
SAFETY DATA SHEET

Annex 3

Exposure scenario

LIQUID PYROLYSIS PRODUCTS, FRACTION C9

CAS #:68477-54-3

EC #:270-737-2

Resin Oils & Cyclic Dienes Category (LOA)

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1. EXPOSURE ASSESSMENT

The following generic uses were evaluated in the exposure assessment of Resin Oils and Cyclic Dienes Category streams.

ES number	Volume (EU tonnes per year per use)	Manufacture	Identified uses			Resulting cycle stage		Linked Identified Use to	Sector of Use (SU)	Preparation Category (PC)	Process category (PROC)	Article category (AC)	Environmental Release Category (ERC)	EU tonnage (ktonnes/yr)	Regional fraction
			Formulation	End use	Consumer use	Service life (for articles)	Waste stage								
ES 1	Manufacture of substances: Industrial	X						1 Ind	8,9,3	NA	1, 2, 3, 4, 8a, 8b, 15	NA	1, 4	2.50E+07	0.1
ES 2	Use as Intermediate: Industrial			X				1A Ind	8,9,3	NA	1, 2, 3, 4, 8a, 8b, 15	NA	6a	1.00E+07	0.1
ES 3	Distribution: Industrial (X				1B Ind	3	NA	1, 2, 3, 4, 8a, 8b, 9,15	NA	1, 2, 3, 4, 5, 6, 7	2.50E+07	0.1
ES 4	Formulation & packing of preparations and mixtures: Industrial		X					2 Ind	3	NA	1, 2, 3, 4, 8a, 8b, 9,14,15	NA	2	1.50E+07	0.1
ES 5	Uses in Coatings: Industrial			X				3 Ind	3	NA	1, 2, 3, 4, 5, 7, 8a, 8b, 10, 13,15	NA	4	1.26E+07	0.1
ES 6	Use as a fuel: Industrial			X				12 Ind	3	NA	1, 2, 3, 8a, 8b, 16	NA	7	1.50E+06	0.1
ES 7	Use as a fuel: Professional			X				12 Pro	22	NA	1, 2, 3, 8a, 8b, 16,	NA	9a, 9b	7.50E+05	0.1
ES 8	Polymer production: Industrial			X				20 Ind	10, 3	NA	1, 2, 3, 4, 5, 6, 8a, 8b, 9, 14, 21	NA	4, 6c	2.50E+04	0.1
ES 9	Polymer processing: Industrial			X				21 Ind	10, 3	NA	1, 2, 3, 4, 5, 6, 8a, 8b, 9,13, 14, 21	NA	4,	5.00E+04	0.1
ES 10	Rubber production and processing: Industrial			X				19 Ind	10, 3	NA	1, 2, 3, 4, 5, 6, 8a, 8b, 14, 7, 9, 13, 15, 21	NA	1, 4, 6d	2.50E+04	0.1

9a Carcinogenicity (R45) and mutagenicity (R46) hazard qualitative risk assessment

The general approach aims to reduce/avoid contact or incidents with the substance. However, implementation of risk management measures (RMMs) and operational conditions (OCs) needs to be proportional to the degree of concern for the health hazard presented by the substance. Exposures should be controlled to at least the levels that represent an acceptable level of risk, i.e. implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the hazard of the substance is negligible, and the risk is considered to be controlled to a level of no concern.

For carcinogenic and mutagenic hazards a qualitative risk assessment was conducted and handling and storage risk management measures that are generally identified to control potential risks are outlined in Appendix C.1. A review of these RMMs indicates that if the user complies with the following generic statement, risks due to carcinogenic and mutagenic hazards are considered to be controlled:

- *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]*

1b Skin irritation (R38) qualitative assessment

This general qualitative CSA approach aims to reduce/avoid contact or incidents with the substance. However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance. Exposures should be controlled to at least the levels that represent an acceptable level of risk, i.e. implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the hazard of the substance is negligible, and the risk is considered to be controlled to a level of no concern.

For skin irritation a qualitative risk characterisation was conducted. Handling and storage risk management measures that are generally identified for skin irritation and identified in the Table given in Appendix C.2.

A review of these RMMs indicates that if the user complies with the following generic statements, risks due to skin irritation can be considered to be adequately controlled:

E3: Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if direct hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin effects that may develop.

Plus (where there is the potential for additional and significant aerosol exposure, e.g. associated with PROCs 7, 11, 17 or 18):

E4: Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

1c Aspiration hazard (R65) qualitative assessment

‘Aspiration’ means the entry of a liquid substance directly into the trachea and lower respiratory tract. Aspiration of hydrocarbon substances can result in severe acute effects such as chemical pneumonitis, varying degrees of pulmonary injury or death. This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage. Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties.

The R65 risk phrase (Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. viscosity) that can occur during ingestion and also if it is vomited following ingestion. A DNEL cannot be derived.

This general qualitative CSA approach (Appendix C.3) aims to reduce/avoid contact or incidents with the substance. However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance. Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.

There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk. For any substance, classified as R65, these measures should be communicated via the safety data sheet by use of the following phrase:

- Do not ingest. If swallowed then seek immediate medical assistance.

1.1. Exposure scenario 1: Manufacture of Resin Oils and Cyclic Dienes Category streams

1.1.1. Exposure scenario

Section 1	Exposure Scenario Title
Title	Manufacture 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: ERC1, ERC4, ERC6a
Processes, tasks, activities covered	Manufacture of the substance or use as an intermediate or process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% (unless otherwise stated) Assumes DCPD content >25% (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>

Category L (DCDP rich) LOA

<p>General measures (carcinogens) [G18]</p>	<p>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].</p>
<p>General exposures (closed systems) [CS15].</p>	<p>Handle substance within a closed system [E47].</p>
<p>General exposures (closed systems) [CS15]. With sample collection [CS56]. With occasional controlled exposure [CS140]</p>	<p>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 [OC 28]. Wear suitable gloves tested to EN374 [PPE15].</p>
<p>General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].</p>	<p>Handle substance within a closed system [E47]. Provide a good standard of general or controlled 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]. Wear suitable gloves tested to EN374 [PPE15].</p>
<p>General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].</p>	<p>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]. Wear suitable gloves tested to EN374 [PPE15].</p>
<p>Process sampling [CS2].</p>	<p>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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].</p>
<p>Laboratory activities [CS36].</p>	<p>Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]. Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12].</p>
<p>Bulk transfers [CS14]. (open systems) [CS108]. With potential for aerosol generation [CS138].</p>	<p>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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].</p>
<p>Bulk transfers [CS14]. (closed systems) [CS107];</p>	<p>Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 1 hour [OC 27]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].</p>

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 or controlled 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)	2.5e6
Fraction of Regional tonnage used locally	0.24
Annual site tonnage (tonnes/year)	6.0e5
Maximum daily site tonnage (kg/day)	2.0e6
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	40
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 1.1.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-2
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-3
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).. [TCR1k]. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of $\geq 53.9\%$ [TCR10]. Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Treat air emission to provide a typical removal efficiency of (%)	90
Treat wastewater (prior to receiving water discharge) to provide the required removal efficiency \geq (%). 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)	2.0e6
Assumed domestic sewage treatment plant flow (m^3/d)	10000

Conditions and measures related to external treatment of waste for disposal	
During manufacturing no waste of the substance is generated [ETW4].	
Conditions and measures related to external recovery of waste	
During manufacturing no waste of the substance is generated [ERW2].	
Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>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 ESVOG (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

1.1.2. Exposure estimation

1.1.2.1. Workers exposure

The worker exposure estimates for the activities associated with the manufacturing of for Resin Oils and Cyclic Dienes Category streams were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.1.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

APPENDIX B: ENVIRONMENTAL EXPOSURE

1.1.2.4. Environmental exposure

See Appendix B.

1.2. Exposure scenario 2: Use of Resin Oils and Cyclic Dienes Category streams as intermediates

Intermediate use of Resin Oils and Cyclic Dienes Streams by workers is covered within exposure scenario 1: Manufacture of Resin Oils and Cyclic Dienes Streams

1.2.1. Exposure scenario

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
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
See Exposure 1: Manufacture of Fuel Oil Streams	

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 6.1a.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)	2.5e-2
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-3
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 [TCR14]. If discharging to domestic sewage treatment plant, no wastewater treatment required [TCR10].	
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 \geq (%) 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)	5.0e4
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
The substance is consumed during use and no waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
The substance is consumed during use and no waste of the substance is generated [ERW3].	

1.2.2. Exposure estimation

1.2.2.1. Workers exposure

Not applicable

1.2.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

1.2.2.4. Environmental exposure

See Appendix B.

1.3. Exposure scenario 3: Distribution of Resin Oils and Cyclic Dienes streams

1.3.1. Exposure scenario

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: ERC1-7
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
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% (unless otherwise stated) Assumes DCPD content >25% (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>
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 exposures (closed systems) [CS15].	Handle substance within a closed system [E47].Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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 [OC 27].
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 1 hour [OC27].ear suitable gloves tested to EN374 [PPE15].
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 1 hour [OC27].ear suitable gloves tested to EN374 [PPE15].
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 1 hour [OC27]. Wear suitable gloves tested to EN374 [PPE15].
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]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]Wear suitable gloves tested to EN374 [PPE15].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55].Clear spills immediately [C&H13]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]; Wear suitable gloves tested to EN374 [PPE15]. 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].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)	2.5e6
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)	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 1.1b.v1)	
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 inhalation). [TCR1k]. Prevent discharge of undissolved substance to or recover from wastewater [TCR14]. If discharging to domestic sewage treatment plant, no wastewater treatment required [TCR10].	
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 \geq (%) Treatment may be onsite or via a municipal sewage treatment plant.	0.00
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	
The substance is consumed during use and no waste of the substance is generated [ETW5].	
Conditions and measures related to external recovery of waste	
The substance is consumed during use and no waste of the substance is generated [ERW3].	

Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>

4.2. Environment	<i>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]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

1.3.2. Exposure estimation

1.3.2.1. Workers exposure

The worker exposure estimates for the activities associated with the distribution of for Resin Oils and Cyclic Dienes Category streams were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.3.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

1.3.2.4. Environmental exposure

See Appendix B.

1.4. Exposure scenario 4: Use in Formulation of Resin Oils and Cyclic Dienes Category streams

1.4.1. Exposure scenario

Title	Formulation & (re)packaging of substances and mixtures of Resin Oils and Cyclic Dienes Category streams
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	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 batch 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
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% Assumes DCPD content >25% Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures <i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>
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 exposures (closed systems) [CS15].	Handle substance within a closed system [E47]. Wear suitable gloves tested to EN374 [PPE15].

General exposures (closed systems) [CS15]. With sample collection [CS56]. Bench-mounted Activity [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]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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 1 hour [OC27]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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 [OC27]. Wear suitable gloves tested to EN374 [PPE15].
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 1 hour [OC27]. Wear suitable gloves tested to EN374 [PPE15].
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 [OC28]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Production or preparation of articles by tableting, 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]. Wear suitable gloves tested to EN374 [PPE15].

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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]. Wear suitable gloves tested to EN374 [PPE15].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55]. Clear spills immediately [C&H13]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable coveralls to prevent exposure to the skin [PPE27]. 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]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]. 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)	1.5e6
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 2.2.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 (after typical onsite RMMs consistent with EU Solvent Emissions Directive requirements) [OOC11]	1.0e-4
Release fraction to wastewater from process (initial release prior to RMM)	5.0e-5
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]. 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. [TCR14]	
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 (%)	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	
External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [ERW1]	

Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>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 ESVO (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

1.4.2. Exposure estimation

1.4.2.1. Workers exposure

The worker exposure estimates for the activities associated with the use in formulation of for Resin Oils and Cyclic Dienes Category streams were assessed using ECETOC TRAv2. See Appendix A). Appendix A contains Tables 1 and 2, used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.4.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

1.4.2.4. Environmental exposure

See Appendix B.

1.5. Exposure scenario 5: Use of Resin Oils and Cyclic Dienes Category streams in coatings - Industrial

1.5.1. Exposure scenario

Section 1	Exposure Scenario Title
Title	Use in coatings of Resin Oils and Cyclic Dienes Category streams
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC7, PROC8a, PROC8b, PROC10, PROC13, PROC15
	Environmental Release Categories: ERC 4
Processes, tasks, activities covered	Covers the use in coatings (paints, inks, adhesives, etc) including exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application by spray, roller, spreader, dip, flow, fluidised bed on production lines and film formation) and equipment cleaning, maintenance and associated laboratory activities.
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content of >25% unless otherwise stated. Assumes DCPD content of >25% unless otherwise stated. Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>
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].

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General exposures (closed systems) [CS15].	Handle substance within a closed system [E47].Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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]. or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
Preparation of material for application [CS96]. Mixing operations (open systems) [CS30].	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].or: Wear a full face respirator conforming to EN140 with Type A filter or better. [PPE24]
Spraying (automatic/robotic) [CS97]	Limit the substance content in the product to 25% [OC18].Carry out in a vented booth provided with laminar airflow [E59]. Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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]. Avoid carrying out activities involving exposure for more than 4 hours [OC28] Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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 EN140 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 [OC27]. or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].

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 [OC27]. or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
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 [E117]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]. or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
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 [OC27]. or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
Production or preparation of articles by tableting, 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 [OC27]. or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
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]	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]. 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)	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	
Emissions 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 cannot exceed 5 ug/m ³ 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)	1e-3
Release fraction to wastewater from process (initial release prior to RMM)	1e-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 freshwater sediment [TCR1b]. 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. [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.	98.5
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 (%)	98.5
Maximum allowable site tonnage (M _{safe}) based on release following total wastewater treatment removal (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. [ETW3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [ERW1]	

Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>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</i>

	<i>provided in factsheet for SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

1.5.2. Exposure estimation

1.5.2.1. Workers exposure

The worker exposure estimates for the activities associated with the industrial use in coatings of for Resin Oils and Cyclic Dienes Category were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.5.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

1.5.2.4. Environmental exposure

See Appendix B.

1.6. Exposure scenario 6: Use of Resin Oils and Cyclic Dienes Category streams in fuels - Industrial

1.6.1. Exposure scenario

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, PROC8a, PROC8b, PROC16
	Environmental Release Categories: ERC7
Processes, tasks, activities covered	Covers the use as a 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
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% (unless otherwise stated) Assumes DCPD content >25% (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures <i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>

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].	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 1 hour [OC27]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Drum/batch 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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
General exposures (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]. Wear suitable gloves tested to EN374 [PPE15].
General exposures (closed systems) [CS15]. Batch 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) [CS107]	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) [CS107]. Batch 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 [OC27].
Equipment maintenance [CS5].	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]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training [PPE17]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].

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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]. Wear suitable gloves tested to EN374 [PPE15].
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	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 7.12a.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)	2e-5
Release fraction to wastewater from process (initial release prior to RMM)	1e-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 freshwater sediment [TCR1b]. If discharging to domestic sewage treatment plant, no on-site wastewater treatment required [TCR9].	
Treat air emission to provide a typical removal efficiency of (%)	95.0
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.	
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)	5.4e6
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 no waste of the substance is generated. [ETW5]	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated. [ERW3]	

Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>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 SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

1.6.2. Exposure estimation

1.6.2.1. Workers exposure

The worker exposure estimates for activities associated with the industrial use in fuels of for Resin Oils and Cyclic Dienes Category were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.6.2.2. Consumer exposure

Not applicable

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

See Table B.1: LocalCSR Worksheet

1.6.2.4. Environmental exposure

See Appendix B.

1.7. Exposure scenario 7: Use of Resin Oils and Cyclic Dienes Category streams in fuels – Professional

1.7.1. Exposure scenario

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, PROC8a, PROC8b, PROC16
	Environmental Release Categories: ERC 9A, ERC 9B
Processes, tasks, activities covered	Covers the use as a 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
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% (unless otherwise stated) Assumes DCPD content >25% (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>
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].

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Bulk 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 1 hour [OC27].Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training [PPE16]. Clear transfer lines prior to de-coupling [E39].
Drum/batch 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 [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training [PPE16].
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 [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training [PPE16].
General exposures (closed systems) [CS15].	Handle substance within a closed system [E47]. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training [PPE16].
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 [OC27].
General exposures (open systems) [CS16]. (closed systems) [CS107]. Batch 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 [OC27]. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training [PPE16].
General exposures (open systems) [CS16]. (closed systems) [CS107]	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]. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training [PPE16].
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 [OC28]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training [PPE16]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENV4].
Vessel and container cleaning [CS103]	Drain down 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 [OC28]. Wear a

	respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]	Store substance within a closed system [E84]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].

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	1
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	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 9.12b.v1)	
Release fraction to air from process (initial release prior to RMM)	1e-2
Release fraction to wastewater from process (initial release prior to RMM)	1e-5
Release fraction to soil from process (initial release prior to RMM)	1e-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 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 (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency \geq (%) 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 (%)	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)	1.2e3
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 no waste of the substance is generated. [ETW5]	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated. [ERW3]	

Section 3	Exposure Estimation
3.1. Health	<i>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected</i>

	<i>to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>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 SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

1.7.2. Exposure estimation

1.7.2.1. Workers exposure

The worker exposure estimates for activities associated with the professional use in fuels of for Resin Oils and Cyclic Dienes Category streams were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.7.2.2. Consumer exposure

Not applicable

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

See Table B.1: LocalCSR Worksheet

1.7.2.4. Environmental exposure

See Appendix B.

1.8. Exposure scenario 8: Use of Resin Oils and Cyclic Dienes Category streams in rubber manufacture – Industrial

1.8.1. Exposure scenario

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 (SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC7, PROC8a, PROC8b, PROC13, PROC14, PROC21
	Environmental Release Categories: ERC6D
Processes, tasks, activities covered	Manufacture of tyres and general rubber articles, including processing of raw (uncured) rubber, handling and mixing of rubber additives, vulcanising, cooling and finishing.
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% except where otherwise stated Assumes DCPD content >25% except where otherwise stated Assumes a good basic standard of occupational hygiene is implemented [G1].
	0
Contributing Scenarios	Risk Management Measures
	<i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>

Category L (DCDP rich) LOA

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].
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 [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Bulk weighing [CS91]. (closed systems) [CS107].	Handle substance within a closed system [E47].
Bulk 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 [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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 [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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 [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].

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 [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Calendering (including Banburys) [CS64]	Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Calendering (including Banburys) [CS64]	Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Pressing uncured rubber blanks [CS73]	Limit the substance content in the 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 points where emissions occur [E54]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Vulcanisation [CS70]	Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Cooling cured articles [CS71]	Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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].
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]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. 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

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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	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 4.19.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-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 ingestion). [TCR1j]. 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. [TCR14]	
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.	
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)	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. [ETW3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [ERW1]	

Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>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].</i>

	<i>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 SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

9.8.2. Exposure estimation

9.8.2.1. Workers exposure

The worker exposure estimates for activities associated with the use in rubber manufacture of for Resin Oils and Cyclic Dienes Category streams were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.8.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

18.2.4. Environmental exposure

See Appendix B.

1.9. Exposure scenario 10: Use of Resin Oils and Cyclic Dienes Category streams in polymer production – Industrial

1.9.1. Exposure scenario

Section 1	Exposure Scenario Title
Title	Use in polymer production of Resin Oils and Cyclic Dienes Category streams
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC14, PROC21
	Environmental Release Categories: ERC6A, 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
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% except where otherwise stated Assumes DCPD content >25% except where otherwise stated Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>

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 exposures (closed systems) [CS15]. Continuous process [CS54]. No sampling [CS57].	Handle substance within a closed system [E47]. Wear suitable gloves tested to EN374 [PPE15].
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 or controlled 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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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 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 1 hour [OC 27].
Finishing operations [CS102]. Batch process [CS55]. With sample collection [CS56]. 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 [OC 27].
Intermediate polymer storage [CS66]	Limit the substance content in the product to 5% [OC17]. Provide extract ventilation to points where emissions occur [E54]. Wear suitable gloves tested to EN374 [PPE15].
Additivation and stabilisation [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 or controlled ventilation (not less than 3 to 5 air changes per hour) [E11].

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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 or controlled 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
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 or controlled ventilation (not less than 3 to 5 air changes per hour) [E11]. or [G9]; Ensure operation is undertaken outdoors [E69]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
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 a 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 [OC 27]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].

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)	2.5e4
Fraction of Regional tonnage used locally	0.6
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)	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 4.21.a. 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)	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 ingestion). [TCR1j]. 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. [TCR14]	
Treat air emission to provide a typical removal efficiency of (%)	80
Treat wastewater (prior to receiving water discharge) to provide the required removal efficiency \geq (%). 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	
External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [ERW1]	

Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>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 SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.

Control of Worker Exposure

<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
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Control of environmental exposure

<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
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1.9.2. Exposure estimation

1.9.2.1. Workers exposure

The worker exposure estimates for activities associated with the industrial use in polymer production of for Resin Oils and Cyclic Dienes Category streams were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.9.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

1.9.2.4. Environmental exposure

See Appendix B.

1.10. Exposure scenario 10: Use of Resin Oils and Cyclic Dienes Category streams in polymer processing – Industrial

1.10.1. Exposure scenario

Section 1	Exposure Scenario Title
Title	Use in polymer processing of Resin Oils and Cyclic Dienes Category streams
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC21
	Environmental Release Categories: ERC 6D
Processes, tasks, activities covered	Processing of formulated polymers including material transfers, additives handling (e.g. pigments, stabilisers, fillers, plasticisers, etc.), moulding, curing and forming activities, material re-works, storage and associated maintenance.
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
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	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% except where stated Assumes DCPD content >25% except where stated Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>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 advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>
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

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	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]. Wear suitable gloves tested to EN374 [PPE15].
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) [CS107].	Handle substance within a closed system [E47]. Wear suitable gloves tested to EN374 [PPE15].
Bulk weighing [CS91]. With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]. Limit the substance content in the product to 25% [OC18]. 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]. Wear suitable gloves tested to EN374 [PPE15].
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) [CS107]	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) [CS108]. 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] Wear suitable gloves tested to EN374 [PPE15].
Additive premixing [CS92]. General exposures (open systems) [CS16].	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]. Wear suitable gloves tested to EN374 [PPE15].

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 1 hour [OC27]. Wear suitable gloves tested to EN374 [PPE15].
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]. Wear suitable gloves tested to EN374 [PPE15].
Calendering (including Banburys) [CS64]	Limit the substance content in the 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]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Production of articles by dipping and pouring [CS113].	Limit the substance content in the 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 the 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 EN374 [PPE15].
Injection moulding of articles [CS89]	Limit the substance content in the 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]. Wear suitable gloves tested to EN374 [PPE15].
Equipment maintenance [CS5].	Drain down system prior to equipment break-in or maintenance [E65]. 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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. 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]. 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)	5.0e3

Category L (DCDP rich) LOA

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	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 8.21b. 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)	7.5e-1
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 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 (%)	80
Treat wastewater (prior to receiving water discharge) to provide the required removal efficiency \geq (%). 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)	5.0e4
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. [ETW3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [ERW1]	

Section 3	Exposure Estimation
3.1. Health	<i>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.</i>
3.2. Environment	<i>The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].</i>
Section 4	Guidance to check compliance with the Exposure Scenario
4.1. Health	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
4.2. Environment	<i>Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define</i>

	<i>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 SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]</i>
Section 5	Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
Control of environmental exposure	
<i>Selection of relevant RMM Core Phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

1.10.2. Exposure estimation

1.10.2.1. Workers exposure

The worker exposure estimates for activities associated with the industrial use in polymer processing of for Resin Oils and Cyclic Dienes Category were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.10.2.2. Consumer exposure

Not applicable.

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

See Table B.1: LocalCSR Worksheet

1.10.2.4. Environmental exposure

See Appendix B.

1.11 Regional Exposure Concentrations

See Appendix B.

2. RISK CHARACTERISATION

As the substance is a hydrocarbon UVCB the hydrocarbon block method has been used for environmental risk assessment (see REACH guidance, R7, app.13-1). For the environmental modelling aquatic PNECs for the hydrocarbon blocks have been derived using the HC5 statistical extrapolation method and the target lipid model using representative structures, see Appendix B.

LOCAL DERMAL REFERENCE VALUE:

In the absence of experimental animal data or human case reports indicating a potential to cause local toxicity, a reference value for local effects was developed based on information indicating that these streams are likely to irritate skin i.e. dermal responses triggering classification would be expected following dermal application of 0.5 ml liquid (approx. 470 mg, based on density 0.902 – 0.972 g/ml) to 6 cm² of rabbit skin (conditions assumed identical to those of EU guideline B4). In view of the response obtained, it is not unreasonable to predict that no irritation would occur after application of one third of the guideline amount (157 mg). This is equivalent to local dermal reference dose of 26 mg/cm².

INHALATION LONG-TERM SYSTEMIC REFERENCE VALUE

The inhalation long-term systemic reference value for Category L for the general population reflects the internal dose of styrene received at the consumer DNEL (10.2 mg/m³) after applying a standard respiratory volume of 0.288 m³/kg bwt. This is equivalent to an internal dose of 2.9 mg/kg bwt/day. (Note: 100% uptake assumed, based on RAR.)

Table 1. DN(M)ELs for workers

Exposure pattern	Route	Descriptor	DNEL / DMEL
Acute - systemic effects	Dermal (mg.kg ⁻¹ .d ⁻¹)	not quantifiable	
Acute - systemic effects	Inhalation (mgm ⁻³)	not quantifiable	
Acute - local effects	Dermal (mg.kg ⁻¹ .d ⁻¹)	not quantifiable	
Acute - local effects	Inhalation (mgm ⁻³)	not quantifiable	
Long-term systemic effects	Dermal (mg.kg ⁻¹ .d ⁻¹)	DNEL (DCPD)	23.4
Long-term systemic effects	Inhalation (mgm ⁻³)	DMEL (benzene)	3.25
Long-term - local effects	Dermal ((mg.kg ⁻¹ .d ⁻¹)	not quantifiable	
Long-term - local effects	Inhalation (mgm ⁻³)	not quantifiable	

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

2.1 Human Health

2.1.1. Exposure Scenario 1: Manufacture of Resin Oils and Cyclic Dienes Category

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
General exposures (closed systems) [CS15].	0.01	0.20	0.21
General exposures (closed systems) [CS15]. With sample collection [CS56].	0.60	0.08	0.68
General exposures (closed systems) [CS15].	0.35	0.10	0.45
General exposures (open systems) [CS16].	0.28	0.40	0.68
Process sampling [CS2].	0.70	0.20	0.90
Laboratory activities [CS36].	0.30	0.10	0.40
Bulk transfers [CS14]. (open systems) [CS108]	0.63	0.20	0.83
Bulk transfers [CS14]. (closed systems) [CS107];	0.30	0.20	0.50
Equipment cleaning and maintenance [CS39].	0.35	0.40	0.75
Storage [CS67]	0.42	0.40	0.82

2.1.1.1. Consumers

Not relevant for this ES

2.1.2 Exposure Scenario 2: Use of Resin Oils and Cyclic Dienes Category as intermediates

Use as an intermediate for the worker is covered by

2.1.3 Exposure Scenario 3: Distribution of Resin Oils and Cyclic Dienes Category

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
General exposures (closed systems) [CS15].	0.01	0.20	0.21
General exposures (closed systems) [CS15]. With sample collection [CS56].	0.70	0.08	0.78
General exposures (closed systems) [CS15].	0.35	0.10	0.45
General exposures (open systems) [CS16].	0.28	0.40	0.68
Process sampling [CS2].	0.35	0.10	0.45
Laboratory activities [CS36].	0.30	0.10	0.40
Bulk transfers [CS14]. (closed systems) [CS107]	0.21	0.40	0.61
Bulk transfers [CS14]. (open systems) [CS108]	0.21	0.40	0.61
Drum and small package filling [CS6].	0.45	0.40	0.85
Equipment cleaning and maintenance [CS39].	0.10	0.81	0.91
Storage [CS67]	0.14	0.81	0.95

2.1.3.1. Consumers

Not relevant for this ES

2.1.4 Exposure Scenario 4: Formulation of Resin Oils and Cyclic Dienes Category

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
General exposures (closed systems) [CS15].	0.01	0.20	0.21
General exposures (closed systems) [CS15]. With sample collection [CS56].	0.42	0.40	0.82
General exposures (closed systems) [CS15].	0.35	0.20	0.55
General exposures (open systems) [CS16].	0.28	0.40	0.68
Batch processes at elevated temperatures [CS136].	0.70	0.02	0.72
Process sampling [CS2].	0.35	0.20	0.55
Laboratory activities [CS36].	0.30	0.10	0.40
Bulk transfers [CS14].	0.30	0.40	0.70
Mixing operations (open systems) [CS30].	0.70	0.20	0.90
Manual [CS34]. Transfer from/pouring from containers [CS22].	0.63	0.08	0.71
Drum/batch transfers [CS8].	0.63	0.20	0.83
Production or preparation or articles by tableting, compression, extrusion or pelletisation [CS100]	0.70	0.20	0.90
Drum and small package filling [CS6].	0.35	0.40	0.75
Equipment cleaning and maintenance [CS39].	0.50	0.40	0.90
Storage [CS67]	0.42	0.40	0.82

2.1.4.1. Consumers

Not relevant for this ES

2.1.5 Exposure Scenario 5: Use in coatings of Resin Oils and Cyclic Dienes Category (industrial)

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
General exposures (closed systems) [CS15].	0.01	0.20	0.21
General exposures (closed systems) [CS15].	0.70	0.08	0.78
Film formation - force drying (50 - 100°C). Stoving (>100°C). UV/EB radiation curing [CS94]	0.70	0.08	0.78
Mixing operations (closed systems) [CS29].	0.75	0.10	0.85
Film formation - air drying [CS95]	0.08	0.40	0.49
Preparation of material for application [CS96]	0.07	0.20	0.27
Spraying (automatic/robotic) [CS97]	0.45	0.19	0.64
Manual [CS34].	0.23	0.63	0.86
Material transfers [CS3].	0.09	0.40	0.49
Material transfers [CS3].	0.09	0.40	0.49
Roller, spreader, flow application [CS98]	0.03	0.81	0.84
Dipping, immersion and pouring [CS4].	0.09	0.40	0.49
Laboratory activities [CS36].	0.70	0.10	0.80
Material transfers [CS3].	0.04	0.40	0.44
Production or preparation or articles by tableting, compression, extrusion or pelletisation [CS100]	0.07	0.20	0.27
Equipment cleaning and maintenance [CS39].	0.50	0.40	0.90
Storage [CS67]	0.70	0.08	0.78

2.1.5.1. Consumers

See Section 2.1.6

2.1.6 Exposure Scenario 6: Use in fuels of Resin Oils and Cyclic Dienes Category streams (industrial)

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
Bulk transfers [CS14].	0.28	0.20	0.48
Drum/batch transfers [CS8].	0.70	0.20	0.90
General exposures (closed systems) [CS15].	0.01	0.09	0.10
General exposures (closed systems) [CS15].	0.70	0.08	0.78
General exposures (closed systems) [CS15].	0.75	0.10	0.85
General exposures (open systems) [CS16]. (closed systems) [CS107]	0.50	0.10	0.60
General exposures (open systems) [CS16]. (closed systems) [CS107]	0.35	0.10	0.45
Equipment maintenance [CS5].	0.35	0.40	0.75
Vessel and container cleaning [CS103]	0.50	0.40	0.90
Storage [CS67]	0.01	0.09	0.10
Storage [CS67]	0.70	0.08	0.78
Disposal of wastes [CS28].	0.50	0.40	0.90

2.1.6.1. Consumers

See section 2.1.8

2.1.7 Exposure Scenario 7: Use in fuels of Resin Oils and Cyclic Dienes Category streams (professional)

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
Bulk transfers [CS14].	0.28	0.20	0.48
Drum/batch transfers [CS8].	0.84	0.10	0.94
Dipping, immersion and pouring [CS4].	0.84	0.10	0.94
General exposures (closed systems) [CS15].	0.01	0.10	0.11
General exposures (closed systems) [CS15].	0.56	0.40	0.96
General exposures (open systems) [CS16]. (closed systems) [CS107]	0.70	0.10	0.80
General exposures (open systems) [CS16]. (closed systems) [CS107]	0.28	0.10	0.38
Equipment cleaning and maintenance [CS39].	0.84	0.04	0.88
Vessel and container cleaning [CS103]	0.84	0.04	0.88
Storage [CS67]	0.01	0.10	0.11

2.1.7.1. Consumers

See section 2.1.7.

2.1.8 Exposure Scenario 8: Use of Resin Oils and Cyclic Dienes Category streams in rubber manufacture (industrial)

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
Material transfers [CS3].	0.01	0.09	0.10
Material transfers [CS3].	0.70	0.04	0.74
Material transfers [CS3].	0.63	0.20	0.83
Bulk weighing [CS91]	0.01	0.09	0.10
Bulk weighing [CS91]	0.70	0.04	0.74
Small scale weighing [CS90]	0.70	0.20	0.90
Additive premixing [CS92]	0.75	0.10	0.85
Additive premixing [CS92]	0.60	0.20	0.80
Material transfers [CS3].	0.30	0.20	0.50
Material transfers [CS3].	0.30	0.20	0.50
Additive premixing [CS92]	0.90	0.04	0.94
Calendering (including Banburys) [CS64]	0.45	0.40	0.85
Calendering (including Banburys) [CS64]	0.45	0.40	0.85
Pressing uncured rubber blanks [CS73]	0.30	0.10	0.40
Vulcanisation [CS70]	0.45	0.40	0.85
Cooling cured articles [CS71]	0.30	0.40	0.70
Laboratory activities [CS36].	0.70	0.10	0.80

Equipment maintenance [CS5].	0.15	0.40	0.55
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2.1.8.1. Consumers

Not relevant for this ES

2.1.9 Exposure Scenario 9: Use of Resin Oils and Cyclic Dienes Category streams in polymer production (industrial)

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
General exposures (closed systems) [CS15].	0.01	0.20	0.21
Bulk transfers [CS14].	0.63	0.20	0.83
Polymerisation (bulk and batch) [CS65]	0.42	0.40	0.82
Polymerisation (bulk and batch) [CS65]	0.35	0.10	0.45
Polymerisation (bulk and batch) [CS65]	0.35	0.10	0.45
Finishing operations [CS102]	0.35	0.10	0.45
Intermediate polymer storage [CS66]	0.40	0.40	0.80
Additivation and stabilisation [CS69]	0.50	0.10	0.60
Mixing in containers [CS23].	0.35	0.20	0.55
Pelletizing [CS53].	0.42	0.40	0.82
Pelletizing [CS53].	0.70	0.20	0.90
Pelletisation and pellet screening [CS68]	0.30	0.40	0.70
Bulk transfers [CS14].	0.50	0.20	0.70
Transport [CS58].	0.30	0.40	0.70
Equipment maintenance [CS5].	0.50	0.40	0.90
Storage [CS67]	0.40	0.40	0.80

2.1.9.1. Consumers

Not relevant for this ES

2.1.10 Exposure Scenario 10: Use of Resin Oils and Cyclic Dienes Category streams in polymer processing (industrial)

Contributing Scenarios	Substance specific RCR (inhalation)	Substance specific RCR (dermal)	Substance specific RCR (all routes)
Bulk transfers [CS14]. (closed systems) [CS107]	0.01	0.20	0.21
Bulk transfers [CS14]. (closed systems) [CS107]	0.30	0.04	0.34
Bulk transfers [CS14].	0.45	0.20	0.65
Bulk weighing [CS91]	0.01	0.20	0.21
Bulk weighing [CS91]	0.36	0.48	0.84
Small scale weighing [CS90]	0.70	0.20	0.90
Additive premixing [CS92]	0.35	0.01	0.36
Additive premixing [CS92]	0.84	0.04	0.88
Additive premixing [CS92]	0.90	0.04	0.94
Bulk transfers [CS14].	0.30	0.40	0.70
Bulk transfers [CS14].	0.90	0.04	0.94
Calendering (including Banburys) [CS64]	0.45	0.40	0.85
Production of articles by dipping and pouring [CS113].	0.30	0.20	0.50
Extrusion and masterbatching [CS88]	0.30	0.40	0.70
Injection moulding of articles [CS89]	0.30	0.20	0.50
Equipment maintenance [CS5].	0.30	0.40	0.70
Storage [CS67]	0.84	0.08	0.92

2.1.10.1. Consumers

Not relevant for this ES

2.2 Environment

2.2.1. Exposure Scenario 1: Manufacture of Resin Oils and Cyclic Dienes Category streams

See Appendix B.

2.2.2 Exposure Scenario 2: Intermediate use of Resin Oils and Cyclic Dienes Category streams

See Appendix B.

2.2.3 Exposure Scenario 3: Distribution of Resin Oils and Cyclic Dienes Category streams

See Appendix B.

2.2.4 Exposure Scenario 4: Formulation of Resin Oils and Cyclic Dienes Category streams

See Appendix B.

2.2.5 Exposure Scenario 5: Use in coatings of Resin Oils and Cyclic Dienes Category streams (industrial)

See Appendix B.

2.2.6 Exposure Scenario 6: Use as a fuels of Resin Oils and Cyclic Dienes Category streams (industrial)

See Appendix B.

10.2.7 Exposure Scenario 7: Use as a fuels of Resin Oils and Cyclic Dienes Category streams (professional)

See Appendix B.

10.2.8 Exposure Scenario 9: Use in rubber manufacture of Resin Oils and Cyclic Dienes Category streams (industrial)

See Appendix B.

2.2.9 Exposure Scenario 10: Use in polymer production of Resin Oils and Cyclic Dienes Category streams (industrial)

See Appendix B.

2.2.10 Exposure Scenario 11: Use in polymer processing of Resin Oils and Cyclic Dienes Category streams (industrial)

See Appendix B.

2.2.11 Regional RCRs

See Appendix B.

2.3 Overall exposure (combined for all relevant emission/release sources)

2.3.1. Human health (combined for all exposure routes)

Combined exposures can be calculated with information provided on the individual exposure scenarios presented in section 1. However, it is unclear how to define risk management measures resulting from this analysis.

2.3.2. Indirect exposure of humans via the environment (combined for all emission sources)

See Appendix B.

2.3.3 Environment (combined for all emission sources)

Combined exposures can be calculated with information provided on the individual exposure scenarios presented in section 1. However, it is unclear how to define risk management measures resulting from this analysis.

Attachment 1: Chemical Category Justification for ‘Resin Oils and Cyclic Dienes’

(NB : all compositions are in w/w for liquids and v/v for gases)

Category definition and its members	
1.1.	Category Definition
1.1.a.	Category Hypothesis
	<p>The Resin oils and cyclic dienes (DCPD rich) category covers hydrocarbons typically produced by the distillation of products from a steam cracking process. Imported streams will need to confirm that they meet the chemical description and are in domain. The category contains non-hydrotreated products (the Resin Oil products) and two products that are concentrates (1) dicyclopentadiene (DCPD) and (2) methylcyclopentadiene dimer (MCPD). Member of this category will have a carbon number distribution that is predominantly C5 – C15 and may contain more than 0.1 % isoprene and/or more than 0.6% DCPD, and/or more than 0.1% benzene or 1,3-butadiene. Companies importing streams will need to confirm that such streams meet the chemical description and are in domain.</p> <p>By definition, from the category, these streams have overlapping hydrocarbon compositions, within a defined range, and hence, will have similar properties. It is therefore reasonable to assume that the components of the category will behave in a reasonably predictable manner, and with respect to phys-chem and environmental fate and effect properties read-across is valid</p> <p>For mammalian endpoints, the predominant route of exposure will be by inhalation and in those streams that contain benzene, butadiene and isoprene these will be the major drivers for effects.</p> <p>For mammalian endpoints, the classification of these streams will be driven by the content of DCPD when more than 0.6%, benzene, 1,3-butadiene or isoprene when more than 0.1%, by the content of naphthalene when more than 1%, and by the content of toluene when more than 5%.</p>
1.1.b.	Applicability domain (AD) of the category
	<p>The category applies to streams with the following PIONA* analysis: predominantly (iso)paraffins, olefins, naphthenics and aromatics and a carbon number range of predominantly 5-15, some streams will contain more than 0.1% isoprene, benzene, 1,3-butadiene, naphthalene and/or toluene and more than 0.6% DCPD.</p> <p><i>Boiling Point –the streams in this category will boil predominantly in the range of 100 - 220°C</i></p> <p>Specific components</p> <p><i>Benzene: <0.1 – 40%</i></p> <p><i>1,3-butadiene: <0.1 – 1%</i></p> <p><i>Isoprene : <0.1 to 3%</i></p> <p><i>DCPD: ≤75%</i></p> <p><i>Toluene: up to 22%</i></p> <p><i>Naphthalene: up to 48%</i></p> <p><i>Styrene: up to 40%</i></p>

C8 Aromatics (xylenes, ethylbenzene): up to 25%

PIONA* :

(iso)Paraffins – up to 50% : C# 4 - 12

Olefins – up to 60% : C# 5 - 15

Naphthenics – up to 90% : C# 5 - 15

Aromatics – up to 100% : C# 5 - 15

*: PIONA refers to a description of the type of hydrocarbons present, paraffins, isoparaffins, olefins, naphthenics and aromatics. It does not refer to a specific type of analysis or determination.

1.2. Category Members

CAS Number	CAS Description	Registered Substance Name
68477-54-3	Distillates (petroleum), steam-cracked, C8-12 fraction	Distillates (petroleum), steam-cracked, C8-12 fraction
		Aromatic HCD C9

1.3. Purity / Impurities

The substances in this category are UVCBs and as such are considered to be 100% pure. The term impurity is not relevant for UVCBs, however, substances will be described using the following:

- Known constituents present at 10% or greater (if any), identified by IUPAC name and EC number/CAS number, indicating typical concentrations and/or concentration ranges;
- Constituents relevant for hazard classification (if any);
- Constituents relevant for PBT assessment (if any).

2. Category justification

The **Resin oils and cyclic dienes (DCPD rich)** category covers hydrocarbons typically produced by the distillation of products from a steam cracking process. Imported streams will need to confirm that they meet the chemical description and are in domain. The category contains non-hydrotreated products (the Resin Oil products) and two products that are concentrates (1) dicyclopentadiene (DCPD) and (2) methylcyclopentadiene dimer (MCPD). Member of this category will have a carbon number distribution that is predominantly C5 – C15 and may contain more than 0.1 % isoprene and/or more than 0.1% benzene or 1,3-butadiene. The physico-chemical properties associated with these types of UVCBs indicated that they comprise a category based on the range of boiling points (from 100°C to 220°C) and will have similar behaviour in the environment. The log Kow ranges from 2.2 to >6.5 and the streams in this category are not considered to be readily biodegradable. The mammalian toxicity information and environmental assessment also indicated that the streams in this category exert similar effects.

3. Data matrix

Resin oils and cyclic dienes (DCPD rich) is a UCVB category and therefore identification of trends between category members is not appropriate and therefore, according to the ECHA Guidance on information requirements and chemical assessment Chapter R.6, it is not feasible to establish a full data matrix for this category. Consequently, a data set that applies to all members of this category has been developed.

4.	Conclusions per endpoint for C&L, PBT/vPvB and dose descriptor
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CLASSIFICATION AND LABELLING

Physico-chemical Hazard Assessment

- **Boiling point** - The measured boiling point of streams in this category was ranged from 167°C to 193°C (agreed category boiling point ranged from 100°C to 220°C).
- **Partition coefficient** - The streams in this category have partition coefficients ranges from log Kow 2.8 to >6.5.
- **Flash point** - The flash point of streams in this category is 44.5 °C to 76°C. Some streams will have the following classification.

Flashpoint of ≥ 23 °C and initial boiling point ≤ 60 °C.

Flam. Liquid 3 (Hazard statement: H226: Flammable liquid and vapour).

Human Health Hazard Assessment

- **Toxicokinetics** – The marker substances for this category (benzene, 1,3-butadiene, isoprene, toluene, naphthalene, styrene and C8 aromatics), in their pure form, have well-defined toxicokinetic parameters that have been taken into account during the derivation of their respective DNEL's. The overall DNEL of this category is driven by the DNELs for benzene, naphthalene and styrene.
- **Acute toxicity** – Resin Oils and Cyclic Dienes streams are of low acute toxicity by the dermal route and do not warrant classification for this end-point. Streams with >9% DCPD should be classified for acute inhalation toxicity. Some streams are hazardous following oral or inhalation exposure and streams containing $\geq 25\%$ naphthalene will need to be classified for oral toxicity.
- **Irritation** – Resin Oils and Cyclic Dienes streams are considered to be skin and eye irritants. If the combined concentration of xylenes and ethylbenzene is $\geq 10\%$ the stream is also considered to be a respiratory irritant.
- **Sensitisation** – Not sensitising.
- **Repeat dose toxicity** – The limited repeat dose toxicity data on specific streams identified for this category (oral toxicity studies for CAS 68477-54-3 [Low Dicyclopentadiene Resin Oil] and provided no evidence of significant target organ toxicity. However, there are substantial data on the repeated dose toxicity of a number of specific components present in some streams which demonstrate significant target organ toxicity and when present at concentrations greater than or equal to 1% (benzene) or 10% (toluene, styrene and ethylbenzene) will drive the mammalian toxicity effects.
- **Genetic toxicity** – In vitro and in vivo genotoxicity data are available for 2 streams within this category - CAS 68477-54-3 (Low Dicyclopentadiene Resin Oil) and. These studies

show negative results. However, data on the genotoxicity of the marker substances, benzene, 1,3-butadiene and isoprene show them to be mutagenic in vivo. Streams that contain $\geq 0.1\%$ benzene or 1,3-butadiene or $\geq 1\%$ isoprene are considered to be mutagenic and will require classification for this end-point.

- **Carcinogenicity** – There are no specific carcinogenicity data on any of the streams within this category. However, there are substantial data on the carcinogenicity of a number of specific components present in some streams. Of these, benzene, 1,3-butadiene, naphthalene and isoprene have been shown to be carcinogenic. Resin Oils and Cyclic Dienes are considered to be carcinogens if they contain $\geq 0.1\%$ benzene, 1,3-butadiene or isoprene or $\geq 1\%$ naphthalene.
- **Toxic to reproduction** – Limited reproduction toxicity data are available for 2 streams within this category (CAS 68477-64-3: Low Dicyclopentadiene Resin Oil; In OECD Guideline 422 studies no evidence of impaired fertility or teratogenicity was seen. For CAS 68477-54-3 (Low dicyclopentadine resin oil) lower pup body weight was seen at maternally toxic doses. Data on the reproductive and developmental toxicity of specific components present in some streams indicate that none possesses specific effects on fertility which warrant classification but toluene is labelled with respect to developmental toxicity. Therefore, classification and labelling with respect to developmental toxicity will be driven by the concentration of toluene in Resin Oils and Cyclic Dienes streams.

Environmental Hazard Assessment

- **Biodegradation** - Based on two experimental studies the streams in this category have not been shown to be readily biodegradable and will not be considered readily biodegradable.
- **Bioaccumulation** - BCF have been calculated using for various representative components of these streams. Using a log Kow range of 2.68 to 6.96 the calculated values range from 26 to 18000. The latter figure was calculated for a C15 Olefin, all other BCF values for the category fall within the range 26-174.
- **Ecotoxicity** – The available studies for category members showed similar results across the three trophic levels. Two fish studies provided a 96 hr LL50 range between 0.73 – 6.3 mg/l (96 hr LC50 ranged from 0.58 – 58.6mg/l in 5 studies). Two invertebrate studies provided 48 hr EL50 range of 0.91 – 3.2 mg/l (48 hr EC50 ranged 0.76-2.9mg/l). Two 72 hr algae studies provided a 72 hr ErL50 range of 1.3-1.5 (72 hr ErC50 ranged 0.84-1.4 mg/l).

Based on the available experimental data streams in this category should have the classification R50/53 under the DSD and Acute 1 Chronic 1 under the CLP regulations.

CONCLUSION FOR PBT

The screening assessment of the available data indicates that the properties of the members of this category do not meet the specific criteria detailed in Annex XIII or do not allow a direct comparison with all the criteria in Annex XIII but nevertheless indicate that the substance

would not have these properties and therefore are not considered PBT/vPvB.

Human Health DN(M)ELs:

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.

Against this background, the most hazardous marker substances present in these streams are highlighted in the following table:

Workers

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 (DCPD)	≤75%	2.3	32.6	0.34	220
benzene	<0.1 to 25	3.25	7.69	23.4	1.07
1,3-butadiene	<0.1 to 1	2.21	0.45	<i>na</i>	<i>na</i>
isoprene	<0.1 to 3	8.4	0.36	23.7	0.13
toluene	Up to 22	192	0.11	384	0.06
naphthalene	Up to 48	50	0.96	72	0.67
styrene	Up to 40	85	0.47	406	0.10
xylenes	Up to 25	221	0.11	3182	<0.01
ethylbenzene	Up to 25	77	0.32	180	0.14

To demonstrate safe use in worker exposure scenarios computed by application of the ECETOC TRA, estimates of inhalation exposure and risk characterisation will use benzene as the marker substance (based on its relatively high volatility and carcinogenicity), while estimates of dermal exposure and risk characterisation will use DCPD as the marker substance (based on its lower volatility and very low dermal DNEL).

APPENDIX A: HUMAN HEALTH EXPOSURE

Appendix A.1 ES1 Manufacturing of Resin Oils and Cyclic Dienes Category streams

Table A.1.1 ES1 General Information

Substance specific information		Reference Values		
Substance	Resin Oils and Cyclic Dienes Category streams			
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#				
Processes, tasks, activities covered	Manufacture of the substance or use as an intermediate or process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU8, SU9)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15			
Applicable Use Descriptors (ERC or SpERC)	ERC1, ERC4			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; (unless otherwise stated) (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes Benzene content >25% Assumes DCPD content >25%			

Table A.1.2 ES 1: Manufacturing Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs	Use Descriptor	
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase (optional)	CS further specification (free text)	[free text]	[free text]	LEV (Yes/No)	Process Category (scroll list)
Manufacture of Resin Oils and Cyclic Dienes Category streams	Industrial - SU3	General measures (carcinogens) (CS18)						
	Industrial - SU3	General exposures (closed systems) (CS15)		ambient temp. Closed process. No exposure. >4 hours.	Continuous; daily; 15 - 1 hour; product temp. Outdoor	Closed processes	No	1 - Use in closed process, no likelihood of exposure
	Industrial - SU3	General exposures (closed systems) (CS15). With sample collection (CS56)	With occasional controlled exposure (CS140)	>4 hours, ambient temp.	Continuous; daily; 15 mins - 1 hour; product temp. Outdoor	Enclosed process; Outdoor location; closed/semi-closed sampling point	Yes	2 - Use in closed, continuous process with occasional controlled exposure
	Industrial - SU3	General exposures (closed systems) (CS15)	Use in contained batch processes (CS37)	>4 hours, ambient temp.	Batch process; daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Closed equipment, enclosed or vented sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial - SU3	General exposures (open systems) (CS16)	Batch process (CS55). With sample collection (CS56)	>4 hours, ambient temp.	Daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
	Industrial - SU3	Process sampling (CS2)		>4 hours, ambient temp.	Daily; <15 mins; product temp.; Indoor/Outdoor	Closed or ventilated sampling points	Yes	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial - SU3	Laboratory activities (CS36)		>4 hours, ambient temp.	Daily; 15 mins - 1 hour; product temp.; Indoor	Fume cupboard; PPE.	Yes	15 - Use of laboratory reagents in small scale laboratories
	Industrial - SU3	Bulk transfers (CS14). (open systems) (CS106)	With potential for aerosol generation (CS136)	>4 hours, ambient temp. aerosols	Daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Enclosed transfers, clear lines prior to decoupling	Yes	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial - SU3	Bulk transfers (CS14). (closed systems) (CS107)		daily; ambient temp.	Daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Enclosed transfers, vented transfer points; clear lines prior to decoupling	Yes	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Industrial - SU3	Equipment cleaning and maintenance (CS39)		>4 hours; ambient temp.	Daily; 15 mins - 1 hour; product temp.; collection of line waste in container; Indoor/Outdoor	Enclosed lines; retain wash down in sealed storage pending disposal or use as recycled material for subsequent formulation. PPE.	Yes	8a - Transfer of chemicals from/to vessels/ large containers at non-dedicated facilities	
Industrial - SU3	Storage (CS67)	With occasional controlled exposure (CS140)		daily; ambient temp.	Daily; 8 hrs; product temp.	samples collected at dedicated sample point	Yes	2 - Use in closed, continuous process with occasional controlled exposure

Table A.1.3 ES 1: Manufacturing Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																			
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure							Dermal exposure							Risk Characterization					
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	TRA Predicted Exposure (copy - no modifier)	TRA LEV efficiency (%)	Dilution Ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA RPE Factor	Extra exposure modifier [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure (copy - modified)	TRA Predicted Dermal exposure (mg/kg) - no modifiers	TRA Annual exposure LEV reduction factor	TRA concentration factor	PPE factor	Extra exposure modifier [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal exposure (mg/kg) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)	
Manufacture of Resin Dis and Cyclic Diene Category streams	Industrial - SU3	General mess area (carcinogens) [CS18]																					
	Industrial - SU3	General exposures (closed systems) [CS15]		0.01								0.01	0.34			gloves			0.07	0.01	0.20	0.21	
	Industrial - SU3	General exposures (closed systems) [CS15] WITH sample collection [CS56]	With occasional controlled exposure [CS140]	10	90			1-4 hours				0.60	1.37	0.1		gloves			0.03	0.60	0.08	0.68	
	Industrial - SU3	General exposures (closed systems) [CS15]	Use in contained batch processes [CS37]	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.10	0.45	
	Industrial - SU3	General exposures (open systems) [CS16]	Batch process [CS55] With sample collection [CS56]	20	90	30		15 min-1 hour				0.28	6.86	0.1		gloves			0.14	0.28	0.40	0.68	
	Industrial - SU3	Process sampling [CS2]		50	90	30		15 min-1 hour				0.70	6.86	0.1		gloves-basic training			0.07	0.70	0.20	0.90	
	Industrial - SU3	Laboratory activities [CS36]		10	90	70						0.30	0.34	0.1					0.03	0.30	0.10	0.40	
	Industrial - SU3	Bulk transfers [CS14] (open systems) [CS108]	With potential for aerosol generation [CS138]	50	97	30		1-4 hours				0.63	6.86	0.1		gloves-basic training			0.07	0.63	0.20	0.83	
	Industrial - SU3	Bulk transfers [CS14] (closed systems) [CS107]		50	97			15 min-1 hour				0.30	6.86	0.1		gloves-basic training			0.07	0.30	0.20	0.50	
	Industrial - SU3	Equipment cleaning and maintenance [CS39]		50	90	30			half mask		LEV effectiveness assumed to equate to SCP relating to draining etc prior to treatment; additional LEV (90%)	0.35	13.71	0.01					0.14	0.35	0.40	0.75	
Industrial - SU3	Storage [CS67]	With occasional controlled exposure [CS140]	10	90	30		1-4 hours				0.42	1.37	0.1					0.14	0.42	0.40	0.82		

Table A.1.4 ES 1: Manufacturing Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code].}
Manufacture of Resin Oils and Cyclic Dienes Category streams	Industrial - SU3	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].
	Industrial - SU3	General exposures (closed systems) [CS15].		Handle substance within a closed system [E47].(Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]).
	Industrial - SU3	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 [OC 28].Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	General exposures (closed systems) [CS15].	Use in contained batch processes [CS37].	Handle substance within a closed system [E47].Provide a good standard of general or controlled 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].Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	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 1 hour [OC 27].Wear suitable gloves tested to EN374 [PPE15]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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 4 hours [OC 28].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Ensure operatives are trained to minimise exposures [E119]).
	Industrial - SU3	Laboratory activities [CS36].		Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]. ; Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Wear suitable coveralls to prevent exposure to the skin [PPE27]).
	Industrial - SU3	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 1 hour [OC 27].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Clear transfer lines prior to de-coupling [E39]). (Provide a good standard of general or controlled ventilation (5 to 10 air changes per hour) [E40]). (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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 [ENV14]. (Provide a good standard of general or controlled ventilation (5 to 10 air changes per hour) [E40]). (Wear suitable gloves tested to EN374 [PPE15]).
Industrial - SU3	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 or controlled 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](Avoid dip sampling [E42]). (Provide a good standard of general or controlled ventilation (5 to 10 air changes per hour) [E40]). (Wear suitable gloves tested to EN374 [PPE15]).	

Appendix A.2 ES2 Use of Resin Oils and Cyclic Dienes Category streams as intermediates

Not applicable

Appendix A.3 ES3 Distribution of Resin Oils and Cyclic Dienes Category streams

Table A.3.1 ES3 General information

Substance specific information		Reference Values		
Substance	Resin Oils and Cyclic Dienes Category streams			
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#	2			
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			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU8, SU9)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15			
Applicable Use Descriptors (ERC or SpERC)	ERC1-7			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; >25% (unless otherwise stated) content >25% (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1].		Assumes Benzene content Assumes DCPD	

Table A.3.2 ES 3: Distribution Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
Distribution of Resin Oils and Cyclic Dienes Category streams	Industrial - SU3	General measures (carcinogens) [C18]						
	Industrial - SU3	General exposures (closed systems) [CS19]		>4 hours, ambient temp.	Continuous; Outdoor; daily; 15 - 1 hour; product temp.	Closed process. No exposure.	No	1 - Use in closed process, no likelihood of exposure
	Industrial - SU3	General exposures (closed systems) [CS19]; With sample collection [CS56]	With occasional controlled exposure [CS140]	>4 hours, ambient temp.	Continuous; Outdoor; daily; 15 mins - 1 hour; product temp.	Enclosed process; closed/semi-closed sampling point	Yes	2 - Use in closed, continuous process with occasional controlled exposure
	Industrial - SU3	General exposures (closed systems) [CS19]	Use in contained batch processes [CS37]	>4 hours, ambient temp.	Batch process; Outdoor; daily; 15 - 1 hour; product temp. ambient	Closed equipment, enclosed or vented sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial - SU3	General exposures (open systems) [CS19]	Batch process [CS55]; With sample collection [CS56]	>4 hours, ambient temp.	Daily; Indoor/Outdoor; 15 - 1 hour; product temp. ambient	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
	Industrial - SU3	Process sampling [CS2]		>4 hours, ambient temp.	Daily; < 15 mins; product temp. ambient; Outdoor	Closed or ventilated sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial - SU3	Laboratory activities [CS36]		>4 hours, ambient temp.	Daily; 15 mins - 1 hour; product temp. ambient; Indoor	Fume cupboard, PPE.	Yes	15 - Use of laboratory reagents in small scale laboratories
	Industrial - SU3	Bulk transfers [CS14]; (closed systems) [CS107]		>4 hours, ambient temp.	Outdoor; Daily; 15 - 1 hour; product temp. ambient; exposure potential during breaking of hose connection	Enclosed transfers, clear lines prior to decoupling	Yes	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial - SU3	Bulk transfers [CS14]; (open systems) [CS108]		daily; ambient temp.	Outdoor; Daily; 1 - 4 hours; product temp. ambient; exposure potential from vapour emissions from tank opening	Enclosed transfers, submerged loading via tank opening, collection of drips from loading arm. May involve LEV and/or PPE.	Yes	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial - SU3	Drum and small package filling [CS6]		daily; ambient temp.	Indoor; Continuous; daily; 8 hour; product temp.	Enclosed transfers, vented transfer points, dedicated filling line	Yes	9 - Transfer of chemicals into small containers (dedicated filling line)
	Industrial - SU3	Equipment cleaning and maintenance [CS39]		daily; ambient temp.	Daily; 15 min - 1 hour; product temp; collection of line waste in container	Enclosed lines; retain wash down in sealed storage pending disposal or use as recycled material for subsequent formulation, PPE.	Yes	8a - Transfer of chemicals from/to vessels/ large containers at non-dedicated facilities
	Industrial - SU3	Storage [CS67]	With occasional controlled exposure [CS140]	daily; ambient temp.	Daily; 8 hrs; product temp; Outdoors	Samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure

Table A.3.3 ES 3: Distribution Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																			
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure										Dermal exposure						Risk Characterization			
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase (optional)	TRSA Predicted Exposure - (ppm) - no modifiers	TRSA LEV efficiency (%)	Dilution ventilation effectiveness (%)	TRSA concentration factor	TRSA duration factor	TRSA PPE factor	Extra exposure modifier (optional)	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure (ppm) - modified	TRSA Predicted dermal exposure (mg/kg/d) - no modifiers	TRSA Dermal exposure LEV reduction factor	TRSA concentration factor	PPE factor	extra exposure modifier (optional)	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)	
Distribution of Resin Oils and Cyclic Dienes Category streams	Industrial - SU3	General measures (carcinogens) [CS18]																					
	Industrial - SU3	General exposures (closed systems) [CS19]		0.01								0.01	0.34			gloves			0.07	0.01	0.20	0.21	
	Industrial - SU3	General exposures (closed systems) [CS19] ; With sample collection [CS56]	With occasional controlled exposure [CS140]	10	90	30						0.70	1.37	0.1		gloves			0.03	0.70	0.08	0.78	
	Industrial - SU3	General exposures (closed systems) [CS19]	Use in contained batch processes [CS37]	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.10	0.45	
	Industrial - SU3	General exposures (open systems) [CS19]	Batch process [CS55] ; With sample collection [CS56]	20	90	30		15 min-1 hour				0.28	6.86	0.1		gloves			0.14	0.28	0.40	0.68	
	Industrial - SU3	Process sampling [CS2]		25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.10	0.45	
	Industrial - SU3	Laboratory activities [CS36]		10	97							0.30	0.34	0.1					0.03	0.30	0.10	0.40	
	Industrial - SU3	Bulk transfers [CS14] ; (closed systems) [CS107]		50	97	30		15 min-1 hour				0.21	6.86	0.1		gloves			0.14	0.21	0.40	0.61	
	Industrial - SU3	Bulk transfers [CS14] ; (open systems) [CS108]		50	97	30		15 min-1 hour				0.21	6.86	0.1		gloves			0.14	0.21	0.40	0.61	
	Industrial - SU3	Drum and small package filling [CS6]		50	95	70		1-4 hours				0.45	6.86	0.1		gloves			0.14	0.45	0.40	0.85	
	Industrial - SU3	Equipment cleaning and maintenance [CS39]		50				15 min-1 hour	half mask	0.1	LEV effectiveness assumed to equate to SOP relating to draining etc prior to maintenance.	0.10	13.71	0.1		gloves			0.27	0.10	0.81	0.91	
Industrial - SU3	Storage [CS67]	With occasional controlled exposure [CS140]	10	90	30					0.2	Transfer via enclosed lines. Assume equivalent of LEV efficiency 80%	0.14	1.37		gloves			0.27	0.14	0.61	0.95		

Table A.3.4 ES 3 Distribution Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code]}
Distribution of Resin Oils and Cyclic Dienes Category streams	Industrial - SU3	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
	Industrial - SU3	General exposures (closed systems) [CS15].		Handle substance within a closed system [E47].Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	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]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	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 [OC 27].Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	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 1 hour [OC27].Wear suitable gloves tested to EN374 [PPE15]. (Clear transfer lines prior to de-coupling [E39]).
	Industrial - SU3	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 (not less than 3 to 5 air changes per hour) [E11].Avoid carrying out activities involving exposure for more than 1 hour [OC 27].(Avoid dip sampling [E42]). (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	Laboratory activities [CS36].		Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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 1 hour [OC27].Wear suitable gloves tested to EN374 [PPE15]. (Clear transfer lines prior to de-coupling [E39]).
	Industrial - SU3	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 1 hour [OC27].Wear suitable gloves tested to EN374 [PPE15]. (Clear transfer lines prior to de-coupling [E39]).
	Industrial - SU3	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]. Avoid carrying out activities involving exposure for more than 4 hours [OC28].Wear suitable gloves tested to EN374 [PPE15]. (Put lids on containers immediately after use [E9]). ; (Clear spills immediately [C&H13]).
	Industrial - SU3	Equipment cleaning and maintenance [CS39].		Drain down and flush system prior to equipment break-in or maintenance [E55]. Clear spills immediately [C&H13]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENV14]. (Transfer via enclosed lines [E52]). (Apply vessel entry procedures including use of forced supplied air [AP15]).
Industrial - SU3	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 [E64].Wear suitable gloves tested to EN374 [PPE15]. (Avoid dip sampling [E42]).	

Appendix A.4 ES4 Formulation of Resin Oils and Cyclic Dienes Category streams

Table A.4.1 ES4 General Information

Substance specific information				
Substance	Resin Oils and Cyclic Dienes Category streams	Reference Values		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#				
Processes, tasks, activities covered	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, large and small scale packing, maintenance and associated laboratory activities			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU10)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15			
Applicable Use Descriptors (ERC or SpERC)	ERC2			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; >25% Assumes a good basic standard of occupational hygiene is implemented [G1].			Assumes Benzene content

Table A.4.2 ES 4: Formulation Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Conditions	Typical Mapped RMMs		Use Descriptor
Short Title	Life Cycle Stage / Area of Application	Title	Supporting Process (CS140)	CS Further specification (Proc. Req.)	[Free text]	[Free text]	LEV (v.a./76)	Process Category (Proc. Req.)
Formulation & (re)packaging of substances and mixtures of Skin Care and Cosmetics Category Creams	Industrial - SUS	General measures (carcinogens) (CS14)						
	Industrial - SUS	General exposure (closed systems) (CS14)			Continuous: daily; 16-17 hour; product temp.	Closed processes	No	1 - Use in closed process (no likelihood of exposure)
	Industrial - SUS	General exposure (closed systems) (CS14)	Bench-mounted Activity (CS140)		Continuous: daily; 16-17 hour; 1 hour	Enclosed systems; closed/semi-closed receiving points	Yes	2 - Use in enclosed/controlled processes with secondary contained exposure
	Industrial - SUS	General exposure (closed systems) (CS14)	Use in contained batch processes (CS37)		Batch process: daily; 16-17 hour; product temp.	Batch operations; enclosed or vented receiving points	No	3 - Use in enclosed batch processes (exposure or formulation)
	Industrial - SUS	General exposure (open systems) (CS14)	Batch process (CS38) - With sample collection (CS140)		Batch process: 16-17 hour; product temp.	Batch operations; closed forms prior to decoupling	Yes	4 - Use in batch and other processes (exposure or formulation) where opportunity for exposure exists
	Industrial - SUS	Batch processes at regulated temperatures (CS138)			Batch process: daily; 16-17 hour; product temp. (continuous)	Closed operations; enclosed or vented receiving points; venting processes; sealed	Yes	3 - Use in enclosed batch processes (exposure or formulation)
	Industrial - SUS	Process sampling (CS3)			Batch: 16-17 hour; product temp.	Closed or vented receiving points	Yes	3 - Use in enclosed batch processes (exposure or formulation)
	Industrial - SUS	Laboratory activities (CS36)			Batch: 16-17 hour; 1 hour; product temp. (continuous); ambient	Open equipment; open	Yes	10 - Use of laboratory equipment in open systems
	Industrial - SUS	Risk transfer (CS14)			Batch: 16-17 hour; product temp. (continuous); collection of the sample in container	Transfer; vented receiving points; closed forms prior to decoupling	Yes	10 - Transfer of substances; provided secondary/ large containers at dedicated facilities
	Industrial - SUS	Mixing operations (open systems) (CS34)	With potential for aerosol generation (CS138)		Batch: Batch; process: daily; 16-17 hour; product temp. (continuous)	LEV; PPE	Yes	8 - Filling or blending in batch processes (exposure or formulation) at risk
	Industrial - SUS	Transfer from/into containers (CS22)			Batch: Batch; 16-17 hour; product temp. (continuous)	Vertical transfer; LEV; PPE; open	Yes	10 - Transfer of substances; provided secondary/ large containers at risk; dedicated facilities
	Industrial - SUS	Transfer into containers (CS2)			Batch: Batch; 16-17 hour; product temp. (continuous)	Batch operations; enclosed receiving equipment	Yes	10 - Transfer of substances; provided secondary/ large containers at dedicated facilities
	Industrial - SUS	Production or preparation of articles by melting, compression, extrusion or pulsification (CS10)			Batch: Batch; 16-17 hour; product temp. (continuous)	LEV; PPE	Yes	13 - Production of granules or articles by melting, compression, extrusion, pulsification
	Industrial - SUS	Empty and reuse package filling (CS3)			Batch: Continuous; daily; 16-17 hour; product temp. (continuous)	Batch operations; vented transfer points	Yes	10 - Transfer of substances (continuous filling lines)
	Industrial - SUS	Equipment cleaning and maintenance (CS39)			Batch: Batch; 1-3 hour; product temp. (continuous); collection of the waste in container	Batched batch; batch operations; closed receiving equipment; use of recycled material for formulation; PPE	No	10 - Transfer of substances; provided secondary/ large containers at risk; dedicated facilities
	Industrial - SUS	Storage (CS5)	Bench-mounted Activity (CS140)		Batch: 16-17 hour; sampling product temp. (continuous)	Batch operations; enclosed receiving points	No	2 - Use in enclosed/controlled processes with secondary contained exposure

Table A.4.3 ES 4: Formulation Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																						
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure								Dermal exposure						Risk Characterisation								
Short Title	Life Cycle Stage / Area of Application	Title	Supporting phases (optional)	FR, Product (mass and molarity)	FR, LDC (frequency, %)	Duration (ventilation and employment, %)	FR, Inhalation factor	FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	FR, FR, Inhalation factor	
Formulation & (re)packaging of substances and mixtures in Batch Cells and Cyclic Clean Category streams	Industrial - SLS	General measures (carcinogens) (CS18)																								
	Industrial - SLS	General exposures (closed systems) (CS18)		0.01																						
	Industrial - SLS	General exposures (closed systems) (CS18); WHI sample collection (CS18B)	Batch-oriented Activity (CS140)		10	300	30																			
	Industrial - SLS	General exposures (closed systems) (CS18)	Use in contained batch processes (CS19)		20	300	30																			
	Industrial - SLS	General exposures (open systems) (CS18)	Batch process (CS18B); WHI sample collection (CS18B); WHI production for aerosol generation (CS18A)		20	300	30																			
	Industrial - SLS	Batch processes at elevated temperatures (CS18A)			100	300	30																			
	Industrial - SLS	Process sampling (CS2)			20	300	30																			
	Industrial - SLS	Laboratory activities (CS8)			10	30	30																			
	Industrial - SLS	Risk factors (CS14)			30	30	30																			
	Industrial - SLS	Batch operations (open systems) (CS18)	WHI production for aerosol generation (CS18A)		30	300	30																			
	Industrial - SLS	Transfer from closed batch containers (CS2)			30	30	30																			
	Industrial - SLS	Environment transfer (CS8)			30	30	30																			
	Industrial - SLS	Prevention of degradation of articles by leaching, adsorption, migration or penetration (CS18A)			30	300	30																			
	Industrial - SLS	Open and closed package filling (CS8)			30	300	30																			
	Industrial - SLS	Equipment cleaning and maintenance (CS8)			30	300	30																			
Industrial - SLS	Storage (CS8)	Batch-oriented Activity (CS140)		10	30	30																				

Table A.4.4 ES 4 Formulation Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase (optional)	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase (RMM code). Recommended: phrase (RMM code).)
Formulation & (re)packaging of substances and mixtures of Resin Oils and Cyclic Diene Category streams	Industrial - SU3	General measures (carcinogens) (CS16)		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.
	Industrial - SU3	General exposures (closed systems) (CS15)		Handle substance within a closed system (E47). Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	General exposures (closed systems) (CS15) ; With sample collection (CS56)	Bench-mounted Activity (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 (E64). Avoid carrying out activities involving exposure for more than 4 hours (OC27). Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	General exposures (closed systems) (CS15)	Use in contained batch processes (CS57)	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) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 1 hour (OC27). Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	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 (E64) ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). (E11) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 1 hour (OC27). Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	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 (C9) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 15 minutes (OC26). Wear suitable gloves tested to EN374 (PPE15). (Formulate in enclosed or ventilated mixing vessels (E48).
	Industrial - SU3	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 (C9) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 1 hour (OC27). Wear suitable gloves tested to EN374 (PPE15). (Avoid dip sampling (E42).
	Industrial - SU3	Laboratory activities (CS36)		Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. (E15) (Wear suitable gloves tested to EN374 (PPE15)).
	Industrial - SU3	Bulk transfers (CS14)		Ensure material transfers are under containment or extract ventilation (E66) ; Avoid carrying out activities involving exposure for more than 1 hour (OC27). Wear suitable gloves tested to EN374 (PPE15) (Clear transfer lines prior to de-coupling (E59) ; Clear spills immediately (C&H13) ; (Return IBCs or tanks to supplier for re-use (ENV77)).
	Industrial - SU3	Mixing operations (open systems) (CS30)	With potential for aerosol generation (CS138)	Provide extract ventilation to points where emissions occur (E64) ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). (E11) ; or (C9) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 1 hour (OC27). (Wear suitable gloves tested to EN374 (PPE15). (Wear suitable coveralls to prevent exposure to the skin (PPE27)).
	Industrial - SU3	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 (C9) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 4 hours (OC28). Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	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 (C9) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 4 hours (OC28). Wear chemically resistant gloves (tested to EN374) in combination with basic employee training (PPE16). (Avoid spillage when (OC28).)
	Industrial - SU3	Production or preparation of 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 (C9) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 1 hour (OC27). Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	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 (C9) ; Ensure operation is undertaken outdoors (E69). Avoid carrying out activities involving exposure for more than 1 hour (OC27). Wear suitable gloves tested to EN374 (PPE15). (Clear spills immediately (C&H13) ; ; Put lids on containers immediately after use (E60).
	Industrial - SU3	Equipment cleaning and maintenance (CS39)		Drain down and flush system prior to equipment break-in or maintenance (E55). Clear spills immediately (C&H13). Wear chemically resistant gloves (tested to EN374) in combination with basic employee training (PPE16). Wear a respirator conforming to EN140 with Type A filter or better. (PPE22). Wear suitable coveralls to prevent exposure to the skin (PPE27). Retain drain downs in sealed storage pending disposal or for subsequent recycle (ENV14). (Transfer via enclosed lines (E52)). (Apply vessel entry procedures including use of forced supplied air (AP15)).
	Industrial - SU3	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). Avoid carrying out activities involving exposure for more than 4 hours (OC28). Wear suitable gloves tested to EN374 (PPE15). (Avoid dip sampling (E42)).

Appendix A.5 ES5 Use in coatings of Resin Oils and Cyclic Dienes Category streams (Industrial)

Table A.5.1 ES4 General Information

Substance specific information				
Substance	Resin Oils and Cyclic Dienes Category streams	Reference Values		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#				
Processes, tasks, activities covered	Covers the use in coatings (paints, inks, adhesives, etc) including exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application by spray, roller, spreader, dip, flow, fluidised bed on production lines and film formation) and equipment cleaning, maintenance and associated laboratory activities.			
Life Cycle Stage / Sector of Use	Industrial (SU3)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC7, PROC8a, PROC8b, PROC10, PROC13, PROC15			
Applicable Use Descriptors (ERC or SpERC)	ERC 4			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; otherwise stated.		Assumes Benzene content of >25% unless otherwise stated.	
	Assumes a good basic standard of occupational hygiene is implemented [G1].		Assumes DCPD content of >25% unless otherwise stated.	

Table A.5.2 ES 5: Use in coatings (Industrial) Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Occupancy Conditions		Typical Mapped PMMs	Use Descriptor
Start Title	Life Cycle Stage / Area of Application	Title	Supporting items (optional)	CS further specifications (free text)	(free text)	(free text)	LEV (Yes/No)	Process Category (event ID)
Use in coatings of Rein. Cils and cyclic Glass Category streams	Industrial - SLS	General measures (carcinogens) (CS18)						
	Industrial - SLS	General exposures (closed systems) (CS18)			Continuous; daily; 8hour	Exhausted processes, closed/semi-closed working point	No	1 - Use in closed processes for absorption of exposure
	Industrial - SLS	General exposures (closed systems) (CS18)	With multiple collection Use in contained systems (CS18)		Continuous; daily; 8hour	Exhausted processes, closed/semi-closed working point	Yes	2 - Use in closed containment processes with technological containment measures
	Industrial - SLS	Film formation - force drying (60-100°C), heating (5-100°C), UV/IR radiation during (CS18)				Exhausted in site in workplace	Yes	2 - Use in closed containment processes with technological containment measures
	Industrial - SLS	Rolling operations (closed systems) (CS18)	General exposures (closed systems) (CS18)				Yes	2 - Use in closed containment processes (contaminated environment)
	Industrial - SLS	Film formation - air drying (CS18)					Yes	3 - Use in both open and closed processes, by operators, workers, passers-by or the general public
	Industrial - SLS	Preparation of substrates for application (CS18)	Rolling operations (closed systems) (CS18)			Roller process (process) - batch; roller; customer	Yes	3 - Rolling or moving in both open and closed processes (contaminated environment)
	Industrial - SLS	Spraying (conductive/insulative) (CS18)				daily; 3-8 hours; product temp (continuous); paper	Yes	7 - Industrial spraying
	Industrial - SLS	Painting (CS18)	Spraying (CS18)			open; air supported systems; evaporator	Yes	7 - Industrial spraying
	Industrial - SLS	Keratin transfer (CS18)	Non-occupied facility (CS18)			daily; 18 days - 1 hour; product temp (continuous); collection of hair waste in container; customer/customer	Yes	8A - Transfer of keratin from animal sources (large quantities) at non-dedicated facilities
	Industrial - SLS	Keratin transfer (CS18)	Dedicated facility (CS18)			daily; 18 days - 1 hour; product temp (continuous); collection of hair waste in container; customer/customer	Yes	8B - Transfer of keratin from animal sources (large quantities) at dedicated facilities
	Industrial - SLS	Roller application - flow application (CS18)				daily; 3-8 hours; product temp (continuous); storage; flow; 2-500; water; 20-200	Yes	10 - Roller application or painting
	Industrial - SLS	Shipping, installation and painting (CS18)				daily; 3-8 hours; product temp (continuous); storage; system; 200; paper	Yes	10 - Transportation of articles by shipping and painting
	Industrial - SLS	Laboratory activities (CS18)				batch; scale; 200g; 18 min	Yes	14 - Use of laboratory equipment in small scale production
	Industrial - SLS	Keratin transfer (CS18)	Non-occupied facility (CS18)			daily; 18 days - 1 hour; product temp (continuous); water; system; 200; 200	Yes	8A - Transfer of keratin from animal sources (large quantities) at non-dedicated facilities
	Industrial - SLS	Preparation or preparation of articles by laminating, compression, adhesion or penetration (CS18)				daily; 18 days - 1 hour; product temp (continuous); water; system; 200; 200	Yes	15 - Preparation or preparation of articles by laminating, compression, adhesion or penetration
	Industrial - SLS	Equipment cleaning and maintenance (CS18)				3-8 hours; product temp (continuous); water; system; 200; 200	No	8A - Transfer of keratin from animal sources (large quantities) at non-dedicated facilities
	Industrial - SLS	Storage (CS18)	With technological controlled exposure (CS18)			daily; 24 hours; product temp (continuous); water; system; 200; 200	No	2 - Use in closed containment processes with technological containment measures

Table A.5.3 ES5 Use in coatings (Industrial) Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																			
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure							Dermal exposure							Risk Characterisation					
Short Title	Life Cycle Stage / Area of Application	Title	Supporting phase (optional)	TRM Product Release (kg/yr/worker)	TRM LEV of Frequency (%)	Children (percentage of population) (%)	TRM occupational factor	TRM absorption factor	TRM PPE Factor	TRM dermal reduction (percentage) (optional)	From here - converted to derm. additional multiplier (laboratory)	Product Release (kg/yr/worker)	TRM Product Release (kg/yr/worker) as multiplier	TRM dermal reduction LEV reduction factor	TRM dermal absorption factor	PPE Factor	TRM reduction (percentage) (optional)	From here - converted to derm. additional multiplier (laboratory)	Product Release (kg/yr/worker)	ICER (inhalation)	ICER (dermal)	ICER (all routes)	
Use in coatings of Road, Civil and Cycle Coatings Category streams	Industrial - SL2	General measures (dechlorine) (CS18)																					
	Industrial - SL2	General exposures (closed systems) (CS19)		0.01								0.01	0.33			100%			0.07	0.01	0.02	0.21	
	Industrial - SL2	General exposures (closed systems) (CS19)	With active collection (CS19)	10	90	30						0.70	1.37	0.1		100%			0.08	0.70	0.08	0.78	
	Industrial - SL2	Paint formulation - sand drying (up to 100°C) - blowing in 100°C) - UV/EB radiation curing (CS18)	Use in contained systems (CS18)	10	90	30						0.70	1.37	0.1		100%			0.08	0.70	0.08	0.78	
	Industrial - SL2	Mixing operations (closed systems) (CS19)	General exposures (closed systems) (CS19)	25	90	70						0.75	0.34	0.1		100%			0.03	0.75	0.10	0.85	
	Industrial - SL2	Paint formulation - sand drying (CS18)		20	90	30		1.5 hours	full mask				0.08	0.30	0.1		100%			0.14	0.08	0.30	0.30
	Industrial - SL2	Preparation of material for application (CS19)	Mixing operations (closed systems) (CS19)	80	90	30		1.5 hours	full mask				0.07	13.71	0.006		100%			0.07	0.07	0.30	0.27
	Industrial - SL2	Applying (automated/robotic) (CS19)		250	90	70	0-25%						0.45	42.36	0.08	0-25%	dermal specific testing			0.08	0.45	0.10	0.53
	Industrial - SL2	Manual (CS18)	Spraying (CS19)	250	90	70		1.5 hours	full mask				0.33	42.36	0.08		100%			0.21	0.33	0.63	0.86
	Industrial - SL2	Manual transfer (CS19)	Pan-located facility (CS18)	80	90	70		1.5 hours	full mask				0.09	13.71	0.01		100%			0.14	0.09	0.30	0.30
	Industrial - SL2	Manual transfer (CS19)	Dedicated facility (CS18)	80	97			1.5 hours	full mask				0.09	0.30	0.1		100%			0.14	0.09	0.30	0.30
	Industrial - SL2	Roller - sprayer - flow application (CS18)		80	90	70		1.5 (0.5)-1 hour	full mask				0.03	57.33	0.06		100%			0.27	0.03	0.31	0.33
	Industrial - SL2	Shipping, installation and packing (CS18)		80	90	70		1.5 hours	full mask				0.09	13.71	0.06		100%			0.14	0.09	0.30	0.30
	Industrial - SL2	Catalytic converter (CS18)		10	90	30							0.70	0.33	0.1		100%			0.03	0.70	0.10	0.80
	Industrial - SL2	Manual transfer (CS19)	Overbatch transfer (CS18) - Transfer from/returning from customer (CS19)		80	90	30		1.5 (0.5)-1 hour	full mask			0.03	0.30	0.1		100%			0.14	0.03	0.30	0.34
	Industrial - SL2	Preparation of preparation of articles by industrial, commercial, institution or professional (CS10)		80	90	30		1.5 (0.5)-1 hour	full mask				0.07	3.33	0.1		100%			0.07	0.07	0.30	0.27
	Industrial - SL2	Equipment cleaning and maintenance (CS18)		80					full mask	0.1	LEV effectiveness assigned to ensure to safe conditions according the data in technical additional LEV (MPC)		0.60	13.71	0.01		100%			0.14	0.60	0.40	0.90
	Industrial - SL2	Storage (CS19)	With occasional controlled exposure (CS14)		10	90	30						0.70	1.37	0.1		100%			0.08	0.70	0.08	0.78

Table A.5.4 ES5 Use in coatings (Industrial) Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	RMMs for communication – Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: (phrase [RMM code].)
Use in coatings of Resin Oils and Cyclic Dienes Category streams	Industrial - SU3	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
	Industrial - SU3	General exposures (closed systems) [CS15].		Handle substance within a closed system [E47]. Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	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 [E68]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. ; [G9]. Ensure operation is undertaken outdoors [E69]. Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	Film formation - force drying (60 - 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]. ; [G9]. Ensure operation is undertaken outdoors [E69]. Wear suitable gloves tested to EN374 (PPE15).
	Industrial - SU3	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]. ; [G9]. Ensure operation is undertaken outdoors [E69]. (Wear suitable gloves tested to EN374 (PPE15)). ;
	Industrial - SU3	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]. ; [G9]. Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28] or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 (PPE15). (Avoid manual contact with wet work pieces [E117]).
	Industrial - SU3	Preparation of material for application [CS56]	Mixing operations (open systems) [CS30].	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]. ; [G9]. Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27] or: Wear a full face respirator conforming to EN140 with Type A filter or better. [PPE24] (Avoid manual contact with wet work pieces [E117]). (Wear suitable gloves tested to EN374 (PPE15)).
	Industrial - SU3	Spraying (automatic/robotic) [CS97]		Limit the substance content in the product to 25% [OC18]. Carry out in a vented booth provided with laminar airflow [E59]. ; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial - SU3	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]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial - SU3	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 [E68]. Avoid carrying out activities involving exposure for more than 4 hours [OC28] or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22] (Clear transfer lines prior to de-coupling [E39]). (Provide extract ventilation to points where emissions occur [E54]). (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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 [OC27] or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15]. (Clear transfer lines prior to de-coupling [E39]). (Provide extract ventilation to points where emissions occur [E54]).
	Industrial - SU3	Roller, spreader, flow application [CS38]		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 [OC27] or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	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 [E117]. Avoid carrying out activities involving exposure for more than 4 hours [OC28] or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15]. (Clear up spills immediately and dispose of waste safely [E19]).
	Industrial - SU3	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]. (Avoid manual contact with wet work pieces [E117]). (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	Material transfers [CS3].	Drum/batch transfers [CS8]. ; Transfer from/pouring from containers [CS22].	Ensure material transfers are under containment or extract ventilation [E68]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. ; [G9]. Ensure operation is undertaken outdoors [E69]. Use container to collect drips [E73]. Avoid carrying out activities involving exposure for more than 1 hour [OC27] or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	Production or preparation of articles by tableting, compression, extrusion or pelletisation [CS100]		Ensure material transfers are under containment or extract ventilation [E68]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. ; [G9]. Ensure operation is undertaken outdoors [E69]. Use container to collect drips [E73]. Avoid carrying out activities involving exposure for more than 1 hour [OC27] or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial - SU3	Equipment cleaning and maintenance [CS39].		Drain down and flush system prior to equipment break-in or maintenance [E56]. Clear spills immediately [CA113]. 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 [ENV14]. (Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]). (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	Storage [CS67]	With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]. Ensure material transfers are under containment or extract ventilation [E68]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]. ; [G9]. Ensure operation is undertaken outdoors [E69]. Wear suitable gloves tested to EN374 [PPE15]. (Avoid dip sampling [E42]). (Wear suitable gloves tested to EN374 [PPE15]).

Appendix A.6 ES 6 Use in fuels of Resin Oils and Cyclic Dienes Category streams (industrial)

Table A.6.1 ES 6 General information

Substance specific information		Resin Oils and Cyclic Dienes Category streams	Reference Values	
Substance				
CAS RN			DNEL worker - inhalation (long term)	1 ppm
Substance volatility:	10 kPa		DNEL worker - inhalation (short term)	ppm
TRA volatility range	medium		DNEL worker - dermal (long term)	0.34 mg/kg/day
physical property	liquid			
ES#				
Processes, tasks, activities covered	Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU10)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16			
Applicable Use Descriptors (ERC or SpERC)	ERC7			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; >25% (unless otherwise stated) content >25% (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1].		Assumes Benzene content Assumes DCPD	

Table A.6.2 ES6 Use in fuels (industrial) Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
Use in Fuels of Resin Oils and Cyclic Dienes Category streams	Industrial -SU3	General measures (carcinogens) [G18]						
	Industrial -SU3	Bulk transfers [CS14].			Daily; 1 - 4 hours; ambient temp.	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
	Industrial -SU3	Drum/batch transfers [CS8].			Daily; 1 - 4 hours; ambient temp.	Pumped transfer from drum to equipment	Yes	Bb -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial -SU3	General exposures (closed systems) [CS15].			Indoor; Daily; >4 hours	Closed equipment; designed for ease of maintenance; PPE	No	1 - Use in closed process; no likelihood of exposure
	Industrial -SU3	General exposures (closed systems) [CS15].	With occasional controlled exposure [CS140]		Indoor; Daily; >4 hours	Closed equipment; designed for ease of maintenance; PPE	No	2 - Use in closed, continuous process with occasional controlled exposure
	Industrial -SU3	General exposures (closed systems) [CS15].	Batch process [CS55].		Indoor; Daily; >4 hours	Closed equipment; designed for ease of maintenance; PPE	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]			Daily; >4 hours, to 100%	Closed equipment	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected
	Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Batch process [CS55].		Daily; >4 hours, to 100%	Closed equipment	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial -SU3	Equipment maintenance [CS5].			Daily; >4 hours, to 100%	PPE, Operator training.	No	Ba -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
	Industrial -SU3	Vessel and container cleaning [CS103]			Infrequent; >4 hours	vessel entry procedures, retain wash down in sealed storage pending disposa., PPE.	Yes	Ba -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
	Industrial -SU3	Storage [CS67]			Daily; 8 hrs; ambient temp.	samples collected at dedicated sample point	No	1 - Use in closed process; no likelihood of exposure
	Industrial -SU3	Storage [CS67]	With occasional controlled exposure [CS140]		Daily; 8 hrs; ambient temp.	samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure
	Industrial -SU3	Disposal of wastes [CS28].			Daily; 8 hrs; ambient temp.	samples collected at dedicated sample point	No	Ba -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities

Table A.6.3 ES6 Use in fuels (industrial) Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																			
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure										Dermal exposure					Risk Characterization				
Short Title	Life Cycle Stage / Area of Application	Title	supporting phase [optional]	TRA Predicted Exposure - (ppm) - no modifiers	TRA LEV - efficiency (%)	Dilution ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA PPE factor	Extra exposure modifier [optional]	Free text 1 - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - modified	TRA Predicted Dermal exposure (mg/kg/d) - no modifiers	TRA Dermal exposure LEV reduction factor	TRA concentration factor	PPE factor	Extra exposure modifier [optional]	Free text 1 - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)	
Use in Fuels of Resin Oils and Cyclic Dienes Category streams	Industrial -SUS	General measures (carcinogens) [C18]																					
	Industrial -SUS	Bulk transfers [CS14]		20	90	30		15 min-1 hour				0.28	6.86	0.1		gloves-basic training			0.07	0.28	0.20	0.48	
	Industrial -SUS	Drum/batch transfers [CS8]		50	90	30				0.2	Use of drum pump equivalent to 90% efficiency	0.70	6.86	0.1		gloves-basic training			0.07	0.70	0.20	0.90	
	Industrial -SUS	General exposures (closed systems) [CS15]		0.01								0.01	0.03						0.03	0.01	0.09	0.10	
	Industrial -SUS	General exposures (closed systems) [CS15]	With occasional controlled exposure [CS140]	10	90	30						0.70	1.37	0.1		gloves			0.03	0.70	0.08	0.78	
	Industrial -SUS	General exposures (closed systems) [CS15]	Batch process [CS55]	25	90	70						0.75	0.34	0.1					0.03	0.75	0.10	0.85	
	Industrial -SUS	General exposures (open systems) [CS16] ; (closed systems) [CS107]		5	90							0.50	0.34	0.1					0.03	0.50	0.10	0.60	
	Industrial -SUS	General exposures (open systems) [CS16] ; (closed systems) [CS107]	Batch process [CS55]	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.10	0.45	
	Industrial -SUS	Equipment maintenance [CS5]		50		30			half mask	0.1	SCP equivalent to 90% efficiency	0.35	13.71	0.2		gloves-specific training			0.14	0.35	0.40	0.75	
	Industrial -SUS	Vessel and container cleaning [CS103]		50	90					0.1	SCP equivalent to 90% efficiency	0.50	13.71	0.01					0.14	0.50	0.40	0.90	
	Industrial -SUS	Storage [CS67]		0.01								0.01	0.03						0.03	0.01	0.09	0.10	
	Industrial -SUS	Storage [CS67]	With occasional controlled exposure [CS140]	10	90	30						0.70	1.37	0.1		gloves			0.03	0.70	0.08	0.78	
	Industrial -SUS	Disposal of wastes [CS28]		50	95			15 min-1 hour				0.50	1.37	0.1					0.14	0.50	0.40	0.90	

Table A.6.4 ES6 Use in fuels (industrial) Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code].}
Use in Fuels of Resin Oils and Cyclic Dienes Category streams	Industrial -SU3	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
	Industrial -SU3	Bulk 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 1 hour [OC27].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial -SU3	Drum/batch 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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial -SU3	General exposures (closed systems) [CS15].		Handle substance within a closed system [E47].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	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]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	General exposures (closed systems) [CS15].	Batch 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].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]		Handle substance within a predominantly closed system provided with extract ventilation [E49].Provide extract ventilation to points where emissions occur [E54]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Batch 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 [OC27].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Equipment maintenance [CS5].		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]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]; Wear chemically resistant gloves (tested to EN374) in combination with specific activity training [PPE17]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENV4].
	Industrial -SU3	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 [ENV4]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Storage [CS67]		Store substance within a closed system [E84].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	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].Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	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].(Wear suitable gloves tested to EN374 [PPE15]).

Appendix A.7 ES7 Use in fuels of Resin Oils and Cyclic Dienes Category streams (Professional)

Table A.7.1 ES7 General Information

Substance specific information				
Substance	Resin Oils and Cyclic Dienes Category streams	Reference Values		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#				
Processes, tasks, activities covered	Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.			
Life Cycle Stage / Sector of Use	Professional (SU22)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16			
Applicable Use Descriptors (ERC or SpERC)	ERC 9A, ERC 9B			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; >25% (unless otherwise stated) content >25% (unless otherwise stated) Assumes a good basic standard of occupational hygiene is implemented [G1].			
			Assumes Benzene content Assumes DCPD	

Table A.7.2 ES7 Use in fuels (professional) Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
Use in Fuels of Resin Oils and Cyclic Dienes Category streams	Professional - SU22	General measures (carcinogens) [G18]						
	Professional - SU22	Bulk transfers [CS14].			Daily; 1-4 hour; ambient temp.	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
	Professional - SU22	Drum/batch transfers [CS8].			Daily; 15 mins - 1 hour; ambient temp	Pumped transfer from drum to equipment	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Professional - SU22	Dipping, immersion and pouring [CS4].			Daily; >4 hours, to 100%	Pumped transfer to vehicle	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Professional - SU22	General exposures (closed systems) [CS15].			Daily; >4 hours	Closed equipment	No	1 - Use in closed process, no likelihood of exposure
	Professional - SU22	General exposures (closed systems) [CS15].	With occasional controlled exposure [CS14]		Daily; >4 hours	Closed equipment	Yes	2 - Use in closed, continuous process with occasional controlled exposure
	Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Batch process [CS55].		Daily; >4 hours, to 100%	Enclosed or ventilated mixing vessel	Yes	3 - Use in closed batch process (synthesis or formulation)
	Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]			Daily; >4 hours, to 100%	Closed equipment	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected
	Professional - SU22	Equipment cleaning and maintenance [CS39].			Daily; >4 hours, to 100%	PPE. Operator training.	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
	Professional - SU22	Vessel and container clearing [CS103]			Daily; >4 hours, to 100%	vessel entry procedures, retain wash down in sealed storage pending disposa. PPE.	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
Professional - SU22	Storage [CS67]			Daily; 8 hrs; ambient temp;	samples collected at dedicated sample point	No	1 - Use in closed process, no likelihood of exposure	

Table A.7.3 ES7 Use in fuels (professional) Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																			
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure										Dermal exposure						Risk Characterization			
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	TSA Predicted Exposure (ppm - no modifiers)	TSA LEV efficiency (%)	Dilution ventilation effectiveness (%)	TSA concentration factor	TSA duration factor	TSA RFE factor	Extra exposure modifier [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - modified	TSA Predicted Dermal exposure (mg/kg) - no modifiers	TSA Dermal exposure LEV reduction factor	TSA concentration factor	PPE factor	Extra exposure modifier [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)	
Use in Fuels of Resin Oils and Cyclic Diisocyanate Category streams	Professional - SU22	General measures (carcinogens) (G18)																					
	Professional - SU22	Bulk transfers (CS14)		50	80	30		15 min-1 hour		0.2	clear lines prior to decoupling	0.28	6.86	0.1		gloves-basic training			0.07	0.28	0.20	0.48	
	Professional - SU22	Drum/batch transfers (CS8)		50		30	1-5%	1-4 hours		0.2	Drum pumps equivalent to 80% efficiency	0.84	3.43	0.1		gloves-basic training			0.03	0.84	0.10	0.94	
	Professional - SU22	Dipping, immersion and pouring (CS4)		50		30	1-5%	1-4 hours		0.2	Drum pumps equivalent to 80% efficiency	0.84	3.43	0.1		gloves-basic training			0.03	0.84	0.10	0.94	
	Professional - SU22	General exposures (closed systems) (CS15)		0.01								0.01	0.34			gloves-basic training			0.03	0.01	0.10	0.11	
	Professional - SU22	General exposures (closed systems) (CS15)	With occasional controlled exposure (CS140)	20	80	30		15 min-1 hour				0.56	1.37	0.1					0.14	0.56	0.40	0.96	
	Professional - SU22	General exposures (open systems) (CS16) ; (closed systems) (CS107)	Batch process (CS55)	25	80	30		15 min-1 hour				0.70	0.34			gloves-basic training			0.03	0.70	0.10	0.80	
	Professional - SU22	General exposures (open systems) (CS16) ; (closed systems) (CS107)		10	80	30		15 min-1 hour				0.28	0.34			gloves-basic training			0.03	0.28	0.10	0.38	
	Professional - SU22	Equipment cleaning and maintenance (CS39)		100	80	30		1-4 hours	half mask		SOP equivalent to 90% LEV efficiency	0.84	13.71	0.01		gloves-basic training			0.01	0.84	0.04	0.88	
	Professional - SU22	Vessel and container cleaning (CS103)		100	80	30		1-4 hours	half mask			0.84	13.71	0.01		gloves-basic training			0.01	0.84	0.04	0.88	
Professional - SU22	Storage (CS67)		0.01								0.01	0.34			gloves-basic training			0.03	0.01	0.10	0.11		

Table A.7.4 ES7 Use in fuels (professional) Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: (phrase [RMM code])
Use in Fuels of Resin Oils and Cyclic Dienes Category streams	Professional - SU22	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 in
	Professional - SU22	Bulk 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 1 hour [OC27].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Clear transfer lines prior to de-coupling [E39].
	Professional - SU22	Drum/batch 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 [OC28]Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Professional - SU22	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 [E68]. 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Professional - SU22	General exposures (closed systems) [CS15].		Handle substance within a closed system [E47].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Professional - SU22	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 [OC27].Wear suitable gloves tested to EN374 [PPE15].
	Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Batch 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 [OC27].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]		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].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Professional - SU22	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 [OC28]Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [EN140].
	Professional - SU22	Vessel and container cleaning [CS103]		Drain down 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 [OC28]Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]; Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [EN140].
	Professional - SU22	Storage [CS67]		Store substance within a closed system [E84].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].

Appendix A.8 ES8 Use in rubber manufacture of Resin Oils and Cyclic Dienes Category streams (industrial)

Table A.8.1 ES8 General Information

Substance specific information		Reference Values		
Substance	Resin Oils and Cyclic Dienes			
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#				
Processes, tasks, activities covered	Manufacture of tyres and general rubber articles, including processing of raw (uncured) rubber, handling and mixing of rubber additives, vulcanising, cooling and finishing.			
Life Cycle Stage / Sector of Use	Industrial (SU10)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC7, PROC8a, PROC8b, PROC13, PROC14, PROC21			
Applicable Use Descriptors (ERC or SpERC)	ERC6D			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% except where otherwise stated Assumes DCPD content >25% except where otherwise stated Assumes a good basic standard of occupational hygiene is implemented [G1].			

Table A.8.2 ES8 Use in rubber manufacture Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
Use in rubber manufacturing and processing of Resin Oils and Cyclic Diene Category streams	Industrial - SU3	General measures (carcinogens) [G18]						
	Industrial - SU3	Material transfers [CS3].			Daily; 15 min - 1 hour; ambient temp	Enclosed transfers, clear lines prior to decoupling	No	1 - Use in closed process, no likelihood of exposure
	Industrial - SU3	Material transfers [CS3].	With occasional controlled exposure [CS140]		Daily; 15 min - 1 hour; ambient temp	Enclosed transfers, clear lines prior to decoupling	Yes	2 - Use in closed, continuous process with occasional controlled exposure
	Industrial - SU3	Material transfers [CS3].	Dedicated facility [CS81].	Large Containers	Daily; 15 min - 1 hour; ambient temp	general ventilation, minimise spills	Yes	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial - SU3	Bulk weighing [CS91]	(closed systems) [CS107].		Daily; 15 min - 1 hour; ambient temp	Enclosed activity	No	1 - Use in closed process, no likelihood of exposure
	Industrial - SU3	Bulk weighing [CS91]	With occasional controlled exposure [CS140]		Daily; 15 min - 1 hour; ambient temp	Enclosed activity	Yes	2 - Use in closed, continuous process with occasional controlled exposure
	Industrial - SU3	Small scale weighing [CS90]	Dedicated facility [CS81].		Daily; 15 min - 1 hour; ambient temp	LEV; minimise spillages; operator training	Yes	9 - Transfer of chemicals into small containers (dedicated filling line)
	Industrial - SU3	Additive premixing [CS92]	Batch process [CS55], (closed systems) [CS107].		Daily; 15 min - 1 hour; ambient temp	LEV; minimise spillages;	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial - SU3	Additive premixing [CS92]			Daily; 15 min - 1 hour; ambient temp	LEV; minimise spillages;	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
	Industrial - SU3	Material transfers [CS3].	Dedicated facility [CS81].		Daily; 15 min - 1 hour; ambient temp	Enclosed activity	No	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial - SU3	Material transfers [CS3].		Small Containers	Daily; 15 min - 1 hour; ambient temp	Enclosed activity	Yes	9 - Transfer of chemicals into small containers (dedicated filling line)
	Industrial - SU3	Additive premixing [CS92]	Mixing operations (open systems) [CS30].		Daily; 1-4 hours; ambient temp	LEV; minimise spillages;	Yes	5 - Mixing or blending in batch processes (multistage and/or significant contact)
	Industrial - SU3	Calendering (including Banburys) [CS64]			Daily; >4 hours, elevated temperature	LEV; minimise area/size of openings	Yes	6 - Calendering operations
	Industrial - SU3	Calendering (including Banburys) [CS64]			Daily; >4 hours, elevated temperature	LEV; minimise area/size of openings	Yes	6 - Calendering operations
	Industrial - SU3	Pressing uncured rubber blanks [CS73]			Daily; 1-4 hours; ambient temp	Good GV	Yes	14 - Production of preparations or articles by tableting, compression, extrusion, pelletisation
	Industrial - SU3	Vulcanisation [CS70]			Daily; >4 hours, elevated temperature	LEV at emission points; minimise area/size of openings; good GV	Yes	6 - Calendering operations
	Industrial - SU3	Cooling cured articles [CS71]			> 4 hours; daily; ambient temp.	Extract ventilation/hood	Yes	6 - Calendering operations
	Industrial - SU3	Laboratory activities [CS36].			Daily; <15 mins; ambient temp.	Local exhaust ventilation at fill point, PPE	Yes	15 - Use of laboratory reagents in small scale laboratories
	Industrial - SU3	Equipment maintenance [CS5].			Daily; 15 min - 1 hour; ambient temp; collection of line waste in container	Enclosed lines; retain wash down in sealed storage pending disposal or use as recycled material for subsequent formulation, PPE.	Yes	8a - Transfer of chemicals from/to vessels/ large containers at non dedicated facilities

Table A.8.3 ES8 Use in rubber manufacture Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																				
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure										Dermal exposure					Risk Characterization					
Short Title	Life Cycle Stage / Area of Application	Title	Supporting phase (optional)	TSA Predicted Exposure (mg/kg) - no modifiers	TSA LEV efficiency (%)	Dilution correction efficiency (%)	TSA concentration factor	TSA duration factor	TSA RPF factor	Extra exposure modifier (optional)	Free text - comment to clarify additional modifier (inhalation)	Predicted exposure - (ppm) - modified	TSA Predicted Dermal exposure (mg/kg/d) - no modifiers	TSA Dermal exposure LEV reduction factor	TSA absorption factor	PPE factor	Extra exposure modifier (optional)	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)		
Use in rubber manufacturing and processing of Resin Oils and Cyclic Diene's Category streams	Industrial - SU3	General measures (carcinogens) [CS18]																						
	Industrial - SU3	Material transfers [CS3]		0.01								0.01	0.03						0.03	0.01	0.09	0.10		
	Industrial - SU3	Material transfers [CS3]	With occasional controlled exposure [CS140]	10	90	30						0.70	0.14	0.1					0.01	0.70	0.04	0.74		
	Industrial - SU3	Material transfers [CS3]	Dedicated facility [CS81]	50	97	30		1-4 hours				0.63	6.86	0.1		gloves-basic training			0.07	0.63	0.20	0.63		
	Industrial - SU3	Bulk weighing [CS91]	closed systems [CS107]	0.01								0.01	0.03						0.03	0.01	0.09	0.10		
	Industrial - SU3	Bulk weighing [CS91]	With occasional controlled exposure [CS140]	10	90	30						0.70	0.14	0.1					0.01	0.70	0.04	0.74		
	Industrial - SU3	Small scale weighing [CS90]	Dedicated facility [CS81]	50	90	30		15 min-1 hour				0.70	6.86	0.1		gloves-basic training			0.07	0.70	0.20	0.90		
	Industrial - SU3	Additive premixing [CS92]	Batch process [CS55] - closed systems [CS107]	25	90	70						0.75	0.34	0.1					0.03	0.75	0.10	0.85		
	Industrial - SU3	Additive premixing [CS92]		20	90	70						0.60	6.86	0.1		gloves-basic training			0.07	0.60	0.20	0.60		
	Industrial - SU3	Material transfers [CS3]	Dedicated facility [CS81]	50	97			15 min-1 hour				0.30	6.86	0.1		gloves-basic training			0.07	0.30	0.20	0.50		
	Industrial - SU3	Material transfers [CS3]		50	90	70		15 min-1 hour				0.30	6.86	0.1		gloves-basic training			0.07	0.30	0.20	0.50		
	Industrial - SU3	Additive premixing [CS92]	Mixing operations open systems [CS30]	50	90	70		1-4 hours				0.90	13.71	0.01		gloves-basic training			0.01	0.90	0.04	0.94		
	Industrial - SU3	Calendering (including Barbours) [CS64]		250	95	70	1-5%	1-4 hours				0.45	27.43	0.05		gloves-basic training			0.14	0.45	0.40	0.85		
	Industrial - SU3	Calendering (including Barbours) [CS64]		250	95	70	1-5%	1-4 hours				0.45	27.43	0.05		gloves-basic training			0.14	0.45	0.40	0.85		
	Industrial - SU3	Pressing uncured rubber sheets [CS73]		50	90	70	1-5%					0.30	3.43	0.1		gloves-basic training			0.03	0.30	0.10	0.40		
	Industrial - SU3	Vulcanisation [CS70]		250	99	70		1-4 hours				0.45	27.43	0.05		gloves-basic training			0.14	0.45	0.40	0.85		
	Industrial - SU3	Cooling cured articles [CS71]		50	90	70	1-5%					0.30	27.43	0.05		gloves-basic training			0.14	0.30	0.40	0.70		
	Industrial - SU3	Laboratory activities [CS36]		10	90	30						0.70	0.34	0.1					0.03	0.70	0.10	0.80		
	Industrial - SU3	Equipment maintenance [CS5]		50		70			half mask	0.1	SoP Equivalent to 90%LEV efficiency		0.15	13.71	0.1		gloves-basic training			0.14	0.15	0.40	0.55	

Table A.8.4 ES8 Use in rubber manufacture Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				DNEL =
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code].}
Use in rubber manufacturing and processing of Resin Oils and Cyclic Dienes Category streams	Industrial - SU3	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
	Industrial - SU3	Material transfers [CS3].		Handle substance within a closed system [E47]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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].
	Industrial - SU3	Material transfers [CS3].	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].
	Industrial - SU3	Bulk weighing [CS91]	(closed systems) [CS107].	Ensure operation is undertaken outdoors [E69]. (Wear suitable gloves tested to EN374 [PPE15]). Avoid carrying out activities involving exposure for more than 4 hours [OC28]Wear chemically resistant gloves (tested to EN374) in combination with Handle substance within a closed system [E47]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	Bulk 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].
	Industrial - SU3	Small scale weighing [CS90]	Dedicated facility [CS81].	Ensure operation is undertaken outdoors [E69]. ; Wear chemically resistant gloves (tested to EN374) in combination with Provide extract ventilation to points where emissions occur [E54]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	Additive premixing [CS92]	Batch process [CS55]. ; (closed systems) [CS107].	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].
	Industrial - SU3	Additive premixing [CS92]		Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]Wear chemically resistant gloves (tested to EN374) in combination with Handle substance within a closed system [E47]. Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]. Carefully handle substance [C&H19]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Carefully handle substance [(C&H19)].
	Industrial - SU3	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 [OC28]Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Transfer materials directly to mixing vessels [E45]). (Avoid carrying out activities involving exposure for more than 4 hours [OC28]).
	Industrial - SU3	Material transfers [CS3].		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 [OC28]Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Transfer materials directly to mixing vessels [E45]). (Avoid carrying out activities involving exposure for more than 4 hours [OC28]).
	Industrial - SU3	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 [OC28]Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Carefully handle substance [C&H19].
	Industrial - SU3	Calendering (including Banburys) [CS64]		Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Avoid carrying out activities involving exposure for more than 4 hours [OC28]).
	Industrial - SU3	Calendering (including Banburys) [CS64]		Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Avoid carrying out activities involving exposure for more than 4 hours [OC28]).
	Industrial - SU3	Pressing uncured rubber blanks [CS73]		Limit the substance content in the 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 points where emissions occur [E54]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial - SU3	Vulcanisation [CS70]		Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial - SU3	Cooling cured articles [CS71]		Limit the substance content in the 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial - SU3	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]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial - SU3	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]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [EN174].

Appendix A.9 ES9 Use in polymer production of Resin Oils and Cyclic Dienes Category streams (industrial)

Table A.9.1 ES9 General Information

Substance specific information				
Substance	Resin Oils and Cyclic Dienes Category streams	Reference Values		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#				
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).			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU10)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC14, PROC21			
Applicable Use Descriptors (ERC or SpERC)	ERC6A, ERC6C			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; Benzene content >25% except where otherwise stated >25% except where otherwise stated Assumes a good basic standard of occupational hygiene is implemented [G1].			
				Assumes DCPD content

Table A.9.2 ES9 Use in polymer production Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain								
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll if fit]
Use in polymer production of Resin Oils and Cyclic Dienes Category streams	Industrial -SU3	General measures (carcinogens) [G18]						
	Industrial -SU3	General exposures (closed systems) [CS19].	Continuous process [CS54] ; No sampling [CS57].		Continuous; daily; 15 - 1 hour; ambient temp.	Closed processes	No	1 - Use in closed process, no likelihood of exposure
	Industrial -SU3	Bulk transfers [CS14].	Transport [CS58] ; With sample collection [CS56].		Daily; <15 mins; ambient temp.	Enclosed transfers, vented transfer points; clear lines prior to decoupling	Yes	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial -SU3	Polymerisation (bulk and batch) [CS65]	Continuous process [CS54] ; With sample collection [CS56].		Continuous; daily; 15 mins - 1 hour	Enclosed process; Outside location; closed/semi-closed sampling point	No	2 - Use in closed, continuous process with occasional controlled exposure
	Industrial -SU3	Polymerisation (bulk and batch) [CS65]	Batch process [CS55] ; With sample collection [CS56].		Batch process; daily; 8 hour; ambient temp.	Closed equipment, enclosed or vented sampling points	No	3 - Use in closed batch process (synthesis or formulation)
	Industrial -SU3	Polymerisation (bulk and batch) [CS65]	Batch process [CS55] ; With sample collection [CS56].	Elevated Temperature	Batch process; daily; 8 hour; ambient temp.	Closed equipment, enclosed or vented sampling points	No	3 - Use in closed batch process (synthesis or formulation)
	Industrial -SU3	Finishing operations [CS102]	Batch process [CS55] ; With sample collection [CS56].	Catalyst inactivation and removal, washing and stripping / distillation to remove unreacted monomer	Batch process; daily; 8 hour; ambient temp.	Closed equipment, enclosed or vented sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial -SU3	Intermediate polymer storage [CS66]			Batch process; daily; 8 hour; ambient temp.	Closed equipment, enclosed or vented sampling points	Yes	4 - Use in batch and other process (synthesis or formulation) where opportunity for exposure arises
	Industrial -SU3	Addition and stabilisation [CS66]			Batch process; daily; 8 hour; ambient temp.	Closed equipment, enclosed or vented sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
	Industrial -SU3	Mixing in containers [CS23].	Batch process [CS55].		Batch process; daily; 8 hour; ambient temp.	Closed or contained equipment, enclosed or vented sampling points	Yes	5 - Mixing or blending in batch processes (multistage and/or significant contact)
	Industrial -SU3	Pelletizing [CS53].	Extrusion and masterbatching [CS88]		Batch process; daily; 8 hour; ambient temp.	Closed equipment, enclosed or vented extrusion heads	Yes	6 - Calendering operations
	Industrial -SU3	Pelletizing [CS53].			daily; 8 hour; ambient temp.	Semi closed equipment with extraction ventilation; good GV.	No	14 - Production of preparations or articles by tableting, compression, extrusion, pelletisation
	Industrial -SU3	Pelletisation and pellet screening [CS68]	(open systems) [CS108]		Batch process; daily; 8 hour; ambient temp.	Open transport lines, conveyor belts	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
	Industrial -SU3	Bulk transfers [CS14].	Continuous process [CS54] ; With sample collection [CS56].		Batch process; daily; 8 hour; ambient temp.	Outside location; Closed equipment, enclosed or vented sampling points	No	3 - Use in closed batch process (synthesis or formulation)
	Industrial -SU3	Transport [CS58].	With sample collection [CS56].		Daily; <15 mins; ambient temp.	Closed or ventilated sampling points	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Industrial -SU3	Equipment maintenance [CS5].			Daily; 15 min - 1 hour; ambient temp; collection of line waste in container	Enclosed lines; retain wash down in sealed storage pending disposal or use as recycled material for subsequent formulation. PPE.	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	
Industrial -SU3	Storage [CS67]		With occasional controlled exposure [CS140]	Daily; <15 mins (sampling) product temp. (ambient).	samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure	

Table A.9.3 ES9 Use in polymer production Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain				Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																			
Generic Exposure Scenario		Contributing Scenarios		Inhalatory exposure							Dermal exposure							Risk Characterization					
Short Title	Life Cycle Stage / Area of Application	Title	Supporting phase (optional)	TSA Predicted Polymer (g/m ³) or modifier	TSA LEV efficiency (%)	Dilution reduction of recoveries (%)	TSA concentration factor	TSA duration factor	TSA PPE factor	Extra exposure modifier (optional)	Risk Red - comment to clarify additional modifier (optional)	Predicted exposure - (g/m ³) or modifier	TSA Predicted dermal exposure (mg/kg/d) - risk modifier	TSA Dermal exposure LEV reduction factor	TSA concentration factor	PPE factor	Extra exposure modifier (optional)	Risk Red - comment to clarify additional modifier (optional)	Predicted dermal exposure (mg/kg/d) - modified	RCSR (inhalation)	RCSR (dermal)	RCSR (all routes)	
Use in polymer production of Resin Cils and Cyclic Dienes Category streams	Industrial - SUs	General measures (carcinogens) (CS18)																					
	Industrial -SUs	General exposures (closed systems) (CS19)	Continuous process (CS54) - No sampling (CS57)	0.01								0.01	0.34				gloves		0.07	0.01	0.20	0.21	
	Industrial -SUs	Bulk transfers (CS14)	Transport (CS58) - WH sample collection (CS59)	50	97	30		1-4 hours				0.63	6.86	0.1			gloves-basic training		0.07	0.63	0.20	0.83	
	Industrial -SUs	Polymerisation (bulk and batch) (CS60)	Continuous process (CS54) - WH sample collection (CS59)	10	90	30		1-4 hours				0.42	1.37	0.1					0.14	0.42	0.40	0.82	
	Industrial -SUs	Polymerisation (bulk and batch) (CS60)	Batch process (CS55) - WH sample collection (CS59)	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.10	0.45	
	Industrial -SUs	Polymerisation (bulk and batch) (CS60)	Batch process (CS55) - WH sample collection (CS59)	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.10	0.45	
	Industrial -SUs	Finishing operations (CS102)	Batch process (CS55) - WH sample collection (CS59)	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.10	0.45	
	Industrial -SUs	Intermediate polymer storage (CS60)			20	90		1-5%				0.40	6.86	0.1			gloves		0.14	0.40	0.40	0.80	
	Industrial -SUs	Addition and stabilisation (CS60)			25	90		1-5%				0.50	0.34	0.1					0.03	0.50	0.10	0.50	
	Industrial -SUs	Mixing in containers (CS23)	Batch process (CS55)		50	95	30	1-5%				0.35	13.71	0.005					0.07	0.35	0.20	0.55	
	Industrial -SUs	Palleting (CS53)	Exclusion and masterbatching (CS68)		50	90	30	1-5%	1-4 hours			0.42	27.43	0.05			gloves-basic training		0.14	0.42	0.40	0.82	
	Industrial -SUs	Palleting (CS53)			50	90	30	1-5%				0.70	3.43	0.1			gloves		0.07	0.70	0.20	0.90	
	Industrial -SUs	Palletisation and pallet screening (CS68)	open systems (CS108)		50	97		1-5%				0.30	6.86	0.1			gloves		0.14	0.30	0.40	0.70	
	Industrial -SUs	Bulk transfers (CS14)	Continuous process (CS54) - WH sample collection (CS59)		25	90		1-5%				0.50	0.34				gloves		0.07	0.50	0.20	0.70	
	Industrial -SUs	Transport (CS58)	WH sample collection (CS59)		50	97		1-5%				0.30	6.86	0.1			gloves		0.14	0.30	0.40	0.70	
	Industrial -SUs	Equipment maintenance (CS5)			50					hair mask	0.1	LEV effectiveness of 90% assumed to equate to SCOP rating to drawing etc prior to maintenance (CS 1)	0.50	13.71	0.01					0.14	0.50	0.40	0.90
	Industrial -SUs	Storage (CS67)			10			1-5%	15 min-1 hour			0.40	1.37				gloves-basic training		0.14	0.40	0.40	0.80	
			With occasional controlled exposure (CS140)																				

Table A.9.4 ES10 Use in polymer production Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: (phrase [RMM code].)
Use in polymer production of Resin Oils and Cyclic Dienes Category streams	Industrial -SU3	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 indicated for specific activities.
	Industrial -SU3	General exposures (closed systems) [CS15].	Continuous process [CS54]. ; No sampling [CS57].	Handle substance within a closed system [E47].Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	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 or controlled 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].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16]. (Clear transfer lines prior to de-
	Industrial -SU3	Polymerisation (bulk and batch) [CS55]	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 4 hours [OC 28].(Handle substance within a closed system [E47]). (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Polymerisation (bulk and batch) [CS55]	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 1 hour [OC 27].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Polymerisation (bulk and batch) [CS55]	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 1 hour [OC 27].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Finishing operations [CS102]	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 1 hour [OC 27].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Intermediate polymer storage [CS66]		Limit the substance content in the product to 5% [OC17].Provide extract ventilation to points where emissions occur [E54]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	Addition and stabilisation [CS69]		Limit the substance content in the product to 5% [OC17]. ; Handle substance within a predominantly closed system provided with extract ventilation [E49].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	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 or controlled ventilation (not less than 3 to 5 air changes per hour) [E11].(Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	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 or controlled 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
	Industrial -SU3	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 or controlled ventilation (not less than 3 to 5 air changes per hour) [E11]. ; or [G9]. Ensure operation is undertaken outdoors [E69]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	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]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	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]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	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]. Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	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 [ENV14]. (Wear suitable gloves tested to EN374 [PPE15]).
Industrial -SU3	Storage [CS67]		Limit the substance content in the product to 5% [OC17]. ; Sample via a 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 [OC 27].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].	
			With occasional controlled exposure [CS140]	

Appendix A.10 ES10 Use in polymer processing of Resin Oils and Cyclic Dienes Category streams (industrial)

Table A.10.1 ES10 General Information

Substance specific information				
Substance	Resin Oils and Cyclic Dienes Category streams	Reference Values		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	0.34	mg/kg/day
physical property	liquid			
ES#				
Processes, tasks, activities covered	Processing of formulated polymers including material transfers, additives handling (e.g. pigments, stabilisers, fillers, plasticisers, etc.), moulding, curing and forming activities, material re-works, storage and associated maintenance.			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU10)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC21			
Applicable Use Descriptors (ERC or SpERC)	ERC 6D			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; >25% except where stated Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes Benzene content Assumes DCPD content >25% except where stated			

Table A.10.2 ES10 Use in polymer processing Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain									
Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Contributing Conditions		Typical Mapped PERMs		Use Descriptor
Short Title	Life Cycle Stage / Area of Application	Title	Supporting systems (optional)	CR factor application (Data bank)	[Data bank]	[Data bank]	LCU (Yes/No)	Process Category (Data bank)	
Use in polymer processing, extrusion, injection molding, blow molding, and other polymer processing activities	Industrial - BUS	General purpose (conformers) [C174]							
	Industrial - BUS	Blow transform (C174) (closed systems) [C1810P]			Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	1 - Use in closed processes for identification of emissions	
	Industrial - BUS	Blow transform (C174) (closed systems) [C1810P]	With mechanical ventilation equipment [C1810S]		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	2 - Use in closed processes with mechanical ventilation equipment	
	Industrial - BUS	Blow transform (C174)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	(closed systems) [C1810P]		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	1 - Use in closed processes for identification of emissions	
	Industrial - BUS	Blow transform (C181)	With mechanical ventilation equipment [C1810S]		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	2 - Use in closed processes with mechanical ventilation equipment	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	
	Industrial - BUS	Blow transform (C181)	Industrial facility (C181)		Extrusion process; extrusion blow molding	Extrusion process; extrusion blow molding	Yes	3 - Exposed to atmospheric air; use in open processes or identification of emissions	

Table A.10.4 ES10 Use in polymer processing Risk Management Measures

Table 1: Mapping Uses in the Supply Chain				
Generic Exposure Scenario		Contributing Scenarios		Risk Management Measures (RMMs)
Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase (optional)	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: (phrase [RMM code])
Use in polymer processing of Resin Oils and Cyclic Diene Category streams	Industrial -SU3	General measures (carcinogens) [G16]		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 safety 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, clean up spills
	Industrial -SU3	Bulk transfers (CS14) ; (closed systems) [CS107]		Handle substance within a closed system [E47] Wear suitable gloves tested to EN374 [PPE15]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	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]. (Provide extract ventilation to material transfer points and other openings [E82]) (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	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]. (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Bulk weighing [CS91]	(closed systems) [CS107]	Handle substance within a closed system [E47] Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	Bulk weighing [CS91]	With occasional controlled exposure [CS140]	Handle substance within a closed system [E47]; Limit the substance content in the product to 20% [OC18] 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] Wear suitable gloves tested to EN374 [PPE15].
	Industrial -SU3	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] (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Additive premixing [CS92]	(closed systems) [CS107]	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] (Carefully handle substance [C&H19]). (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Additive premixing [CS92]	(open systems) [CS108]; 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] (Wear suitable gloves tested to EN374 [PPE15]). (Carefully handle substance [C&H19]).
	Industrial -SU3	Additive premixing [CS92]	General exposures (open systems) [CS16]	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] (Wear suitable gloves tested to EN374 [PPE15]). (Carefully handle substance [C&H19]).
	Industrial -SU3	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 1 hour [OC27] (Wear suitable gloves tested to EN374 [PPE15]). (Provide extract ventilation to material transfer points and other openings [E82]).
	Industrial -SU3	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] (Wear suitable gloves tested to EN374 [PPE15]). (Provide extract ventilation to material transfer points and other openings [E82]).
	Industrial -SU3	Calendering (including Barbours) [CS64]		Limit the substance content in the 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] Avoid carrying out activities involving exposure for more than 4 hours [OC28] (Wear chemically resistant gloves [E40]).
	Industrial -SU3	Production of articles by dipping and pouring [CS113]		Limit the substance content in the 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 EN374 [PPE15]).
	Industrial -SU3	Extrusion and masterbatching [CS88]		Limit the substance content in the 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 EN374 [PPE15]).
	Industrial -SU3	Injection moulding of articles [CS89]		Limit the substance content in the 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 [E60] (Wear suitable gloves tested to EN374 [PPE15]).
	Industrial -SU3	Equipment maintenance [CS5]		Drain down system prior to equipment break-in or maintenance [E69] 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] (Wear chemically resistant gloves tested to EN374) in combination with 'basic' employee training [PPE16]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENV14].
	Industrial -SU3	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]. (Wear suitable gloves tested to EN374 [PPE15]).

APPENDIX B: ENVIRONMENTAL EXPOSURE

Table B.1.: LocalCSR Worksheet

Table of Local Exposure and Risk Characterisation Results from PETRORISK	local output- Manufacture	local output- Use as Inter	local output- Distribution	local output- Formulation	local output- Use as a fue	local output- Use as a fue	local output- Use as a fue	local output- Uses in Coat	local output- Polymer prod	local output- Polymer proc	local output- Rubber produ
Section 1 - Exposure Assessment	1.1	1.2	1.3	1.4	1.8	1.9	1.10	1.11	1.5	1.6	1.7
Regional Tonnage (T/yr)	2.5E+06	1.0E+06	2.5E+06	1.5E+06	1.3E+06	1.5E+05	7.5E+04	2.5E+03	2.5E+03	5.0E+03	2.5E+03
Fraction of regional tonnage used locally	2.4E-01	1.5E-02	2.0E-03	2.0E-02	1.0E+00	5.0E-04	5.0E-04	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Local Site Tonnage (T/y)	6.0E+05	1.5E+04	5.0E+03	3.0E+04	1.3E+06	7.5E+01	3.8E+01	2.5E+03	2.5E+03	5.0E+03	2.5E+03
Site Tonnage (kg/d)	2.0E+06	5.0E+04	5.0E+04	1.0E+05	4.2E+06	2.1E+02	1.0E+02	2.5E+04	2.5E+04	5.0E+04	2.5E+04
Emission days (d/yr)	300	300	100	300	300	365	3.7E+02	1.0E+02	100	100	100
Release fraction (prior to RMM) - wastewater	1.0E-05	1.0E-04	1.0E-05	5.0E-05	1.0E-07	1.0E-05	1.0E-05	1.0E-03	1.0E-04	0.0E+00	5.0E-04
Release fraction (prior to RMM) - air	5.0E-05	5.0E-04	1.0E-03	1.0E-04	2.0E-05	1.0E-02	1.0E-02	1.0E-03	5.0E-04	5.0E-03	1.0E-03
Dilution Factor - Freshwater	40	10	10	10	10	10	10	10	10	10	10
Dilution Factor - Marine	100	100	100	100	100	100	100	100	100	100	100
On-site removal efficiency - Air (%)	90.0	80.0	90.0	0.0	95.0	0.0	0.0	90.0	80.0	80.0	0.0
Risk-driving Comparment	Human Inhalation	Human Ingestion	Human Inhalation	Human Ingestion	Human Inhalation	Human Inhalation	Human Inhalation	Human Ingestion	Human Ingestion	Human Inhalation	Human Ingestion

Table of Local Exposure and Risk Characterisation Results from PETRORISK	local output- Manufacture	local output- Inter Use as	local output- Distribution	local output- Formulation	local output- Use as a fue	local output- Use as a fue	local output- Use as a fue	local output- Uses in Coat	local output- Polymer prod	local output- Polymer proc	local output- Rubber produ
Wastewater Treatment Required (Yes/No)	No	No	No	No	No	No	No	Yes	No	No	No
Required Removal Efficiency - wastewater (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.5	0.0	0.0	0.0
Onsite Removal Efficiency - wastewater (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.3	0.0	0.0	0.0
Offsite Removal Efficiency - wastewater (%)	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9
Total Removal Efficiency - wastewater (%)	94.9	94.9	94.9	94.9	94.9	94.9	94.9	98.5	94.9	94.9	94.9
Msafe (kg/d)	2.0E+06	5.0E+04	1.6E+05	1.0E+05	5.4E+06	1.3E+03	6.5E+02	2.5E+04	5.0E+04	5.0E+04	2.5E+04
Aquatic without Treatment (kg/d)	6.8E+01	2.7E+02	6.8E+01	2.1E+02	3.4E-01	4.1E+00	2.1E+00	6.8E+00	6.8E-01	0.0E+00	3.4E+00
Aquatic (with onsite and offsite treatment) (kg/d)	6.5E+01	2.6E+02	6.5E+01	1.9E+02	3.3E-01	3.9E+00	1.9E+00	6.5E+00	6.5E-01	0.0E+00	3.2E+00
Air (direct after on-site treatment) (kg/d)	5.9E+01	3.7E+02	7.1E+02	4.8E+02	3.6E+00	4.1E+03	2.1E+03	3.1E+00	9.3E-01	1.4E+01	8.1E+00
Environmental Exposure											
PEC effluent (mg/L)	1.0E-01	1.3E-01	1.3E-02	1.3E-01	1.1E-02	5.3E-05	2.6E-05	6.4E-01	6.4E-02	1.0E-22	3.2E-01
PEC sludge (mg/kg dw)	6.2E+01	7.8E+01	7.8E+00	7.8E+01	6.5E+00	3.2E-02	1.6E-02	3.9E+02	3.9E+01	2.6E-19	1.9E+02
PEC air (mg/m ³)	2.7E-03	1.6E-03	4.0E-04	2.8E-03	1.0E-03	2.0E-04	2.0E-04	1.0E-03	2.7E-04	3.8E-03	2.3E-03
C air (mg/m ³)	2.5E-03	1.4E-03	2.0E-04	2.6E-03	8.0E-04	2.5E-07	1.3E-07	8.3E-04	7.4E-05	3.6E-03	2.1E-03

Table of Local Exposure and Risk Characterisation Results from PETRORISK	local output- Manufacture	local output- Use as Inter	local output- Distribution	local output- Formulation	local output- Use as a fue	local output- Use as a fue	local output- Use as a fue	local output- Uses in Coat	local output- Polymer prod	local output- Polymer proc	local output- Rubber produ
PEC freshwater (mg/L)	2.6E-03	1.3E-02	1.3E-03	1.3E-02	1.1E-03	1.2E-04	1.2E-04	6.4E-02	6.4E-03	1.1E-04	3.2E-02
C freshwater (mg/L)	2.5E-03	1.3E-02	1.2E-03	1.3E-02	9.7E-04	5.3E-06	2.6E-06	6.4E-02	6.3E-03	1.2E-08	3.2E-02
PEC marine (mg/L)	1.0E-03	1.3E-03	1.3E-04	1.3E-03	1.1E-04	5.3E-07	7.3E-07	6.4E-03	6.4E-04	4.7E-07	3.2E-03
C marine (mg/L)	1.0E-03	1.3E-03	1.3E-04	1.3E-03	1.1E-04	5.9E-08	2.6E-07	6.4E-03	6.4E-04	4.9E-09	3.2E-03
PEC freshwater sediment (mg/kg ww)	1.1E-02	5.4E-02	5.4E-03	5.4E-02	4.5E-03	5.8E-04	5.7E-04	2.7E-01	2.7E-02	5.6E-04	1.3E-01
C freshwater sediment (mg/kg ww)	1.0E-02	5.3E-02	4.8E-03	5.3E-02	3.9E-03	2.2E-05	1.1E-05	2.7E-01	2.6E-02	3.8E-08	1.3E-01
PEC marine sediment (mg/kg ww)	4.3E-03	5.4E-03	5.4E-04	5.4E-03	4.5E-04	5.4E-06	4.3E-06	2.7E-02	2.7E-03	3.2E-06	1.3E-02
C marine sediment (mg/kg ww)	4.3E-03	5.4E-03	5.3E-04	5.4E-03	4.5E-04	2.2E-06	1.1E-06	2.7E-02	2.7E-03	1.5E-08	1.3E-02
PEC agricultural soil (mg/kg ww)	2.3E-05	1.5E-05	8.1E-06	2.4E-05	8.3E-06	6.9E-06	8.2E-06	1.0E-05	7.2E-06	3.1E-05	2.0E-05
C agricultural soil (mg/kg ww)	1.8E-05	9.8E-06	3.3E-06	1.9E-05	3.5E-06	2.1E-06	3.4E-06	5.4E-06	2.4E-06	2.6E-05	1.5E-05
PEC groundwater (mg/L)	9.3E-06	6.4E-06	1.2E-06	9.9E-06	3.1E-06	3.1E-07	1.5E-07	5.6E-06	1.1E-06	1.1E-05	8.2E-06
C groundwater (mg/L)	1.9E-06	2.1E-06	7.4E-07	2.0E-06	1.8E-06	2.1E-07	8.9E-08	2.6E-06	7.1E-07	1.8E-06	2.0E-06
PEC oral freshwater fish (mg/kg ww)	2.0E-02	9.6E-02	3.5E-03	9.6E-02	9.0E-03	1.1E-03	1.1E-03	1.6E-01	1.6E-02	4.2E-04	8.0E-02
PEC oral marine top predator (mg/kg ww)	3.9E-03	2.0E-02	6.3E-04	2.0E-02	1.6E-03	8.1E-04	8.5E-05	3.3E-02	3.3E-03	3.8E-05	1.7E-02

Table of Local Exposure and Risk Characterisation Results from PETRORISK	local output-Manufacture	local output-Use as Inter	local output-Distribution	local output-Formulation	local output-Use as a fue	local output-Use as a fue	local output-Use as a fue	local output-Uses in Coat	local output-Polymer prod	local output-Polymer proc	local output- Rubber produ
PEC oral worm (mg/kg ww)	2.8E-05	2.1E-05	7.7E-06	2.9E-05	1.9E-05	5.0E-06	1.8E-06	1.9E-05	6.9E-06	3.5E-05	2.5E-05
Indirect Human Exposure											
PEC fish (mg/kg ww)	3.8E-02	1.9E-01	6.3E-03	1.9E-01	1.6E-02	2.7E-03	2.7E-03	3.2E-01	3.2E-02	2.6E-03	1.6E-01
C fish (mg/kg ww)	3.5E-02	1.9E-01	3.7E-03	1.9E-01	1.3E-02	9.5E-05	4.7E-05	3.1E-01	2.9E-02	4.4E-08	1.6E-01
PEC drinking water (mg/L)	1.1E-03	5.3E-03	1.8E-04	5.3E-03	4.5E-04	6.0E-05	5.9E-05	8.9E-03	8.9E-04	6.9E-05	4.4E-03
C drinking water (mg/L)	1.0E-03	5.3E-03	1.2E-04	5.3E-03	3.9E-04	2.7E-06	1.3E-06	8.8E-03	8.3E-04	1.1E-05	4.4E-03
PEC meat (mg/kg ww)	1.9E-04	1.8E-04	1.6E-04	1.9E-04	1.7E-04	1.6E-04	1.6E-04	1.7E-04	1.6E-04	2.0E-04	1.9E-04
C meat (mg/kg ww)	3.0E-05	1.8E-05	4.6E-06	3.1E-05	1.2E-05	2.5E-09	1.2E-09	1.0E-05	3.0E-06	4.4E-05	2.6E-05
PEC milk (mg/kg ww)	6.3E-05	5.9E-05	5.2E-05	6.3E-05	5.5E-05	5.0E-05	5.0E-05	5.7E-05	5.2E-05	6.6E-05	6.1E-05
C milk (mg/kg ww)	1.2E-05	8.3E-06	1.7E-06	1.3E-05	4.2E-06	1.8E-09	9.2E-10	6.8E-06	1.4E-06	1.5E-05	1.1E-05
PEC leaf (mg/kg ww)	3.2E-05	5.4E-05	3.6E-05	3.4E-05	4.2E-05	3.1E-05	3.1E-05	5.2E-05	3.5E-05	3.9E-05	6.0E-05
C leaf (mg/kg ww)	8.7E-07	2.3E-05	4.3E-06	3.1E-06	1.1E-05	5.5E-09	2.8E-09	2.0E-05	3.8E-06	7.7E-06	2.9E-05
PEC root (mg/kg ww)	4.0E-05	2.6E-05	2.0E-05	4.2E-05	1.5E-05	1.7E-05	1.5E-05	1.9E-05	1.8E-05	5.5E-05	3.5E-05
C root (mg/kg ww)	2.7E-05	1.2E-05	5.8E-06	2.8E-05	7.1E-07	2.6E-06	1.3E-06	4.7E-06	4.3E-06	4.1E-05	2.1E-05
Dose inhalation (ug/kg/d)	7.7E-01	4.7E-01	1.1E-01	8.0E-01	2.9E-01	5.7E-02	5.7E-02	3.0E-01	7.9E-02	1.1E+00	6.6E-01
Dose oral exposure - excluding inhalation (ug/kg/d)	3.7E-01	4.6E-01	1.6E-02	4.7E-01	3.9E-02	8.6E-03	8.5E-03	7.7E-01	7.7E-02	9.9E-03	3.9E-01
Fraction from water pathways	3.3E-01	5.0E-01	1.2E-01	3.7E-01	1.2E-01	4.9E-01	4.9E-01	7.2E-01	5.0E-01	3.0E-04	3.7E-01

Table of Local Exposure and Risk Characterisation Results from PETRORISK	local output- Manufacture	local output- Use as Inter	local output- Distribution	local output- Formulation	local output- Use as a fue	local output- Use as a fue	local output- Use as a fue	local output- Uses in Coat	local output- Polymer prod	local output- Polymer proc	local output- Rubber produ
Section 2 - Risk Characterisation	2.1	2.2	2.3	2.4	2.8	2.9	2.10	2.11	2.5	2.6	2.7
PNEC oral (mg/kg ww)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DNEL inhalation (ug/kg/d)	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01
DNEL oral exposure (ug/kg/d)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Environmental Risk											
RCR effluent	7.2E-03	9.0E-03	9.0E-04	9.0E-03	7.6E-04	3.7E-06	1.9E-06	4.5E-02	4.5E-03		2.3E-02
RCR freshwater	2.8E-03	1.4E-02	1.4E-03	1.4E-02	1.2E-03	2.2E-04	2.2E-04	7.0E-02	7.0E-03	2.1E-04	3.5E-02
RCR marine	1.1E-03	1.4E-03	1.4E-04	1.4E-03	1.2E-04	5.8E-07	1.6E-06	7.0E-03	7.0E-04	1.3E-06	3.5E-03
RCR freshwater sediment	3.2E-03	1.6E-02	1.6E-03	1.6E-02	1.4E-03	1.4E-04	1.3E-04	8.1E-02	8.1E-03	1.3E-04	4.0E-02
RCR marine sediment	1.3E-03	1.6E-03	1.6E-04	1.6E-03	1.4E-04	1.2E-06	8.9E-07	8.1E-03	8.1E-04	5.7E-07	4.0E-03
RCR oral freshwater fish	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RCR oral marine top predator	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RCR agricultural soil	2.2E-05	1.3E-05	4.0E-06	2.3E-05	8.5E-06	5.2E-06	3.2E-06	7.2E-06	2.8E-06	3.3E-05	1.9E-05
RCR worm oral	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Indirect Human Risk											
RCR inhalation	4.1E-01	2.5E-01	6.0E-02	4.2E-01	1.5E-01	3.1E-02	3.1E-02	1.6E-01	4.2E-02	5.8E-01	3.5E-01
RCR ingestion (w/o inhalation)	4.0E-01	5.1E-01	1.7E-02	5.1E-01	4.3E-02	9.3E-03	9.2E-03	8.4E-01	8.4E-02	1.1E-02	4.2E-01
RCR combined HI	8.1E-01	7.6E-01	7.7E-02	9.3E-01	2.0E-01	4.0E-02	4.0E-02	1.0E+00	1.3E-01	5.9E-01	7.7E-01
MaxRCR- Water-related	7.2E-03	1.6E-02	1.6E-03	1.6E-02	1.4E-03	2.2E-04	2.2E-04	8.4E-01	8.1E-03	2.1E-04	4.0E-02

Table of Local Exposure and Risk Characterisation Results from PETRORISK	local output- Manufacture	local output- Use as Inter	local output- Distribution	local output- Formulation	local output- Use as a fue	local output- Use as a fue	local output- Use as a fue	local output- Uses in Coat	local output- Polymer prod	local output- Polymer proc	local output- Rubber produ
compartments											
Max RCR - all compartments	8.1E-01	7.6E-01	7.7E-02	9.3E-01	2.0E-01	4.0E-02	4.0E-02	1.0E+00	1.3E-01	5.9E-01	7.7E-01

Indirect exposure of man via the environment has been amended to reflect that these streams only contain a maximum of 25% benzene.

Table B.2. RegionalCSR Worksheet

Compartment	Value
Emissions	
Aquatic with STP (kg/d)	6.0E+02
Air (direct + STP) (kg/d)	7.6E+03
Soil (direct only) (kg/d)	3.9E+03
Environmental Exposure	
PEC air (mg/m ³)	2.0E-04
PECregional,FW (mg/L)	1.1E-04
PECregional,Fwsediment (mg/kg ww)	5.6E-04
PECregional,Marine (mg/L)	4.7E-07
PECregional,msd (mg/kg ww)	3.2E-06
PECregional,Agsoil (mg/kg ww)	4.8E-06
PECgrassland (Natural) (mg/kg ww)	3.2E-06
Indirect Human Exposure	
PECfish (mg/kg ww)	2.6E-03
PECdrinking water (mg/kg ww)	5.8E-05
PECroot (mg/kg ww)	1.4E-05
PECleaf (mg/kg ww)	3.1E-05
PECmeat (mg/kg ww)	1.6E-04
PECMilk (mg/kg ww)	5.0E-05
Dose inhalation (ug/kg/d)	5.7E-02
Dose oral exposure - excluding inhalation (ug/kg/d)	8.3E-03
Environmental Risk Characterisation	
RCR freshwater	2.1E-04
RCR freshwater sediment	1.3E-04
RCR marine	1.3E-06
RCR marine sediment	5.6E-07
RCR agricultural soil	5.8E-07
RCR grassland (Natural)	3.8E-07
Indirect Human Risk	
RCR inhalation	1.2E-01
RCR oral exposure - excluding inhalation	3.6E-02
combined RCR	1.6E-01

APPENDIX C: QUALITATIVE RISK ASSESSMENTS

Appendix C.1. Carcinogenicity (R45) and mutagenicity (R46) hazard qualitative risk assessment

The purpose of the qualitative risk characterisation is to assess: ".the likelihood that effects are avoided when implementing the exposure scenario..." (REACH Annex 1, Section 6.5). The qualitative risk characterisation has to be completed when there is no basis for setting a DNEL or DMEL for a certain human health endpoint, i.e. when the available data for this effect do not provide quantitative dose-response information, but there exist toxicity data of a qualitative nature. Endpoints for which the available data may trigger a qualitative risk characterisation include carcinogenicity and mutagenicity where no dose threshold is identifiable.

When no DNEL for an endpoint is available the general qualitative risk assessment approach aims to reduce/avoid contact with the substance. This is achieved by implementation of risk management measures (RMMs) and operational conditions (OCs) – these need to be proportional to the degree of concern for the health hazard presented by the substance. For Category 1 and 2 carcinogens and mutagens there is the highest degree of concern. The control strategy must be sufficient to support the conclusion that risk is controlled to a level of no concern.

The general philosophy is twofold – that the use of the substance is limited to suitably equipped settings and that a stringent set of RMMs will be applied.

For the carcinogenic and mutagenic hazard a qualitative risk characterisation has been conducted consistent with the considerations and RMMs identified in the Table below. Implementation of these RMMs will ensure that the likelihood of an event occurring due to the carcinogenic and mutagenic hazard of the substance is negligible and the risk is considered to be controlled to a level of no concern.

Hazard	Material	Risk / Hazard Phrase	Examples of Relevant S Phrases and P Statements	Components of the Qualitative Risk Assessment
Cancer Mutagenicity	•Liquid	Cat2, R45 Cat1B, H350 Cat2, R46 Cat1B, H340	<u>S-Phrases:</u> <ul style="list-style-type: none"> •S36/37: Wear suitable protective clothing and gloves. •S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). •S53: Avoid exposure – obtain special instructions before use. <u>P-Statements:</u>	Worker <ul style="list-style-type: none"> • Implement good standards of occupational hygiene • Consider technical advances and process upgrades • Minimise exposure using measures such as closed systems • Management/supervision to check that the RMMs in place are being used correctly and OCs followed • Restrict access to authorised persons; • Provide specific activity

Hazard	Material	Risk / Hazard Phrase	Examples of Relevant S Phrases and P Statements	Components of the Qualitative Risk Assessment
			Prevention: •P201: Obtain special instructions before use. •P202: Do not handle until all safety precautions have been read and understood. •P281: Use personal protective equipment as required. Response: •P308 + P313: If exposed or concerned: Get medical advice/attention. Storage: •P405: Store locked up. Disposal: •P501: Dispose of contents/container to.... in accordance with local/regional/national/international regulations (to be specified)	training •Regularly inspect, test and maintain all control measures •Consider the need for risk based health surveillance Consumer -Not supported unless marketed in a manner consistent with Article 56 of REACH

These RMMs will be communicated by means of the Exposure Scenario by use of standard phrases.

For every exposure scenario, the following general phrase is be included:

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].

In addition further specific phrases are also be applied, where the identified contributing scenarios are relevant, to potential exposure, within any specific exposure scenario

Appendix C.2. Irritation hazard (R38) qualitative risk assessment

The purpose of the qualitative risk characterisation is to assess: ".the likelihood that effects are avoided when implementing the exposure scenario..." (REACH Annex 1, Section 6.5). The qualitative risk characterisation has to be completed when there is no basis for setting a DNEL or DMEL for a certain human health endpoint, i.e. when the available data for this effect do not provide quantitative dose-response information, but there exist toxicity data of a qualitative nature. One of the endpoints for which the available data may trigger a qualitative risk characterisation includes irritation.

When no DNEL for an endpoint is needed the general approach aims at reducing/avoiding contact with the substance. This is achieved by implementation of risk management measures (RMMs) and operational conditions (OCs) – these need to be proportional to the degree of concern for the health hazard presented by the substance. The control strategy must be sufficient to support the conclusion that risk is controlled to a level of no concern.

Implementation of a selection of these RMMs will ensure that the likelihood of an event occurring due to the irritation hazard of the substance is negligible and the risk is considered to be controlled to a level of no concern.

Hazard	Material	Risk / Hazard Phrase	P Phrase	Qualitative Assessment	Risk
Skin Irritation	<ul style="list-style-type: none"> • Gas • Liquid 	R38 / H315	<p>Prevention:</p> <ul style="list-style-type: none"> •P264: Wash ... thoroughly after handling. •P280: Wear protective gloves. <p>Response:</p> <ul style="list-style-type: none"> •P302 + P352: IF ON SKIN: Wash with plenty of soap and water. •P321: Specific treatment (see ... on this label). •P332 + P313: If skin irritation occurs: Get medical advice/attention. •P362: Take off contaminated clothing and wash before re-use. 	<p><i>Implementation of basic standards of occupational hygiene;</i> <i>Avoid all skin contact with product;</i> <i>Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately;</i> <i>Minimisation of splashes and spills;</i> <i>Avoidance of contact with contaminated tools and objects;</i> <i>Clean up contamination/spills as soon as they occur;</i> <i>Regular cleaning of equipment and work area;</i> <i>Management/supervision in place to check that the RMMs in place are being</i></p>	

				<p><i>used correctly and OCs followed;</i></p> <p><i>Training for staff on good practice to prevent / minimise exposures and to report any skin problems that may develop;</i></p> <p><i>Good standard of personal hygiene.</i></p> <p><i>Where activities may lead to aerosol release e.g. spraying; additional skin protection measures such as impervious suits and face shields are required.</i></p>
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Appendix C.3. Aspiration hazard (R65) qualitative risk assessment

The purpose of the qualitative risk characterisation is to assess: ".the likelihood that effects are avoided when implementing the exposure scenario..." (REACH Annex 1, Section 6.5). The qualitative risk characterisation has to be completed when there is no basis for setting a DNEL or DMEL for a certain human health endpoint, i.e. when the available data for this effect do not provide quantitative dose-response information, but there exist toxicity data of a qualitative nature. The endpoints for which the available data may trigger a qualitative risk characterisation includes aspiration hazard.

The general approach when no DNEL for an endpoint is available aims at reducing/avoiding contact with the substance. This is achieved by implementation of risk management measures (RMMs) and operational conditions (OCs) – which need to be proportional to the degree of concern for the health hazard presented by the substance. The control strategy must be sufficient to support the conclusion that risk is controlled to a level of no concern.

Implementation of a selection of these RMMs will ensure that the likelihood of an event occurring due to the aspiration hazard of the substance is negligible and the risk is considered to be controlled to a level of no concern.

Hazard	Material	Risk/ Hazard Phrase	P Phrase	Qualitative Risk Assessment
Aspiration Toxicity	• Liquid	R65 / H304	Response: •P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. •P331: Do NOT induce vomiting. Storage: •P405: Store locked up. Disposal: •P501: Dispose of contents/container to	Do not ingest Implementation of basic standards of occupational hygiene Minimisation of splashes and spills Avoidance of contact with contaminated tools and objects Regular cleaning of equipment and work area Management/supervision in place to check that the RMMs in place are being used correctly and OCs followed Training for staff on good practice Good standard of personal hygiene

For any substance, classified as R65, these risk management measures should be communicated via the safety data sheet by use of the following phrase:

- Do not ingest. If swallowed then seek immediate medical assistance.

Appendix C.4. Qualitative risk assessment of risks from flammable substances

The accident scenarios relevant for REACH are minor accidents which might occur in the workplace and those related to consumer use. Major accidents caused by chemicals and the requirements to manage these risks are regulated under the Seveso II Directive and do not need to be considered.

Risks from the physicochemical hazards of substances can be controlled by implementing risk management measures tailored to each specific risk. For flammable substances the following measures need to be implemented to control the risks and to show that safe use can be accomplished. For all flammable substances classified as R10, R11 or R12, safety data sheets should be made available in which the appropriate risk management measures are identified and communicated.

Physicochemical Hazard Qualitative Risk Assessment

A selection of the following organisational and technical measures should be taken to avoid ignition of flammable substances. These measures are suitable to prevent minor accidents which might occur at the workplace or during consumer use. Larger facilities manufacturing or using substances with flammable properties in significant quantities should follow the ATEX Directive (94/9/EC and 99/92/EC) to control risks arising from flammable substances and explosive atmospheres.

Based on the implementation of a selection of handling and storage risk management measures for the identified uses, we can conclude that there is no immediate concern as the risk is controlled to an acceptable level.

Hazard	Material	Risk / Hazard Phrase	P Phrase	Qualitative Assessment	Risk
Extremely Flammable	Liquid	R12 / H224 (Extremely flammable liquid and vapour)	Prevention: <ul style="list-style-type: none"> •P210: Keep away from heat/sparks/open flames/... /hot surfaces.... No smoking •P233 Keep container tightly closed. •P240: Ground/bond container and receiving equipment. •P241: Use explosion- 	<u>Substance Handling and Transfer Preventative Measures</u> <i>Avoid Splash Filling (Industrial) – N/A for Gases. Do NOT use compressed air for filling, discharging or handling operations (Industrial). Electrostatic charges may be generated during pumping. Electrostatic discharge may</i>	

Hazard	Material	Risk / Hazard Phrase	P Phrase	Qualitative Assessment Risk
			<p>proof electrical/ventilating/lighting/.../ equipment.</p> <ul style="list-style-type: none"> •P242: Use only non-sparking tools. •P243: Take precautionary measures against static discharge. •P280: Wear protective gloves/eye protection/face protection. <p>Response:</p> <ul style="list-style-type: none"> •P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower •P370 + P378: In case of fire: Use for extinction. <p>Storage:</p> <ul style="list-style-type: none"> •P403 + P235: Store in a well-ventilated place. Keep cool. •P501: Dispose of contents/container to 	<p><i>cause fire (Industrial). Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (< 1m.sec⁻¹ until fill pipe submerged to twice its diameter, then < 7m.sec⁻¹) (Industrial). Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<10m.sec⁻¹) (Industrial). The vapour is heavier than air, spreads along the ground and distant ignition is possible (Industrial). If positive displacement pumps are used, these must be fitted with a non-integral pressure relief valve (Industrial). Use explosion-proof electrical/ventilating/ lighting and other equipment (Industrial). Use appropriate equipment for filling IBCs and other containers. IBCs and other containers must be constructed of appropriate material) (Industrial). Ensure electrical continuity by bonding and grounding (earthing) all equipment. (Industrial / Professional). Keep away from oxidising agents (Industrial/ Professional). Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks (Industrial/ Professional). Handle and open container with care in a well-ventilated area (Industrial/</i></p>

Hazard	Material	Risk / Hazard Phrase	P Phrase	Qualitative Assessment Risk
				<p><i>Professional).</i> <i>Avoid Overfilling (Industrial/ Professional).</i> <i>Do NOT empty into drains (Industrial/ Professional).</i> <i>Use only with adequate ventilation (Consumer).</i> <i>Avoid all possible sources of ignition (spark or flame) (Consumer).</i> <i>Do not puncture or incinerate container (Consumer).</i> <i>Empty pressure vessels should be returned to the supplier (Consumer).</i></p> <p><u>Storage</u> <i>Must be stored in a dike (bunded) and well-ventilated area, away from sunlight, ignition sources and other sources of heat (Industrial).</i> <i>Storage Temperature: Ambient (Industrial).</i> <i>Keep away from flames, sources of ignition and hot surfaces. No smoking.</i> <i>Take precautionary measures against static discharges.</i> <i>Keep container in a well-ventilated place.</i> <i>Keep container tightly closed.</i></p>