled with R65 or H304, intended for supply to the general public are legibly and indelibly marked by 1 December 2010 as follows: ‘Just a sip of grill lighter may lead to life threatening lung damage’; (c) lamp oils and grill lighters, labelled with R65 or H304, intended for supply to the general public are packaged in black opaque containers not exceeding 1 litre by 1 December 2010. 6. No later than 1 June 2014, the Commission shall request the European Chemicals Agency to prepare a dossier, in accordance with Article 69 of the present Regulation with a view to ban, if appropriate, grill lighter fluids and fuel for decorative lamps, labelled R65 or H304, intended for supply to the general public. 7. Natural or legal persons placing on the market for the first time lamp oils and grill lighter fluids, labelled with R65 or H304, shall by 1 December 2011, and

	annually thereafter, provide data on alternatives to lamp oils and grill lighter fluids labelled R65 or H304 to the competent authority in the Member State concerned. Member States shall make those data available to the Commission.
Entry 5 Benzene CAS No 71-43-2 EC No 200-753-7	1. Shall not be used in toys or parts of toys where the concentration of benzene in the free state is greater than 5 mg/kg (0,0005 %) of the weight of the toy or part of toy. 2. Toys and parts of toys not complying with paragraph 1 shall not be placed on the market. 3. Shall not be placed on the market, or used, - as a substance, - as a constituent of other substances, or in mixtures, in concentrations equal to, or greater than 0,1 % by weight. 4. However, paragraph 3 shall not apply to: (a) motor fuels which are covered by Directive 98/70/ EC; (b) substances and mixtures for use in industrial processes not allowing for the emission of benzene in quantities in excess of those laid down in existing legislation; (c) natural gas placed on the market for use by consumers, provided that the concentration of benzene remains below 0,1 % volume/ volume.
Entries 28-30 CMR substances	Without prejudice to the other parts of this Annex the following shall apply to entries 28 to 30: 1.Shall not be placed on the market, or used, - as substances, - as constituents of other substances, or, - in mixtures, for supply to the general public when the individual concentration in the substance or mixture is equal to or greater than: - either the relevant specific concentration limit specified in Part 3 of Annex VI to Regulation (EC) No 1272/2008, or, - the relevant generic concentration limit specified in Part 3 of Annex I of Regulation (EC) No 1272/2008. Without prejudice to the implementation of other Community provisions relating to the classification, packaging and labelling of substances and mixtures, suppliers shall ensure before the placing on the market that the packaging of such substances and mixtures is marked visibly, legibly and indelibly as follows: ‘Restricted to professional users’. 2.By way of derogation, paragraph 1 shall not apply to: (a) medicinal or veterinary products as defined by Directive 2001/82/EC and Directive 2001/83/EC; (b) cosmetic products as defined by Directive 76/768/ EEC; (c) the following fuels and oil products: - motor fuels which are covered by Directive 98/ 70/EC, - mineral oil products intended for use as fuel in mobile or fixed combustion plants, - fuels sold in closed systems (e.g. liquid gas bottles); (d) artists’ paints covered by Regulation (EC) No 1272/2008; (e) the substances listed in Appendix 11, column 1, for the applications or uses listed in Appendix 11, column 2. Where a date is specified in column 2 of Appendix 11, the derogation shall apply until the said date.
Entry 48 Toluene CAS No 108-88-3 EC No 203-625-9	Shall not be placed on the market, or used, as a substance or in mixtures in a concentration equal to or greater than 0,1 % by weight where the substance or mixture is used in adhesives or spray paints intended for supply to the general public.

Entry 72 Benzene	Benzene shall not be placed on the market after 1 November 2020 in any of the following: (a) clothing or related accessories; (b) textiles other than clothing which, under normal or reasonably foreseeable conditions of use, come into contact with human skin to an extent similar to clothing; (c) footwear; if the clothing, related accessory, textile other than clothing or footwear is for use by consumers and the substance is present in a concentration, measured in homogeneous material, equal to or greater than that specified for that substance in Appendix 12.

The product is not on the REACH Candidate List.
The product is not on the REACH Annex XIV List.
Specific components of the product which are included in the Community Rolling Action Plan (CoRAP): Dicyclopentadiene (3a,4,7,7a-tetrahydro-4,7-methanoindene), toluene, xylenes.

Other information, restriction and prohibition regulations

Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC – Seveso III

P5b FLAMMABLE LIQUIDS (Lower-tier requirements 50 t, Upper-tier requirements: 200 t)
E2 ENVIRONMENTAL HAZARDS (Lower-tier requirements 200 t, Upper-tier requirements: 500 t)

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I and Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer. Annex II - Not listed.
Regulation (EC) No 850/2004 on persistent organic pollutants: Annex III – Not listed.
Directive 2013/39/EU priority substances in the field of water policy (amending Directive 2006/60/EC – Water Framework Directive and Directive 2008/105/EC on environmental quality standards in the field of water policy): Benzene (CAS No. 71-43-2) , Naphthalene (CAS No.91-20-3) are listed.
Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous chemicals: **Benzene** (**CN Code** 2902 20 00) is included in the list of chemicals subject to export notification procedure.

15.1.2. National regulations

Germany

AwSV (Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen):
Stoffname: Destillate (Erdöl), Dampf-gekrackt, C8-12-Fraktion
CAS-Nummer: 68477-54-3
Kennummer: 8410
WGK 3, Highly hazardous to water (Classification according to AwSV; ID No. 8410)
Hazardous Incident Ordinance (12. BImSchV): Is not subject of the Hazardous Incident Ordinance (12. BImSchV)
Employment restrictions: Observe restrictions according Act on the Protection of Working Mothers (MuSchG)

	Observe restrictions according Act on the Protection of Young People in Employment (JArbSchG)
Netherlands	ABM category: A(4) - low hazard for aquatic organisms, may have longterm hazardous effects in aquatic environment SZW-lijst van kankerverwekkende stoffen: listed SZW-lijst van mutagene stoffen: listed NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Borstvoeding: not listed NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Vruchtbaarheid: not listed NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Ontwikkeling: not listed

15.2. Chemical safety assessment

Chemical Safety Report has been performed for LOA Resin Oils & Cyclic Dienes Category, which include Distillates (petroleum), steam-cracked, C8-12 fraction (CAS No. 68477-54-3)

SECTION 16. OTHER INFORMATION

16.1. Indication of changes

Version	Date of change	Section	Description of changes
2.1	08/02/2011	All	
3.0	04/03/2019	1-16, Annex	SDS have been corrected in according to data of Registration dossier, Chemical Safety Report and new Transport information
3.1	19/06/2020	8.1, 14	Sections were updated.
3.2	26/10/2020	Title, 1, 15	Product trade name has been changed. Emergency telephone numbers have been added. Information on national regulations have been updated.

16.2. Abbreviations and acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AGS	The German Committee on Hazardous Substances (Ausschuss für Gefahrstoffe – AGS)
BCF	Bioconcentration factor
DFG	Germany Research Foundation (Deutsche Forschungsgemeinschaft - DFG)
DNEL	Derived No Effect Level
IMDG	International Maritime Dangerous Goods
ICAO-TI	Technical Instructions for the Safe Transport of Dangerous Goods by Air
Kow	octanol-water partition coefficient
LC50	Lethal Concentration to 50 % of a test population
LD50	Lethal Dose to 50% of a test population (Median Lethal Dose)
LLC50	Lowest Lethal Concentration to 50% of a test population
LOAEC	Lowest Observable Adverse Effect Concentration
LOAEL	Lowest Observable Adverse Effect Level
LOEC	Lowest Observable Effect Concentration
LTEL	Long Term Exposure Limit
MAK	Maximum concentration at the Workplace (Maximale Arbeitplatzconcentration)
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No Observed Adverse Effect Level

NOEC	No Observed Effect Concentration
OECD	Organization for Economic Co-operation and Development
PNEC	Predicted No Effect Concentration
PBT	Persistent, bioaccumulative, toxic chemical
vPvB	Very Persistent, Very Bioaccumulative
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SCOEL	Scientific Committee on Occupational Exposure Limits
STEL	Short Term Exposure Limit
STP	sewage treatment plant
STOT	Specific Target Organ Toxicity
(STOT) RE	Repeated Exposure
(STOT) SE	Single Exposure
TWA	Time Weighted Average
UN	United Nations

16.3. Full text of H- and EUH-statements:

H224	Flammable liquid, Category 1	Extremely flammable liquid and vapour
H225	Flammable liquid, Category 2	Highly flammable liquid and vapour
H226	Flammable liquid, Category 3	Flammable liquid and vapour
H302	Acute toxicity (oral), Category 4	Harmful if swallowed
H304	Aspiration hazard, Category 2	May be fatal if swallowed and enters airways
H312	Acute toxicity (dermal), Category 4	Harmful in contact with skin
H315	Skin irritation, Category 2	Causes skin irritation
H319	Eye irritation, Category 2	Causes serious eye irritation.
H332	Acute toxicity (inhalation), Category 4	Harmful if inhaled.
H335	Specific Target Organ Toxicity: Single Exposure , Category 3 (STOT SE 3)	May cause respiratory irritation
H336	Specific Target Organ Toxicity: Single Exposure , Category 3 (STOT SE 3)	May cause drowsiness or dizziness
H340	Germ cell mutagenicity, Category 1 B	May cause genetic defects
H341	Germ cell mutagenicity, Category 2	Suspected of causing genetic defects
H350	Carcinogenicity, Category 1A	May cause cancer
H351	Carcinogenicity, Category 2	Suspected of causing cancer
H361d	Reproductive toxicity, Category 2	Suspected of damaging the unborn child
H372	Specific Target Organ Toxicity: Repeated Exposure, Category 1 (STOT RE 1)	Causes damage to organs through prolonged or repeated exposure
H373	Specific Target Organ Toxicity: Repeated Exposure, Category 2 (STOT RE 2)	May cause damage to organs through prolonged or repeated exposure
H400	Aquatic Acute, Category 1	Very toxic to aquatic life
H410	Aquatic Chronic, Category 1	Very toxic to aquatic life with long-lasting effects
H411	Aquatic Chronic, Category 2	Toxic to aquatic life with long-lasting effects

H412	Aquatic Chronic, Category 3	Harmful to aquatic life with long-lasting effects

16.4. List of ES (exposure scenario) given in Annex to the extended SDS

ES1	Use of Resin Oils and Cyclic Dienes Category streams as intermediates
ES2	Distribution of Resin Oils and Cyclic Dienes Category streams
ES3	Use in Formulation of Resin Oils and Cyclic Dienes Category streams
ES4	Use of Resin Oils and Cyclic Dienes Category streams in coatings - Industrial
ES5	Use of Resin Oils and Cyclic Dienes Category streams in fuels - Industrial
ES6	Use of Resin Oils and Cyclic Dienes Category streams in fuels - Professional
ES7	Use of Resin Oils and Cyclic Dienes Category streams in fuels - Consumer
ES8	Use of Resin Oils and Cyclic Dienes Category streams in rubber manufacture - Industrial
ES9	Use of Resin Oils and Cyclic Dienes Category streams in polymer production - Industrial
ES10	Use of Resin Oils and Cyclic Dienes Category streams in polymer processing - Industrial

16.5. Key literature references and sources

CHEMICAL SAFETY REPORT for LOA Resin Oils & Cyclic Dienes Category, which include Distillates (petroleum), steam-cracked, C8-12 fraction (CAS No. 68477-54-3).
GESTIS SUBSTANCE DATABASE
EU DIRECTIVES
REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.
Regulation (EC) No 1272/2008 REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.
Regulations. Commission regulation (EU) no 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).
COMMISSION DIRECTIVE (EU) 2017/164 of 31 January 2017 establishing a fourth list of indicative occupational exposure limit values pursuant to Council Directive 98/24/EC, and amending Commission Directives 91/322/EEC, 2000/39/EC and 2009/161/EU
Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (‘Waste Framework Directive’ or ‘WFD’)
Commission Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Counci (‘List of Waste’ or ‘LoW’), as revised in 2014 and 2017
Notices from European Union Institutions, Bodies, Offices and Agencies European Commission, Commission notice on technical guidance on the classification of waste (2018/C 124/01)

Training advice

Personnel handling the product has to be acquainted demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles.

DISCLAIMER

This information is based on our current level of knowledge. This information may be subject to revision as new knowledge and experience becomes available, and SIBUR makes no warranties and assumes no liability in connection with any use of this information. Since SIBUR cannot be aware of all aspects of your business and the impact the REACH Regulation has for your company, SIBUR strongly encourages you to get familiar with the REACH Regulation in order to comply with its requirements and timelines.

Exposure Scenario 1 (ES1): Use of Resin Oils and Cyclic Dienes Category streams as intermediates

Section 1	**Exposure Scenario Title**
Title	**Intermediate use of Resin Oils and Cyclic Dienes Category Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
	Environmental Release Categories: ERC 6a
Processes, tasks, activities covered	Use as a isolated intermediate not under strictly controlled conditions
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	

Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20° C above ambient [G15]; Assumes Benzene content >25%; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated.
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
General exposure (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]; With sample collection [CS56]. With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]. Provide extract ventilation to points where emissions occur [E54]. Avoid carrying out activities involving exposure for more than 4 hours [OC28].
General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].	Handle substance within a closed system [E47]. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. or [G9]; Ensure operation is undertaken outdoors [E69].

	Avoid carrying out activities involving exposure for more than 1 hour [OC27].
General exposures (open systems) [CS16]. Batch process [CS55]; With sample collection [CS56];	Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Process sampling [CS2].	Sample via a closed loop or other system to avoid exposure [E8]. Provide extract ventilation to points where emissions occur [E54] ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
Laboratory activities [CS36].	Provide a good standard of general ventilation (not less than 10 to 15 air changes per hour) [E40]. Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12].
Bulk transfers [CS14] (open systems) [CS108]. With potential for aerosol generation [CS138].	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Bulk transfers [CS14] (closed systems) [CS107].	Ensure material transfers are under containment or extract ventilation [E66]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55]; Provide extract ventilation to points where emissions occur [E54]; Ensure operation is undertaken outdoors [E69] or [G9]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22] Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67] With occasional controlled exposure [CS140]	Provide extract ventilation to material transfer points and other openings [E82]; Store substance within a closed system [E84]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.0e6
Fraction of Regional tonnage used locally	0.015
Annual site tonnage (tonnes/year)	1.5e4
Maximum daily site tonnage (kg/day)	5.0e4
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 6.1.v1) but have been amended taking into account the requirement that the local air concentration for benzene cannot exceed 5 ug/m3 as specified by EU directive 2000/69/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	5.0e-4

Release fraction to wastewater from process (initial release prior to RMM)	1.0e-4
Release fraction to soil from process (initial release prior to RMM)	1.0e-3
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion) [TCR1j].	
Prevent discharge of undissolved substance to or recover from wastewater [TCR146]. No wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	80
Treat wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%). Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	94.9
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	5.0e6
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and bo waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and bo waste of the substance is generated [EWR 3]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect exposure of man via the environment has been amended to reflect that these streams only contain a maximum of 25% benzene.	
Risk Characterisation Ratio (RCR) inhalation	2.5E-01
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	5.1E-01
Risk Characterisation Ratio (RCR) HI	7.6E-01
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	1.6E-02
Max RCR - all compartments	7.6E-01

Exposure Scenario 2 (ES2): Distribution of Resin Oils and Cyclic Dienes Category streams

Section 1	**Exposure Scenario Title**
Title	**Distribution of Resin Oils and Cyclic Dienes Category Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15
	Environmental Release Categories: ERC 1-7
Processes, tasks, activities covered	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its distribution and associated laboratory activities
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	

Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
General exposure (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]; With sample collection [CS56]. With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]. Provide extract ventilation to points where emissions occur [E54]. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69].

General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].	Handle substance within a closed system [E47]. Provide extract ventilation to points where emissions occur [E54]. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
General exposures (open systems) [CS16]. Batch process [CS55]; With sample collection [CS56];	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Process sampling [CS2].	Handle substance within a predominantly closed system provided with extract ventilation [E49].; Sample via a closed loop or other system to avoid exposure [E8]; Provide a good standard of general or controlled ventilation (no less than 3 to 5 air changes per hour) [E11]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
Laboratory activities [CS36].	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12].
Bulk transfers [CS14] (closed systems) [CS107].	Ensure material transfers are under containment or extract ventilation [E66]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Bulk transfers [CS14] (open systems) [CS108].	Ensure material transfers are under containment or extract ventilation [E66]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Drum and small package filling [CS6].	Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour) [E40]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55]. Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22] Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67] With occasional controlled exposure [CS140]	Transfer via enclosed lines [E52]; Provide extract ventilation to points where emissions occur [E54]; Ensure operation is undertaken outdoors [E69]; Store substance within a closed system [E84].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.50e6
Fraction of Regional tonnage used locally	0.002
Annual site tonnage (tonnes/year)	5.0e3
Maximum daily site tonnage (kg/day)	5.0e4
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	100
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 6.1.v1) but have been amended taking into account the requirement that the local air concentration for benzene cannot exceed 5 ug/m3 as specified by EU directive 2000/69/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	1.0e-03
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-05
Release fraction to soil from process (initial release prior to RMM)	1.0e-05

Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion) [TCR1j].	
Prevent discharge of undissolved substance to or recover from wastewater [TCR146]. No wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	90
Treat wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%). Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	94.9
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	1.6e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and bo waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and bo waste of the substance is generated [EWR 3]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect exposure of man via the environment has been amended to reflect that these streams only contain a maximum of 25% benzene.	
Risk Characterisation Ratio (RCR) inhalation	6.0E-02
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	1.7E-02
Risk Characterisation Ratio (RCR) HI	7.7E-02
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	1.6E-03
Max RCR - all compartments	7.7E-02

Exposure Scenario 3 (ES3): Use in Formulation of Resin Oils and Cyclic Dienes Category streams

Section 1	**Exposure Scenario Title**
Title	**Formulation& (re) packaging of substances and mixtures of Resin Oils and Cyclic Dienes Category Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15
	Environmental Release Categories: ERC2
Processes, tasks, activities covered	Formulation, packing and re-packing of the substance and its mixtures in bath or continuous operations, including storage, materials transfers, mixing, large and small scale packing, maintenance and associated laboratory activities
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	
Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20° C above ambient [G15]; Assumes Benzene content >25%; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
General exposure (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]; With sample collection [CS56]. With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; Provide extract ventilation to points where emissions occur [E54].

General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].	Handle substance within a closed system [E47]. Provide extract ventilation to points where emissions occur [E54]. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
General exposures (open systems) [CS16]. Batch process [CS55]; With sample collection [CS56]; With potential for aerosol generation [CS138]	Provide extract ventilation to points where emissions occur [E54]. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Batch processes at elevated temperatures [CS136].	Handle substance within a closed system [E47]. Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 15 minutes [OC26].
Process sampling [CS2].	Handle substance within a closed system [E47]; Sample via a closed loop or other system to avoid exposure [E8]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
Laboratory activities [CS36].	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12].
Bulk transfers [CS14]	Ensure material transfers are under containment or extract ventilation [E66]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Mixing operations (open systems) [CS30]. With potential for aerosol generation [CS138].	Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Manual [CS34]; Transfer from/pouring from containers [CS22].	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Drum/batch transfers [CS8].	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC28].
Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100].	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60] ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Drum and small package filling [CS6].	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E65]. Clear spills immediately [C&H13]; Wear a respirator conforming to EN140 with Type A filter or better [PPE22]; Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67] Bench-mounted Activity [CS140]	Ensure operation is undertaken outdoors [E69]; Ensure material transfers are under containment or extract ventilation [E66]; Store substance within a closed system [E84]; Wear suitable gloves tested to EN374 [PPE15]. .

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.50e6

Fraction of Regional tonnage used locally	0.02
Annual site tonnage (tonnes/year)	3.0e4
Maximum daily site tonnage (kg/day)	1.0e5
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 6.1.v1) but have been amended taking into account the requirement that the local air concentration for benzene cannot exceed 5 ug/m3 as specified by EU directive 2000/69/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	1.0e-04
Release fraction to wastewater from process (initial release prior to RMM)	5.0e-05
Release fraction to soil from process (initial release prior to RMM)	1.0e-04
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion) [TCR1j].	
Prevent discharge of undissolved substance to or recover from wastewater [TCR146]. No wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%). Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	94.9
Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/d)	1.0e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and bo waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and bo waste of the substance is generated [EWR 3]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect exposure of man via the environment has been amended to reflect that these streams only contain a maximum of 25% benzene.	
Risk Characterisation Ratio (RCR) inhalation	4.2E-01
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	5.1E-01
Risk Characterisation Ratio (RCR) HI	9.3E-01
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	

MaxRCR- Water-related compartments	1.6E-02
Max RCR - all compartments	9.3E-01

Exposure Scenario 4 (ES4): Use of Resin Oils and Cyclic Dienes Category streams in coatings - Industrial

Section 1	**Exposure Scenario Title**
Title	**Use in coatings of Resin Oils and Cyclic Dienes Category streams in coatings - Industrial**
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC 7, PROC 8a, PROC 8b, PROC10, PROC13, PROC15
	Environmental Release Categories: ERC 4
Processes, tasks, activities covered	Covers the use in coatings (paints, inks, adhesives, etc) including exposure during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application by spray, roller, spreader, dip, flow, fluidized bed on production lines and film formation) and equipment cleaning, maintenance and associated laboratory activities.
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	

Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20°C above ambient [G15]; Assumes Benzene content >25%; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated.
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
General exposure (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]; With sample collection [CS56]. Use in contained systems [CS38].	Handle substance within a closed system [E47]; Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69].

Film formation – force drying (50-100°C). Stoving (>100°C). UV/EB radiation curing [CS94].	Handle substance within a closed system [E47]; Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69].
Mixing operations (closed systems) [CS29]; General exposures (closed systems) [CS15].	Handle substance within a closed system [E47]; Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69].
Film formation – air drying [CS95].	Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC28]; Wear a respirator conforming to EN140 with Type A filter or better [PPE24].
Spraying (automatic/robotic) [CS 97].	Carry out in a vented booth provided with laminar air flow [E59]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Manual [CS34]; Spraying [CS10].	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Wear a respirator conforming to EN 140 with Type A filter or better [PPE22].
Bulk transfers [CS14]. Bulk transfers to/from storage.	Handle substance within a closed system [E47].
Material transfers [CS3]. Non – dedicated facility [CS82]	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Ensure material transfers are under containment or extract ventilation [E66]; Avoid carrying out activities involving exposure for more than 4 hours [OC28]; or Wear a respirator conforming to EN 140 with Type A filter or better [PPE22].
Material transfers [CS3]. Dedicated facility [CS81]	Provide extract ventilation to points where emissions occur [E54]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27];or Wear a respirator conforming to EN 140 with Type A filter or better [PPE22].
Roller, spreader, flow application [CS98]	Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27];or Wear a respirator conforming to EN 140 with Type A filter or better [PPE22].
Dipping, immersion and pouring [CS4]	Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Avoid manual contact with wet work pieces [El17]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27];or Wear a respirator conforming to EN 140 with Type A filter or better [PPE22].
Laboratory activities [CS36].	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12].
Material transfers [CS3]. Drum/batch transfers [CS8]; Transfer from /pouring from containers [CS22].	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Use container to collect drips [E73]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27];or Wear a respirator conforming to EN 140 with Type A filter or better [PPE22].
Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Use container to collect drips [E73]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27];or Wear a respirator conforming to EN 140 with Type A filter or better [PPE22].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55]. Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22] Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]With occasional controlled exposure [CS137]	Handle substance within a closed system [E47]. Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69].
Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	

Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.5e3
Fraction of Regional tonnage used locally	1
Annual site tonnage (tonnes/year)	2.5e3
Maximum daily site tonnage (kg/day)	2.5e4
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	100
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emission were based on those in SPERC fact sheet (ESVOC SpERC 4.3a.v1) but have been amended taking into account the requirement that the local air concentration for benzene exceed 5ug/m3 as specified by EU directive 200/69/EC of the European Parliament and of the Council of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	1.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-3
Release fraction to soil from process (initial release prior to RMM)	0
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).[TCR1j]	
No wastewater treatment required [TCR9].	
Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Treat air emission to provide a typical removal efficiency of (%)	90
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	70.3
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	98.5
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	2.5e4
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW 3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [EWR 1]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect Human Risk benzene at 2.5%	
Risk Characterisation Ratio (RCR) inhalation	1.6E-01
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	8.4E-01
Risk Characterisation Ratio (RCR) HI	1.0E+00
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite	

technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	8.4E-01
Max RCR - all compartments	1.0E+00

Exposure Scenario 5(ES5): Use of Resin Oils and Cyclic Dienes Category streams in fuels - Industrial

Section 1	**Exposure Scenario Title**
Title	**Use in Fuels of Resin Oils and Cyclic Dienes Category streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC 8a, PROC 8b, PROC16
	Environmental Release Categories: ERC 7
Processes, tasks, activities covered	Covers the use as fuel (or fuel additive) and includes activities associated with its transfer, use, equipment, maintenance and handling of waste.
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	
Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20°C above ambient [G15]; Assumes Benzene content >25%; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
Balk transfers [CS14]	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; or [G9];Ensure operation is undertaken outdoors [E69]; Ensure material transfers are under containment or extract ventilation [E66]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Drum/bath transfers [CS8]	Use drum pumps [E53]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69].
General exposure (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]; With occasional controlled exposure [CS140].	Handle substance within a closed system [E47]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; Provide extract ventilation to points where emissions occur [E54]

General exposures (closed systems) [CS15]; Bath process [CS55]	Handle substance within a predominantly closed system provided with extract ventilation [E49]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
General exposures (open systems) [CS16]; (closed systems) [CS 107]	Handle substance within a predominantly closed system provided with extract ventilation [E49]; Provide extract ventilation to points where emissions occur [E54].
General exposures (open systems) [CS16]; (closed systems) [CS 107]; Bath process [CS55]	Handle substance within a predominantly closed system provided with extract ventilation [E49]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
Equipment maintenance [CS5].	Drain down and flush system prior to equipment break-in or maintenance [E65]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Clear spills immediately [C&H13]; Wear a respirator conforming to EN140 with Type A filter or better [PPE22]; Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Vessel and container cleaning [CS103]	Drain down and flush system prior to equipment break-in or maintenance [E55]; Provide extract ventilation to points where emissions occur [E54]; Clear spills immediately [C&H13]; Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]	Store substance within a closed system [E84].
Storage [CS67]; With occasional controlled exposure [CS140].	Sample via a closed loop or other system to avoid exposure [E8]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; Store substance within a closed system [E84].
Disposal of wastes [CS28]	Sample via a closed loop or other system to avoid exposure [E8]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.3e6
Fraction of Regional tonnage used locally	1
Annual site tonnage (tonnes/year)	1.3e6
Maximum daily site tonnage (kg/day)	4.2e6
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emission were based on those in SPERC fact sheet (ESVOC SpERC 4.3a.v1) but have been amended taking into account the requirement that the local air concentration for benzene exceed 5ug/m3 as specified by EU directive 200/69/EC of the Euripean Parliament and of the Council of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	2.0e-5
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-7
Release fraction to soil from process (initial release prior to RMM)	0
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation).[TCR1k]	
If discharging to domestic sewage treatment plant, no on-site wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	95

Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	5.4e6
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and bo waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and bo waste of the substance is generated [EWR 3]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect Human Risk benzene at 2.5%	
Risk Characterisation Ratio (RCR) inhalation	1.5E-01
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	4.3E-02
Risk Characterisation Ratio (RCR) HI	2.0E-01
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	1.4E-03
Max RCR - all compartments	2.0E-01

Exposure Scenario 6 (ES6): Use of Resin Oils and Cyclic Dienes Category streams in fuels - Professional

Section 1	**Exposure Scenario Title**
Title	**Use in Fuels of Resin Oils and Cyclic Dienes Category streams**
Use Descriptor	Sector of Use: Professional (SU22)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC 8a, PROC 8b, PROC16
	Environmental Release Categories: ERC 9A, ERC 9B
Processes, tasks, activities covered	Covers the use as fuel (or fuel additive) and includes activities associated with its transfer, use, equipment, maintenance and handling of waste.
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	
Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20°C above ambient [G15]; Assumes Benzene content >25%; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
Balk transfers [CS14]	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]; Provide extract ventilation to points where emissions occur [E54]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28]; Clear transfer lines prior to de-coupling [E39].
Drum/bath transfers [CS8]	Use drum pumps or carefully pour from container [E64]; Limit the substance content in the product to 5% [OC17]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Dipping, immersion and pouring [CS4]	Use drum pumps or carefully pour from container [E64]; Limit the substance content in the product to 5% [OC17]; Ensure material transfers are under containment or extract

	ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
General exposure (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]; With occasional controlled exposure [CS140].	Handle substance within a closed system [E47]; Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
General exposures (open systems) [CS16]; (closed systems) [CS 107]; Bath process [CS55]	Handle substance within a closed system [E47]; Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
General exposures (open systems) [CS16]; (closed systems) [CS 107];	Handle substance within a closed system [E47]; Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Clear spills immediately [C&H13]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28]; Wear a respirator conforming to EN140 with Type A filter or better [PPE22]; Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Vessel and container cleaning [CS103]	Drain down and flush system prior to equipment break-in or maintenance [E65]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Clear spills immediately [C&H13]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28]; Wear a respirator conforming to EN140 with Type A filter or better [PPE22]; Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]	Store substance within a closed system [E84].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.5e5
Fraction of Regional tonnage used locally	5.0e-4
Annual site tonnage (tonnes/year)	7.5e1
Maximum daily site tonnage (kg/day)	2.1e2
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emission were based on those in SPERC fact sheet (ESVOC SpERC 9.12b.v1)	
Release fraction to air from process (initial release prior to RMM)	1.0e-2
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-5
Release fraction to soil from process (initial release prior to RMM)	1.0e-5
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion)[TCR1k].	

No wastewater treatment required [TCR6].	
If discharging to domestic sewage treatment plant, no on-site wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Prevent environmental discharge consistent with regulatory requirements [OMS4].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	1.3e3
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and bo waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and bo waste of the substance is generated [EWR 3]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect Human Risk benzene at 2.5%	
Risk Characterisation Ratio (RCR) inhalation	3.1E-02
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	9.3E-03.
Risk Characterisation Ratio (RCR) HI	4.0E-02
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	2.2E-04
Max RCR - all compartments	4.0E-02

Exposure Scenario 7 (ES7): Use of Resin Oils and Cyclic Dienes Category streams in fuels – Consumer

Section 1	**Exposure Scenario Title**	
Title	**Use as fuel of Resin Oils and Cyclic Dienes Category streams**	
Sector of Use (SU code)	21	
Use Descriptor (PC codes)	PC13	
Processes, tasks, activities covered	Covers consumer uses in liquid fuels	
Environmental Release Category	ERC 9A, ERC 9B	
Specific Environmental Release Category	ESVOC SpERC 9.12c.v1	
Section 2	**Operational conditions and risk management measures**	
Field for additional statements to explain scenario if required- pending better understanding from ECHA		
Section 2.1 Section 2.1 Control of consumer exposure		
Product characteristics		
Physical form of product	Liquid	
Vapour pressure	10 kPa	
Concentration of substance in product	Unless otherwise stated, cover concentrations up to 100% [ConsOC1]	
Amounts used	Unless otherwise stated, covers use amounts up 37500g [ConsOC2]; covers skin contact area up to 420 cm2 [ConsOC5]	
Frequency and duration of use/exposure	Unless otherwise stated, covers use frequency up to 0.143 times per day [ConsOC4]; covers exposure up to 2 hours per event [ConsOC14]	
Other Operational Conditions affecting exposure	Unless otherwise stated, covers use at ambient temperatures [ConsOC15]; assumes use in a 20 m3 room [ConsOC11]; assumes use with typical ventilation [ConsOC8]	
Section 2.1.1	**Product categories**	
PC 13: Fuels-Liquid –subcategories added: Automotive Refuelling	**OC**	Unless otherwise stated, covers concentrations up to 100% [ConsOC1]; covers use up to 52 days/years [ConsOC3]; covers use up to 1 time/on day of use [Cons OC4]; covers skin contact area up to 210.00cm2 [ConsOC5]; for each use event, covers use amounts up to 37500g [ConsOC2]; covers outdoor use [Cons OC12]; covers use in room size of 100m3 [ConsOC11]; for each use event, covers exposure up to 0.05hr/event [ConsOC14]
	RMM	No specific RMMs developed beyond those OCs stated
PC 13: Fuels-Liquid –subcategories added: Scooter Refuelling	**OC**	Unless otherwise stated, covers concentrations up to 100% [ConsOC1]; covers use up to 52 days/years [ConsOC3]; covers use up to 1 time/on day of use [Cons OC4]; covers skin contact area up to 210.00cm2 [ConsOC5]; for each use event, covers use amounts up to 37500g [ConsOC2]; covers outdoor use [Cons OC12]; covers use in room size of 100 m3 [ConsOC11]; for each use event, covers exposure up to 0.03hr/event [ConsOC14]
	RMM	No specific RMMs developed beyond those OCs stated
PC 13: Fuels-Liquid –subcategories added: Garden Equipment - Use	**OC**	Unless otherwise stated, covers concentrations up to 100% [ConsOC1]; covers use up to 26 days/years [ConsOC3]; covers use up to 1 time/on day of use [Cons OC4]; for each use event, covers use amounts up to 750g [ConsOC2]; covers outdoor use[Cons OC12]; covers use in room size of 100 m3 [ConsOC11]; for each use event, covers exposure up to 2.00 hr/event [ConsOC14]
	RMM	No specific RMMs developed beyond those OCs stated
PC 13: Fuels-Liquid –subcategories added: Garden Equipment - Refuelling	**OC**	Unless otherwise stated, covers concentrations up to 50% [ConsOC1]; covers use up to 26 days/years [ConsOC3]; covers use up to 1 time/on day of use [Cons OC4]; covers skin contact area up to 420.00cm2 [ConsOC5]; for each use event, covers use amounts up to 750g [ConsOC2]; covers use in a one car garage (34m3) under typical ventilation [ConsOC10]; covers use in room size of 34 m3 [ConsOC11]; for each use event, covers exposure up to 0.03hr/event [ConsOC14]
	RMM	No specific RMMs developed beyond those OCs stated
PC 13: Fuels-Liquid –subcategories added: Lamp oil	**OC**	Unless otherwise stated, covers concentrations up to 100% [ConsOC1]; covers use up to 52 days/years [ConsOC3]; covers use up to 1 time/on day of use [Cons OC4]; covers skin contact area up to 210.00cm2 [ConsOC5]; for each use event, covers use amounts up to 100g [ConsOC2]; covers use in room size of 20 m3 [ConsOC11]; for each use event, covers exposure up to 0.01 hr/event [ConsOC14]
	RMM	No specific RMMs developed beyond those OCs stated
Section 2.2 Control of environmental exposure		

Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	7.5e4
Fraction of Regional tonnage used locally	5.0e-4
Annual site tonnage (tonnes/year)	3.8e1
Maximum daily site tonnage (kg/day)	1.0e2
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emission were based on those in SPERC fact sheet (ESVOC SpERC 9.12b.v1)	
Release fraction to air from process (initial release prior to RMM)	1.0e-2
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-5
Release fraction to soil from process (initial release prior to RMM)	1.0e-35
Technical conditions and measures at process level (source) to prevent release	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion)[TCR1k].	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Prevent environmental discharge consistent with regulatory requirements [OMS4].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	6.5e2
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and bo waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and bo waste of the substance is generated [EWR 3]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect Human Risk benzene at 2.5%	
Risk Characterisation Ratio (RCR) inhalation	3.1E-02
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	9.2E-03
Risk Characterisation Ratio (RCR) HI	4.0E-02
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	

MaxRCR- Water-related compartments	2.2E-04
Max RCR - all compartments	4.0E-02

Exposure Scenario 8(ES8): Use of Resin Oils and Cyclic Dienes Category streams in rubber manufacture - Industrial

Section 1	**Exposure Scenario Title**
Title	**Use in rubber manufacturing and processing of Resin Oils and Cyclic Dienes Category streams**
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC14, PROC15
	Environmental Release Categories: ERC 1, ERC 4, ERC 6D
Processes, tasks, activities covered	Manufacture of tyres and general rubber articles, including processing of raw (uncured) rubber, handling and mixing of rubber additives, vulcanizing, cooling and finishing.
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	
Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers percentage substance in the product up to 100% (unless stated differently) [G13].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20°C above ambient [G15]; Assumes Benzene content >25% except where otherwise stated; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
Material transfers [CS3]	Handle substance within a closed system [E47].
Material transfers [CS3]. With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]. Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69].
Material transfers [CS3]. Dedicated facility [CS81]. Large containers.	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Balk weighing [CS91] (closed systems) [CS107]	Handle substance within a closed system [E47].
Balk weighing [CS91] With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]; Provide extract ventilation to points where emissions occur [E54].
Small scale weighing [CS90] Dedicated facility [CS81]]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Additive premixing [CS92]; Batch process [CS55]; (closed systems) [CS107]	Handle substance within a closed system [E47]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].

Additive premixing [CS92]	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Provide extract ventilation to points where emissions occur [E54].
Material transfers [CS3]. Dedicated facility [CS81].	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Material transfers [CS3]. Small containers	Handle substance within a predominantly closed system provided with extract ventilation [E49]. Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Additive premixing [CS92] Mixing operations (open systems) [CS30]	Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Calendering (including Banburys) [CS64]	Limit the substance content in product to 5% [OC17]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Calendering (including Banburys) [CS64]	Limit the substance content in product to 5% [OC17]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Vulcanisation [CS70]	Limit the substance content in product to 5% [OC17]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; {Wear suitable gloves tested to EN 374 [PPE15]}.
Coolung cured articles [CS71]	Limit the substance content in product to 5% [OC17]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Laboratory activities [CS36]	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11]; Handle within a fume cupboard or Implement suitable equivalent methods to minimize exposure [E12].
Equipment maintenance [CS5].	Drain down and flush system prior to equipment break-in or maintenance [E55]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Clear spills immediately [C&H13]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28] Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.5e3
Fraction of Regional tonnage used locally	1
Annual site tonnage (tonnes/year)	2.5e3
Maximum daily site tonnage (kg/day)	2.5e4
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	100
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emission were based on those in SPERC fact sheet (ESVOC SpERC 4.3a.v1) but have been amended taking into account the requirement that the local air concentration for benzene exceed 5ug/m3 as specified by EU directive 200/69/EC of the European Parliament and of the Council of 16 November, 2000	

Release fraction to air from process (initial release prior to RMM)	1.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	5.0e-4
Release fraction to soil from process (initial release prior to RMM)	1.0e-4
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation).[TCR1j]	
No waste water treatment required. [TCR6]	
If discharging to domestic sewage treatment plant, no on-site wastewater treatment required. [TCR9].	
Prevent discharge of undissolved substance to or recover from onsite wastewater. [TCR 14]	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	2.5e4
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW 3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [EWR 1]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect Human Risk benzene at 2.5%	
Risk Characterisation Ratio (RCR) inhalation	3.5E-01
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	4.2E-01
Risk Characterisation Ratio (RCR) HI	7.7E-01
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	4.0E-02
Max RCR - all compartments	7.7E-01

Exposure Scenario 9 (ES9): Use of Resin Oils and Cyclic Dienes Category streams in polymer production - Industrial

Section 1	**Exposure Scenario Title**
Title	**Use in polymer production of Resin Oils and Cyclic Dienes Category streams in coatings - Industrial**
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC 6, PROC 8a, PROC 8b, PROC14
	Environmental Release Categories: ERC 6A, ERC6C
Processes, tasks, activities covered	Manufacture of polymers from monomers in continuous and batch processes, include sparging, discharging, and reactor maintenance and immediate polymer product formation (i.e. compounding, pelletisation, product-off-gassing).
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	
Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20°C above ambient [G15]; Assumes Benzene content >25% except where otherwise stated; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
General exposure (closed systems) [CS15]. Continuous process [CS54]; No sampling [CS57]	Handle substance within a closed system [E47].
Bulk transfers [CS14]; Transport [CS58]; with sample collection [CS56]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11] or [G9]; Ensure operation is undertaken outdoors [E69];

	Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Polymerisation (bulk and batch) [CS65]; Batch process [CS55]; with sample collection [CS56]	Handle substance within a closed system [E47]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Polymerisation (bulk and batch) [CS65]; Continuous process [CS54]; with sample collection [CS56]	Handle substance within a closed system [E47]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Finishing operations {CS102]; Batch process [CS55]; Catalyst inactivation and removal, washing and stripping/distillation to remove unreacted monomer	Handle substance within a closed system [E47]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Intermediate polymer storage [CS66]	Limit the substance content in the product to 5% [OC17]; Provide extract ventilation to points where emissions occur [E54].
Addition and stabilization [CS69]	Limit the substance content in the product to 5% [OC17]; Handle substance within a predominantly closed system provided with extract ventilation [E49].
Mixing in containers [CS23]. Batch process [CS55].	Limit the substance content in the product to 5% [OC17]; Provide extract ventilation to points where emissions occur [E54]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11].
Pelletizing [CS53]. Extrusion and masterbatching [CS88]	Limit the substance content in the product to 5% [OC17]; Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. or [G9]; Ensure operation is undertaken outdoors [E69].
Pelletizing [CS53].	Limit the substance content in the product to 5% [OC17]; Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. or [G9]; Ensure operation is undertaken outdoors [E69].
Pelletisation and pellet screening [CS68] (open systems) [CS108]	Limit the substance content in the product to 5% [OC17]; Ensure material transfers are under containment or extract ventilation [E66].
Bulk transfers [CS14]. Continuous process [CS54]; with sample collection [CS56]	Limit the substance content in the product to 5% [OC17]; Ensure material transfers are under containment or extract ventilation [E66].
Transport [CS58] With sample collection [CS56]	Limit the substance content in the product to 5% [OC17]; Ensure material transfers are under containment or extract ventilation [E66].
Equipment maintenance [CS5].	Drain down and flush system prior to equipment break-in or maintenance [E55]. Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22] Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]With occasional controlled exposure [CS140]	Limit the substance content in the product to 5% [OC17]; Sample via closed loop or other system to avoid exposure [E8]; Store substance within a closed system [E84]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.5e3
Fraction of Regional tonnage used locally	1
Annual site tonnage (tonnes/year)	2.5e3
Maximum daily site tonnage (kg/day)	2.5e4
Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	100
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	

Emission were based on those in SPERC fact sheet (ESVOC SpERC 4.3a.v1) but have been amended taking into account the requirement that the local air concentration for benzene exceed 5ug/m3 as specified by EU directive 200/69/EC of the European Parliament and of the Council of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	5.0e-4
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-4
Release fraction to soil from process (initial release prior to RMM)	1.0e-4
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).[TCR1j]	
No wastewater treatment required [TCR9].	
Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Treat air emission to provide a typical removal efficiency of (%)	80
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	98.5
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	5.0e4
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW 3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [EWR 1]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect Human Risk benzene at 2.5%	
Risk Characterisation Ratio (RCR) inhalation	4.4E-02
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	8.4E-02
Risk Characterisation Ratio (RCR) HI	1.3E-01
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	8.1E-03
Max RCR - all compartments	1.3E-01

Exposure Scenario 10 (ES10): Use of Resin Oils and Cyclic Dienes Category streams in polymer processing - Industrial

Section 1	**Exposure Scenario Title**
Title	**Use in polymer processing of Resin Oils and Cyclic Dienes Category streams in coatings - Industrial**
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC 6, PROC 8a, PROC 8b, PROC 9, PROC13, PROC14
	Environmental Release Categories: ERC 6D
Processes, tasks, activities covered	Processing of formulated polymers including material transfers, additives handling (e.g. pigments, stabilizers, fillers, plastisers, etc), moulding, curing and forming activities, material re-works, storage and associated maintenance.
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required	
Section 2.1 Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	*Not applicable*
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [G2].
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting exposure	Assumes use at not >20°C above ambient [G15]; Assumes Benzene content >25% except where otherwise stated; Assumes DCPD content >25% except where stated ; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
	Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: *1. Technical measures to prevent release,* *2. Technical measures to prevent dispersion,* *3. Organisational measures,* *4. Personal protection, Phrases between brackets are good practice only, beyond REACH Chemical Safety Assessment and may be communicated in section 5 of the ES or within the main sections of the SDS.*
General Measures (carcinogens) [G18].	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance [G20].
Bulk transfers [CS14];(closed systems) [CS107]	Handle substance within a closed system [E47].
Bulk transfers [CS14];(closed systems) [CS107]; With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. or [G9]; Ensure operation is undertaken outdoors [E69].

Bulk transfers [CS14]; Dedicated facility [CS81]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69].
Bulk weighing [CS91] (closed systems) [CS 107]	Handle substance within a closed system [E47].
Bulk weighing [CS91]; Wwith occasional controlled exposure [CS140]	Handle substance within a closed system [E47]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Small scale weighing [CS90]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Additive premixing [CS92] (closed systems) [CS 107]	Handle substance within a closed system [E47]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Additive premixing [CS92] (open systems) [CS 108]; With sample collection [CS56]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC28].
Additive premixing [CS92] General exposures (open systems) [C16]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC28].
Bulk transfers [CS14]. Drum/batch transfers [CS8]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC28].
Bulk transfers [CS14]. Small package filling [CS7]	Ensure material transfers are under containment or extract ventilation [E66]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Avoid carrying out activities involving exposure for more than 4 hours [OC28]; {Provide extract ventilation to material transfer points and other openings [E82]} {Wear suitable gloves testing to EN374 [PPE15]}.
Calendering (including Banburys) [CS64]	Limit the substance content in product to 5% [OC17]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Production of articles by dipping and pouring [CS113]	Limit the substance content in product to 5% [OC17]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Extrusion and masterbatching [CS88]	Limit the substance content in product to 5% [OC17]; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Injection moulding of articles [CS89]	Limit the substance content in product to 5% [OC17]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Provide extract ventilation to material transfer points and other openings [E82].
Equipment maintenance [CS5].	Drain down and flush system prior to equipment break-in or maintenance [65]; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]; Clear spills immediately [C&H13]; Avoid carrying out activities involving exposure for more than 1 hour [OC27]; Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11] or [G9]; Ensure operation is undertaken outdoors [E69]; Provide extract ventilation to points where emissions occur [E54].

Section 2.2 Control of environmental exposure

Product characteristics

Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.

Amounts used

Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	5.0e3
Fraction of Regional tonnage used locally	1
Annual site tonnage (tonnes/year)	5.0e3
Maximum daily site tonnage (kg/day)	5.0e4

Frequency and duration of use	
Continuous release. [FD2]	
Emission days (days/year)	100
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emission were based on those in SPERC fact sheet (ESVOC SpERC 4.3a.v1) but have been amended taking into account the requirement that the local air concentration for benzene exceed 5ug/m3 as specified by EU directive 200/69/EC of the European Parliament and of the Council of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	5.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	0
Release fraction to soil from process (initial release prior to RMM)	1.0e-5
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used. [TCS1]	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).[TCR1k]	
No wastewater treatment required [TCR6].	
If discharging to domestic sewage treatment planr, no on-site wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	80
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	5.0e4
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW 3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [EWR 1]	
Section 3 Exposure Estimation	
3.1. Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21 *When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*	
3.2. Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model [EE2].	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.	
Indirect Human Risk benzene at 2.5%	
Risk Characterisation Ratio (RCR) inhalation	5.8E-01
Risk Characterisation Ratio (RCR) ingestion (w/o inhalation)	1.1E-02
Risk Characterisation Ratio (RCR) HI	5.9E-01
4.2. Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]	
MaxRCR- Water-related compartments	2.1E-04
Max RCR - all compartments	5.9E-01