Safety Data Sheet

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

1.1 Product Identifier

Material Name : **Reformate Heartcut**
Product Code : Q9119, Q9105
REACH Registration No. : 01-2119485927-18-0014, 01-2119485927-18-0015, 01-2119485927-18-0016

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

Product use : Raw material for use in the chemical industry.
Please refer to Ch16 and/or the annexes for the registered uses under REACH.
Uses Advised Against : Restricted to professional users.

1.3 Details of the supplier of the substance or mixture

Manufacturer/Supplier : **SHELL TRADING INTERNATIONAL LIMITED**

80 Strand
London
WC2R 0ZA
United Kingdom

Telephone : +44 (0) 20 7546 5000

Email contact for MSDS : TRsds@shell.com

1.4 Emergency Telephone Number

: +44 (0) 151 350 4595

2. HAZARDS IDENTIFICATION

2.1 Classification of substance or mixture

Regulation (EC) No 1272/2008 (CLP)	
Hazard Class & Category	**Hazard statement**
Flammable liquids, Category 1	H224
SKIN CORROSION/IRRITATION, Category 2	H315
Aspiration hazard, Category 1	H304
Toxic to reproduction, Category 2	H361
Germ cell mutagenicity, Category 1B	H340
Carcinogenicity, Category 1B	H350

Specific target organ toxicity - single exposure, Category 3; Narcotic effects.	H336
AQUATIC TOXICITY (CHRONIC), Category 2	H411

67/548/EEC or 1999/45/EC	
Hazard characteristics	**R-phrase(s)**
Highly flammable. Toxic. Dangerous for the environment.	R45, R46, R11, R36/38, R48/23/24/25, R62, R63, R65, R67, R51/53

2.2 Label Elements

Label Name : CONTAINS BENZENE
EC Annex I Number : 649-308-00-2

Labeling according to Regulation (EC) No 1272/2008

Symbol(s) :

Signal Words : Danger

CLP Hazard statements : PHYSICAL HAZARDS:
H224: Extremely flammable liquid and vapor.
HEALTH HAZARDS:
H315: Causes skin irritation.
H304: May be fatal if swallowed and enters airways.
H361: Suspected of damaging fertility or the unborn child.
H340: May cause genetic defects.
H350: May cause cancer.
H336: May cause drowsiness or dizziness.
ENVIRONMENTAL HAZARDS:
H411: Toxic to aquatic life with long lasting effects.

CLP Precautionary statements

Prevention : P201: Obtain special instructions before use.
P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P273: Avoid release to the environment.

Response : P301+P310: IF SWALLOWED: Immediately call a POISON CENTRE or doctor/physician.

Storage : P403+P233: Store in a well-ventilated place. Keep container

tightly closed.

Labeling according to Directive 1999/45/EC

EC Symbols	:	F Highly flammable. T Toxic. N Dangerous for the environment.

EC Classification	:	Highly flammable. Toxic. Carcinogenic, category 1. Mutagenic, category 2.
EC Risk Phrases	:	R45 May cause cancer. R46 May cause heritable genetic damage. R11 Highly flammable. R36/38 Irritating to eyes and skin. R48/23/24/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. R62 Possible risk of impaired fertility. R63 Possible risk of harm to the unborn child. R65 Harmful: may cause lung damage if swallowed. R67 Vapours may cause drowsiness and dizziness. R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
EC Safety Phrases	:	S53 Avoid exposure. Obtain special instructions before use. S16 Keep away from sources of ignition - No smoking. S29 Do not empty into drains. S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

2.3 Other Hazards

Health Hazards	:	Vapours may cause drowsiness and dizziness. Slightly irritating to respiratory system. Irritating to eyes and skin. Harmful: may cause lung damage if swallowed. Possibility of organ or organ system damage from prolonged exposure; see Chapter 11 for details. Target organ(s): Blood. Blood-forming organs. Peripheral nervous system. Immune system. Central nervous system (CNS). Respiratory system. Auditory system. Visual system. May cause cancer. May cause leukaemia (AML - acute myelogenous leukaemia). May cause heritable genetic damage. Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. Possible risk of impaired fertility. Possible risk of

harm to the unborn child.

Aggravated Medical Condition	:	Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Auditory system. Blood. Blood-forming organs. Cardiovascular system. Central nervous system (CNS). Eyes. Immune system. Respiratory system. Skin. Visual system.
Safety Hazards	:	Extremely flammable. Electrostatic charges may be generated during handling. Electrostatic discharge may cause fire. Liquid evaporates quickly and can ignite leading to a flash fire, or an explosion in a confined space.
Environmental Hazards	:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance

CAS No.	:	68955-35-1
INDEX No.	:	649-308-00-2
EINECS No.	:	273-271-8

3.2 Mixtures

Hazardous Components

Classification of components according to Regulation (EC) No 1272/2008

Chemical Name	CAS No.	EINECS	REACH Registration No.	Conc.
Naphtha (petroleum), catalytic reformed	68955-35-1	273-271-8	01-2119485927-18	100.00%
CONTAINS:				%
Benzene	71-43-2	200-753-7	01-2119447106-44	> 30.00 - < 70.00%W
n-Hexane	110-54-3	203-777-6	None	> 5.00 - < 20.00%W
Toluene	108-88-3	203-625-9	01-2119485927-18	> 0.00 - < 5.00%W

Chemical Name	Hazard Class & Category	Hazard statement
Naphtha (petroleum), catalytic reformed	Carc., 1B; Muta., 1B; Asp. Tox., 1;	H350, H340, H304,
CONTAINS:		
Benzene	Flam. Liq., 2; Carc., 1A; Muta., 1B; STOT RE, 1; Asp. Tox., 1; H319, 2; Skin Irrit., 2;	H225, H350, H340, H372, H304, H319, H315,
n-Hexane	Flam. Liq., 2; Repr., 2; Asp. Tox., 1; STOT RE, 2; Skin Irrit., 2; STOT SE, 3; Aquatic Chronic, 2;	H225, H361, H304, H373, H315, H336, H411,
Toluene	Flam. Liq., 2; Repr., 2; Asp. Tox., 1;	H225, H361d, H304, H373, H315,

	STOT RE, 2; Skin Irrit., 2; STOT SE, 3;	H336,

Classification of components according to 67/548/EEC

Chemical Name	CAS	EINECS	REACH Registration No.	Symbol(s)	R-phrase(s)	Conc.
Naphtha (petroleum), catalytic reformed	68955-35-1	273-271-8	01-2119485927-18			100.00 %
CONTAINS:						%
Benzene	71-43-2	200-753-7	01-2119447106-44			> 30.00 - < 70.00 %W
n-Hexane	110-54-3	203-777-6	None	F, Xn, N	R11; R38; R48/20; R62; R65; R67; R51/53	> 5.00 - < 20.00 %W
Toluene	108-88-3	203-625-9	01-2119485927-18	F, Xn	R11; R38; R48/20; R63; R65; R67	> 0.00 - < 5.00 %W

4. FIRST AID MEASURES

4.1 Description of first aid measures

General Information : Keep victim calm. Obtain medical treatment immediately.

Inhalation : DO NOT DELAY. Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.

Skin Contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact : Immediately flush eyes with large amounts of water for at least 15 minutes while holding eyelids open. Transport to the nearest medical facility for additional treatment.

Ingestion : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38,3° C), shortness of breath, chest congestion or continued coughing or wheezing.

4.2 Most important symptoms/effects, acute & delayed : Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty

		in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. Damage to blood-forming organs may be evidenced by: a) fatigue and anaemia (RBC), b) decreased resistance to infection, and/or excessive bruising and bleeding (platelet effect). Immunotoxicity may be evidenced by decreased resistance to infection. Peripheral nerve damage may be evidenced by impairment of motor function (incoordination, unsteady walk, or muscle weakness in the extremities, and/or loss of sensation in the arms and legs). Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing. Auditory system effects may include temporary hearing loss and/or ringing in the ears. Visual system disturbances may be evidenced by decreases in the ability to discriminate between colours.
4.3 Indication of immediate medical attention and special treatment needed	:	Potential for chemical pneumonitis. Potential for cardiac sensitisation, particularly in abuse situations. Hypoxia or negative inotropes may enhance these effects. Consider: oxygen therapy. Call a doctor or poison control center for guidance.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

5.1 Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use water in a jet.
5.2 Special hazards arising from substance or mixture	:	The vapour is heavier than air, spreads along the ground and distant ignition is possible. Will float and can be reignited on surface water. Carbon monoxide may be evolved if incomplete combustion occurs.
5.3 Advice for fire-fighters	:	Wear full protective clothing and self-contained breathing apparatus.
Additional Information	:	Keep adjacent containers cool by spraying with water.

6. ACCIDENTAL RELEASE MEASURES

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Observe all relevant local and international regulations.

6.1 Personal Precautions, Protective Equipment and Emergency Procedures	:	Isolate hazard area and deny entry to unnecessary or unprotected personnel. Stay upwind and keep out of low areas. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains,

ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location, for example by using fog sprays. Ventilate contaminated area thoroughly.

6.2 Environmental Precautions	:	Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Ventilate contaminated area thoroughly.
6.3 Methods and Material for Containment and Clean Up	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
Additional Advice	:	Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Vapour may form an explosive mixture with air. See Chapter 13 for information on disposal.

7. HANDLING AND STORAGE

General Precautions	:	Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. On guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Avoid contact with skin, eyes, and clothing.
7.1 Precautions for Safe Handling	:	Avoid exposure. Obtain special instructions before use. Avoid inhaling vapour and/or mists. Avoid contact with skin, eyes, and clothing. Monitor concentrations in air at regular intervals. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. This product is intended for use in closed systems only. Handling Temperature: Ambient. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/sec until fill

		pipe submerged to twice its diameter, then <= 7 m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.
7.2 Conditions for safe storage, including any incompatibilities	:	Vapours from tanks should not be released to atmosphere. Breathing losses during storage should be controlled by a suitable vapour treatment system. Bulk storage tanks should be diked (bunded). The vapour is heavier than air. Beware of accumulation in pits and confined spaces.
7.3 Specific End Uses	:	Please refer to Ch16 and/or the annexes for the registered uses under REACH.
Additional Information	:	Ensure that all local regulations regarding handling and storage facilities are followed.
Product Transfer	:	Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/sec until fill pipe submerged to twice its diameter, then <= 7 m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.
Recommended Materials	:	For containers, or container linings use mild steel, stainless steel.
Unsuitable Materials	:	Natural, butyl, neoprene or nitrile rubbers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

8.1 Control Parameters

Occupational Exposure Limits

UK Workplace Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
Toluene	ACGIH	TWA	20 ppm		
	EH40 WEL	TWA	50 ppm	191 mg/m3	
	EH40 WEL	STEL	100 ppm	384 mg/m3	
	EH40 WEL	SKIN_DES			Can be absorbed through the skin.
n-Hexane	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	EH40 WEL	TWA	20 ppm	72 mg/m3	
Benzene	EH40 MEL	TWA	1 ppm		
	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	EH40 WEL	TWA	1 ppm		

	EH40 WEL	SKIN_DES			Can be absorbed through the skin.
	EU OELIII	TWA	1 ppm	3.25 mg/m3	
	EU OELIII	SKIN_DES			Can be absorbed through the skin.
	SHELL IS	TWA (8 h)	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	

Additional Information : This ACGIH-value is provided for information only.
SHELL IS is the Shell Internal Standard.
Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.

Material	Source	Hazard Designation
Benzene	EU CARC.	Carcinogen/Mutagen

Derived No Effect Levels (DNEL)

Component	Exposure Route	Exposure Type (long/short)	Application Area	Value
Naphtha (petroleum), catalytic reformed	Dermal	acute, systemic effects	Worker	
	Inhalation	acute, systemic effects	Worker	1.300 mg/m3
	Inhalation	acute, local effects	Worker	1.100 mg/m3
	Dermal	long term, systemic effects	Worker	
	Inhalation	long term, systemic effects	Worker	
	Inhalation	long term, local effects	Worker	840 mg/m3

Predicted No Effect Concentration (PNEC)

Component	Exposure Route	Value	Remark
Naphtha (petroleum), catalytic reformed			Substance is a hydrocarbon with a complex, unknown or variable composition. Conventional methods of deriving PNECs are not appropriate and it is not possible to identify a single representative PNEC for such substances.

8.2 Exposure Controls

General Information : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate ventilation to control airborne concentrations below the exposure guidelines/limits. Adequate explosion-proof ventilation to control airborne concentrations. Firewater monitors and deluge systems are recommended. Eye washes and showers for emergency use.

Read in conjunction with the Exposure Scenario for your specific use contained in the Annex.

Occupational Exposure Controls

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Eye Protection : Chemical splash goggles (chemical monogoggles). Approved to EU Standard EN166, AS/NZS:1337.

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable chemical protection: Longer term protection: Viton. Incidental contact/Splash protection: Nitrile rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.
Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

Body protection : Chemical resistant gloves/gauntlets, boots, and apron. Where risk of splashing or in spillage clean up, use chemical resistant one-piece overall with integral hood.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [boiling point <65 °C (149 °F)] meeting EN14387. Where respiratory protective equipment is required, use a full-face mask. Where air-filtering respirators are unsuitable (e.g., airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus.

Monitoring Methods : Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also

be appropriate. Examples of sources of recommended air monitoring methods are given below or contact supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods, http://www.cdc.gov/niosh/nmam/nmammenu.html. Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods, http://www.osha-slc.gov/dts/sltc/methods/toc.html. Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances, http://www.hsl.gov.uk/publications/mdhs.aspx. Berufsgenossenschaftliches Institut für Arbeitssicherheit (BIA), Germany http://www.hvbg.de/d/bia/index.html. L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/securite/hygiene_securite_travail.html.

Environmental Exposure Controls

Environmental exposure control measures	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	:	Light coloured. Liquid.
Odour	:	Aromatic.
pH	:	Not applicable
Boiling point	:	ca. 35 - 150 °C / 95 - 302 °F
Melting / freezing point	:	Data not available.
Flash point	:	< -30 °C / -22 °F
Explosion / Flammability limits in air	:	1 - 6 %(V)
Auto-ignition temperature	:	Typical > 300 °C / > 572 °F
Vapour pressure	:	Typical < 100 kPa at 50 °C / 122 °F (Reid vapour pressure)
Specific gravity	:	Data not available.
Density	:	ca. 770 kg/m3 at 15 °C / 59 °F
Water solubility	:	Data not available.
Solubility in other solvents	:	Data not available.
n-octanol/water partition coefficient (log Pow)	:	2 - 6
Dynamic viscosity	:	ca. 0.5 - 1 mPa.s at 25 °C / 77 °F
Vapour density (air=1)	:	3.3
Electrical conductivity	:	< 50 pS/m
Evaporation rate (nBuAc=1)	:	Data not available.

9.2 Other Information

Other information	:	Not applicable

10. STABILITY AND REACTIVITY

10.1 Reactivity	:	Stable under normal conditions of use.
10.2 Stability	:	Stable under normal use conditions.
10.3 Possibility of Hazardous Reactions	:	Reacts violently with strong oxidising agents.
10.4 Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources. Prevent vapour accumulation.
10.5 Materials to Avoid	:	Strong oxidising agents.
10.6 Hazardous Decomposition Products	:	Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

Other Information

Hazardous Polymerisation	:	No, hazardous, exothermical polymerization cannot occur.
Sensitivity to Mechanical Impact	:	No, product will not become self-reactive.
Sensitivity to Static Discharge	:	Yes, in certain circumstances product can ignite due to static electricity.

11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological effects

Basis for Assessment	:	Information given is based on data from components.
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Oral Toxicity	:	Low toxicity: LD50 >5000 mg/kg , Rat
Acute Dermal Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rabbit
Acute Inhalation Toxicity	:	High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death. Low toxicity: LC50 >5 mg/l Rat
Skin Irritation	:	Irritating to skin.
Eye Irritation	:	Expected to be slightly irritating.
Respiratory Irritation	:	Inhalation of vapours or mists may cause irritation to the respiratory system.
Sensitisation	:	Not expected to be a skin sensitiser.
Aspiration hazard	:	Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
Mutagenicity	:	May cause heritable genetic damage. Mutagenicity studies on gasoline and gasoline blending streams have shown predominantly negative results. (Benzene)
Carcinogenicity	:	Known human carcinogen. (Benzene)

		May cause leukaemia (AML - acute myelogenous leukaemia). (Benzene) Tumours produced in animals are not considered relevant to humans.
Reproductive and Developmental Toxicity	:	Causes foetotoxicity in animals at doses which are maternally toxic. (Toluene) May impair fertility at doses which produce other toxic effects. (n-Hexane) Many case studies involving abuse during pregnancy indicate that toluene can cause birth defects, growth retardation and learning difficulties. (Toluene)
Specific target organ toxicity - single exposure	:	High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Specific target organ toxicity - repeated exposure	:	Kidney: caused kidney effects in male rats which are not considered relevant to humans Blood-forming organs: repeated exposure affects the bone marrow. (Benzene) Peripheral nervous system: repeated exposure causes peripheral neuropathy in animals. (n-Hexane)
Additional Information	:	Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest. Auditory system: prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats. Solvent abuse and noise interaction in the work environment may cause hearing loss. (Toluene) Abuse of vapours has been associated with organ damage and death. (Toluene) Myelodysplastic syndrome (MDS) was observed in individuals exposed to very high levels (50 ppm to 300 ppm range) of benzene over a long period of time in the workplace. The relevance of these results to lower levels of exposure is not known. (Benzene)

12. ECOLOGICAL INFORMATION

Basis for Assessment		Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products.
12.1 Toxicity		
Acute Toxicity		
Fish	:	Expected to be toxic: LL/EL/IL50 >1 - <=10 mg/l
Aquatic Invertebrates	:	Expected to be toxic: LL/EL/IL50 >1 - <=10 mg/l
Algae	:	Expected to be toxic: LL/EL/IL50 >1 - <=10 mg/l
Microorganisms	:	Expected to be harmful: LL/EL/IL50 >10 - <=100 mg/l
Chronic Toxicity		
Fish	:	NOEC/NOEL > 1.0 - <=10 mg/l (based on test data)
Aquatic Invertebrates	:	NOEC/NOEL > 1.0 - <=10 mg/l (based on test data)
12.2 Persistence and degradability	:	Oxidises rapidly by photo-chemical reactions in air. Expected to be inherently biodegradable.
12.3 Bioaccumulative	:	Contains components with the potential to bioaccumulate.

Potential

12.4 Mobility	:	Floats on water. If product enters soil, one or more constituents will be highly mobile and may contaminate groundwater.
12.5 Result of the PBT assessment	:	The substance does not fulfill all screening criteria for persistence, bioaccumulation and toxicity and hence is not considered to be PBT or vPvB.
12.6 Other Adverse Effects	:	In view of the high rate of loss from solution, the product is unlikely to pose a significant hazard to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods

Material Disposal	:	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or water.
Local Legislation	:	Disposal should be in accordance with applicable regional, national, and local laws and regulations.

14. TRANSPORT INFORMATION

Land transport (ADR/RID):

ADR

14.1 UN No.	:	3295
14.2 Proper shipping name	:	HYDROCARBONS, LIQUID, N.O.S. (,)
14.3 Transport Hazard Class	:	3
14.4 Packing group	:	II
Classification code	:	F1
Hazard indentification no.	:	33
Danger label (primary risk)	:	3
14.5 Environmentally Hazardous	:	Yes

RID

14.1 UN No.	:	3295
14.2 Proper shipping name	:	HYDROCARBONS, LIQUID, N.O.S. (,)
14.3 Transport Hazard Class	:	3
14.4 Packing group	:	II
Classification code	:	F1
Hazard indentification no.	:	33
Danger label (primary risk)	:	3
14.5 Environmentally Hazardous	:	Yes

Sea transport (IMDG Code):

14.1 UN No.	:	3295
14.2 Proper shipping name	:	HYDROCARBONS, LIQUID, N.O.S.
Technical name	:	(N-Hexane)
14.3 Transport Hazard Class	:	3
14.4 Packing group	:	II
14.5 Marine pollutant	:	Yes (N-Hexane)

Air transport (IATA):

14.1 UN No.	:	3295
14.2 Proper shipping name	:	Hydrocarbons, liquid, n.o.s.
14.3 Transport Hazard Class	:	3
14.4 Packing group	:	II
14.5 Environmentally Hazardous	:	No

Sea (Annex II of MARPOL 73/78 and the IBC code)

Pollution Category	**:**	Y
Ship Type	**:**	2
Product Name	**:**	Pyrolysis gasoline (contains benzene)
Special Precaution	**:**	Refer to Chapter 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

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

Other regulatory Information

Chemical Inventory Status

AICS	:	Listed.	
DSL	:	Listed.	
INV (CN)	:	Listed.	
TSCA	:	Listed.	
EINECS	:	Listed.	273-271-8
KECI (KR)	:	Listed.	KE-25600

National Legislation

OE_HPV	:	Listed.

15.2 Chemical Safety Assessment	:	A Chemical Safety Assessment was performed for this substance.

16. OTHER INFORMATION

R-phrase(s)

R11	Highly flammable.
R36/38	Irritating to eyes and skin.
R38	Irritating to skin.
R45	May cause cancer.
R46	May cause heritable genetic damage.
R48/20	Harmful: danger of serious damage to health by prolonged exposure through inhalation.
R48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R62	Possible risk of impaired fertility.
R63	Possible risk of harm to the unborn child.
R65	Harmful: may cause lung damage if swallowed.
R67	Vapours may cause drowsiness and dizziness.

CLP Hazard statements

H224	Extremely flammable liquid and vapor.
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H340	May cause genetic defects.
H350	May cause cancer.
H361	Suspected of damaging fertility or the unborn child.
H361d	Suspected of damaging the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

Identified Uses according to the Use Descriptor System

Uses - Worker

Title	:	Manufacture of substance - Industrial

Uses - Worker

Title		Use as an intermediate - Industrial

Uses - Worker

Title		Distribution of substance - Industrial

Uses - Worker

Title		Formulation & (re)packing of substances and mixtures - Industrial
Recommended restrictions on use (advice against)	:	Restricted to professional users.
MSDS Version Number	:	6.
MSDS Effective Date	:	14.02.2011
MSDS Revisions	:	A vertical bar (|) in the left margin indicates an amendment from the previous version.
MSDS Regulation	:	The content and format of this safety data sheet is in accordance with Regulation 1907/2006/EC.
MSDS Distribution	:	The information in this document should be made available to all who may handle the product
Disclaimer	:	This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Exposure Scenario - Worker

SECTION 1	**EXPOSURE SCENARIO TITLE**
Title	Manufacture of substance - Industrial
Use Descriptor	**Sector of Use**: SU 3, SU8, SU9 **Process Categories**: PROC 1, PROC 2, PROC 3, PROC 8a, PROC 8b, PROC 15 **Environmental Release Categories**: ERC 1, ERC 4, ESVOC SpERC 1.1.v1
Scope of process	Manufacture of the substance or use as a process chemical or extraction agent within closed or contained systems. Includes incidental exposures during 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**

Section 2.1	**Control of Worker Exposure**
Product Characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently);
Frequency and Duration of Use	
Covers daily exposures up to 8 hours (unless stated differently)	
Other Operational Conditions affecting worker Exposure.	
Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is implemented	

Contributing scenarios	**Risk Management Measures**
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General measures (carcinogens)	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.
General exposures (closed systems) with sample collection	Handle substance within a closed system Sample via a closed loop or other system to avoid exposure Ensure operation is undertaken outdoors Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
General exposures (closed systems)	Handle substance within a closed system Provide extract ventilation to points where emissions occur Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Ensure operation is undertaken outdoors Avoid carrying out activities involving exposure for more than 1 hour
Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. Avoid carrying out activities involving exposure for more than 1 hour
Bulk transfers	Ensure material transfers are under containment or extract ventilation Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour , or: Wear a respirator conforming to EN140 with Type A filter or better.
Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance Retain drain downs in sealed storage pending disposal or for subsequent recycle Clear spills immediately. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours Wear a respirator conforming to EN140 with Type A filter or better. Ensure operation is undertaken outdoors Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Storage	Store substance within a closed system Avoid carrying out activities involving exposure for more than 1 hour Wear chemically resistant gloves (tested to EN374) in combination

	with specific activity training.

Section 2.2	**Control of Environmental Exposure**
Substance is complex UVCB.	
Predominantly hydrophobic.	
Amounts used	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year):	1.87E+07
Fraction of Regional tonnage used locally:	0.03
Annual site tonnage (tonnes/year):	6.0E+05
Maximum daily site tonnage (kg/day):	2.0E+06
Frequency and Duration of Use	
Continuous release.	
Emission Days (days/year):	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor:	10
Local marine water dilution factor:	100
Other Operational Conditions affecting Environmental Exposure	
Release fraction to air from process (initial release prior to RMM):	5.0E-02
Release fraction to wastewater from process (initial release prior to RMM):	3.0E-03
Release fraction to soil from process (initial release prior to RMM):	1.0E-04
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation).	
Onsite waste water treatment required.	
Treat air emission to provide a typical removal efficiency of (%)	99.0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of [3] (%)	99.1
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%)	80.4
Organisational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils.	
Sludge should be incinerated, contained or reclaimed.	
Conditions and Measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.5
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	99.1
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day).	2.0E+06
Assumed domestic sewage treatment plant flow (m3/d)	10,000
Conditions and Measures related to external treatment of waste for disposal	

During manufacturing no waste of the substance is generated.
Conditions and measures related to external recovery of waste
During manufacturing no waste of the substance is generated.

SECTION 3	**EXPOSURE ESTIMATION**
Section 3.1 - Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	

Section 3.2 -Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

SECTION 4	**GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO**
Section 4.1 - Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Risk Management Measures are based on qualitative risk characterisation.	

Section 4.2 -Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

Exposure Scenario - Worker

SECTION 1	**EXPOSURE SCENARIO TITLE**
Title	Use as an intermediate - Industrial
Use Descriptor	**Sector of Use**: SU 3, SU8, SU9 **Process Categories**: PROC 1, PROC 2, PROC 3, PROC 8a, PROC 8b, PROC 15 **Environmental Release Categories**: ERC 6A, ESVOC SpERC 6.1a.v1
Scope of process	Use of substance as an intermediate within closed or contained systems (not related to Strictly Controlled Conditions). Includes incidental exposures during 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**

Section 2.1	**Control of Worker Exposure**
Product Characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently);
Frequency and Duration of Use	
Covers daily exposures up to 8 hours (unless stated differently)	
Other Operational Conditions affecting worker Exposure.	
Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is implemented	

Contributing scenarios	**Risk Management Measures**
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General measures (carcinogens)	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.
General exposures (closed systems) with sample collection	Handle substance within a closed system Sample via a closed loop or other system to avoid exposure Ensure operation is undertaken outdoors Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
General exposures (closed systems)	Handle substance within a closed system Provide extract ventilation to points where emissions occur Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Ensure operation is undertaken outdoors Avoid carrying out activities involving exposure for more than 1 hour
Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. Avoid carrying out activities involving exposure for more than 1 hour
Bulk transfers	Ensure material transfers are under containment or extract ventilation Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour , or: Wear a respirator conforming to EN140 with Type A filter or better.
Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance Retain drain downs in sealed storage pending disposal or for subsequent recycle Clear spills immediately. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours Wear a respirator conforming to EN140 with Type A filter or better. Ensure operation is undertaken outdoors Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Storage	Store substance within a closed system Avoid carrying out activities involving exposure for more than 1 hour Wear chemically resistant gloves (tested to EN374) in combination

	with specific activity training.

Section 2.2	**Control of Environmental Exposure**
Substance is complex UVCB.	
Predominantly hydrophobic.	
Amounts used	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year):	2.21E+06
Fraction of Regional tonnage used locally:	6.8E-03
Annual site tonnage (tonnes/year):	1.5E+04
Maximum daily site tonnage (kg/day):	5.0E+04
Frequency and Duration of Use	
Continuous release.	
Emission Days (days/year):	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor:	10
Local marine water dilution factor:	100
Other Operational Conditions affecting Environmental Exposure	
Release fraction to air from process (initial release prior to RMM):	2.5E-02
Release fraction to wastewater from process (initial release prior to RMM):	3.0E-03
Release fraction to soil from process (initial release prior to RMM):	1.0E-03
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Risk from environmental exposure is driven by freshwater sediment.	
If discharging to domestic sewage treatment plant, no secondary wastewater treatment required.	
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 of [3] (%)	92.9
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%)	0
Organisational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils.	
Sludge should be incinerated, contained or reclaimed.	
Conditions and Measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.5
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	95.5
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day).	7.8E+04
Assumed domestic sewage treatment plant flow (m3/d)	2,000
Conditions and Measures related to external treatment of waste for disposal	

This substance is consumed during use and no waste of substance is generated.
Conditions and measures related to external recovery of waste
This substance is consumed during use and no waste of substance is generated.

SECTION 3	**EXPOSURE ESTIMATION**
Section 3.1 - Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	

Section 3.2 -Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

SECTION 4	**GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO**
Section 4.1 - Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Risk Management Measures are based on qualitative risk characterisation.	

Section 4.2 -Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

Exposure Scenario - Worker

SECTION 1	**EXPOSURE SCENARIO TITLE**
Title	Distribution of substance - Industrial
Use Descriptor	**Sector of Use**: SU 3 **Process Categories**: PROC 1, PROC 2, PROC 3, PROC 8a, PROC 8b, PROC 15 **Environmental Release Categories**: ERC 1, ERC 2, ERC 3, ERC 4, ERC 5, ERC 6A, ERC 6B, ERC 6C, ERC 6D, ERC 7, ESVOC SpERC 1.1b.v1
Scope of process	Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incidental exposures during its sampling, storage, unloading, maintenance and associated laboratory activities.

SECTION 2	**OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES**

Section 2.1	**Control of Worker Exposure**
Product Characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently);
Frequency and Duration of Use	
Covers daily exposures up to 8 hours (unless stated differently)	
Other Operational Conditions affecting worker Exposure.	
Assumes use at not more than 20°C above ambient temperature (unless stated differently). Assumes a good basic standard of occupational hygiene is implemented	

Contributing scenarios	**Risk Management Measures**
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General measures (carcinogens)	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.
General exposures (closed systems) with sample collection	Handle substance within a closed system Sample via a closed loop or other system to avoid exposure Ensure operation is undertaken outdoors Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
General exposures (closed systems)	Handle substance within a closed system Provide extract ventilation to points where emissions occur Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Ensure operation is undertaken outdoors Avoid carrying out activities involving exposure for more than 1 hour
Process sampling	Sample via a closed loop or other system to avoid exposure Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. Avoid carrying out activities involving exposure for more than 1 hour
bulk closed loading and unloading	Ensure material transfers are under containment or extract ventilation Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour , or: Wear a respirator conforming to EN140 with Type A filter or better.
Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance Retain drain downs in sealed storage pending disposal or for subsequent recycle Clear spills immediately. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours Wear a respirator conforming to EN140 with Type A filter or better. Ensure operation is undertaken outdoors Provide a good standard of controlled ventilation (10 to 15 air changes per hour)

Storage	Store substance within a closed system Avoid carrying out activities involving exposure for more than 1 hour Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

Section 2.2	**Control of Environmental Exposure**
Substance is complex UVCB.	
Predominantly hydrophobic.	
Amounts used	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year):	1.87E+07
Fraction of Regional tonnage used locally:	2.0E-03
Annual site tonnage (tonnes/year):	3.75E+04
Maximum daily site tonnage (kg/day):	1.2E+05
Frequency and Duration of Use	
Continuous release.	
Emission Days (days/year):	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor:	10
Local marine water dilution factor:	100
Other Operational Conditions affecting Environmental Exposure	
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.	
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).	
If discharging to domestic sewage treatment plant, no secondary wastewater treatment required.	
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 of [3] (%)	12
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%)	0
Organisational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils.	
Sludge should be incinerated, contained or reclaimed.	
Conditions and Measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.5
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	95.5

Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day).	1.1E+06
Assumed domestic sewage treatment plant flow (m3/d)	2,000
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.	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations.	

SECTION 3	**EXPOSURE ESTIMATION**
Section 3.1 - Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	

Section 3.2 -Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

SECTION 4	**GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO**
Section 4.1 - Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Risk Management Measures are based on qualitative risk characterisation.	

Section 4.2 -Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

Exposure Scenario - Worker

SECTION 1	**EXPOSURE SCENARIO TITLE**
Title	Formulation & (re)packing of substances and mixtures - Industrial
Use Descriptor	**Sector of Use**: SU 3, SU 10 **Process Categories**: PROC 1, PROC 2, PROC 3, PROC 8a, PROC 8b, PROC 15 **Environmental Release Categories**: ERC 2, ESVOC SpERC 2.2.v1
Scope of process	Formulation of the substance and its mixtures in batch or continuous operations within closed or contained systems, including incidental exposures during storage, materials transfers, mixing, maintenance, sampling and associated laboratory activities.

SECTION 2	**OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES**

Section 2.1	**Control of Worker Exposure**
Product Characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently);
Frequency and Duration of Use	
Covers daily exposures up to 8 hours (unless stated differently)	
Other Operational Conditions affecting worker Exposure.	
Assumes use at not more than 20°C above ambient temperature (unless stated differently). Assumes a good basic standard of occupational hygiene is implemented	

Contributing scenarios	**Risk Management Measures**
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General measures (carcinogens)	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.
General exposures (closed systems) with sample collection	Handle substance within a closed system Sample via a closed loop or other system to avoid exposure Ensure operation is undertaken outdoors Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
General exposures (closed systems)	Handle substance within a closed system Provide extract ventilation to points where emissions occur Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Ensure operation is undertaken outdoors Avoid carrying out activities involving exposure for more than 1 hour
Storage	Store substance within a closed system Avoid carrying out activities involving exposure for more than 1 hour Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.
Process sampling	Sample via a closed loop or other system to avoid exposure Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. Avoid carrying out activities involving exposure for more than 1 hour
Bulk transfers	Ensure material transfers are under containment or extract ventilation Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
Drum/batch transfers	Ensure material transfers are under containment or extract ventilation Wear chemically resistant gloves (tested to EN374) in combination with #basic# employee training. Avoid carrying out activities involving exposure for more than 1 hour
Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance

	Retain drain downs in sealed storage pending disposal or for subsequent recycle Clear spills immediately. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls. Avoid carrying out activities involving exposure for more than 4 hours Wear a respirator conforming to EN140 with Type A filter or better. Ensure operation is undertaken outdoors Provide a good standard of controlled ventilation (10 to 15 air changes per hour)

Section 2.2	**Control of Environmental Exposure**
Substance is complex UVCB.	
Predominantly hydrophobic.	
Amounts used	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year):	1.65E+07
Fraction of Regional tonnage used locally:	1.8E-03
Annual site tonnage (tonnes/year):	3.0E+04
Maximum daily site tonnage (kg/day):	1.0E+05
Frequency and Duration of Use	
Continuous release.	
Emission Days (days/year):	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor:	10
Local marine water dilution factor:	100
Other Operational Conditions affecting Environmental Exposure	
Release fraction to air from process (initial release prior to RMM):	2.5E-02
Release fraction to wastewater from process (initial release prior to RMM):	2.0E-03
Release fraction to soil from process (initial release prior to RMM):	1.0E-04
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation).	
If discharging to domestic sewage treatment plant, no secondary wastewater treatment required.	
Treat air emission to provide a typical removal efficiency of (%)	56.5
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of [3] (%)	94.7
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%)	0
Organisational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils.	

Sludge should be incinerated, contained or reclaimed.	
Conditions and Measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.5
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	95.5
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day).	1.0E+05
Assumed domestic sewage treatment plant flow (m3/d)	2,000
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.	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations.	

SECTION 3	**EXPOSURE ESTIMATION**
Section 3.1 - Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	

Section 3.2 -Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

SECTION 4	**GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO**
Section 4.1 - Health	
Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Risk Management Measures are based on qualitative risk characterisation.	

Section 4.2 -Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).