



TOBOLSK-NEFTEKHIM LLC

SAFETY DATA SHEET

According to 1907/2006/EC (REACH), 1272/2008 (CLP) & 453/2010

PENTANE

VERSION: 2.2
DATE CREATED: 17/10/2011
DATE UPDATED: -
Regulation: EC No 1272/2008

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

1.1 Product identifier

NAME OF SUBSTANCE: pentane
SYNONYMS: n-pentane, normal pentane
TRADE NAMES: Pentane, normal pentane fraction
CAS #: 109-66-0
EC #: 203-692-4
Index No (CLP) 601-006-00-1
REGISTRATION #: 01-2119459286-30-0003

1.2 Relevant identified uses of the substance

Most common technical function of substance (what it does): solvents
For the detailed identified uses of the product see appendix of the safety data sheet See Annex I

Uses advised against

The use of the substance should be limited to those specified in Annex I.

1.3 Details of the supplier of the safety data sheet

SUPPLIER:

Company name: TOBOLSK-NEFTEKHIM LLC
Address: Promzona, Tobolsk, Tumen region,
626150, Russian Federation
Contact phone: +7 3456 398-7-42; 398-9-51
Fax: +7 3456 39-89-51
Email Address: tnhk@tn.tob.ru
Emergency Telephone: +7 3456 398-7-63, +7 912 922-33-24 (office hours only, GMT+5)

Emergency phone in the country of delivery: 112 (Please note that emergency numbers may vary depending upon the country of delivery though 112 remains valid as universal number)



ONLY REPRESENTATIVE:

Company name: Gazprom Marketing and Trading France
Address: 68 avenue des Champs-Élysées, Paris, 75008, France
Contact phone: +33 1 42 99 73 50
Fax: +33 1 42 99 73 99
Email address: yury.severinchik@gazprom-mt.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 CLASSIFICATION

n-pentane

Classification and labelling according to DSD / DPD
Classification and labelling in Annex I of Directive 67/548/EEC

Physical/Chemical Hazards:

F+; R12 Extremely flammable;

Health Hazards:

Xn; R65 Harmful; Harmful: may cause lung damage if swallowed
R67 Vapours may cause drowsiness and dizziness
R66 Repeated exposure may cause skin dryness or cracking.

Environmental hazards:

N; R51/53 Dangerous for the environment; Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Classification and labelling according to EU CLP 2008:

Physical/Chemical Hazards:

Flam. Liquid 1 (Hazard statement: H224: Extremely flammable liquid and vapour.)

Health Hazards:

Asp. Tox. 1 (Hazard statement: H304: May be fatal if swallowed and enters airways.)
STOT Single Exp. 3 (Hazard statement: H336: May cause drowsiness or dizziness).
Affected organs: Central Nervous System
Route of exposure: Inhalation

Environmental hazards:

Aquatic Chronic 2 (Hazard statement: H411: Toxic to aquatic life with long lasting effects.)

Additional labelling requirements (CLP supplemental hazard statement):

EUH066: Repeated exposure may cause skin dryness or cracking.

2.2 LABELLING

EU LABELLING

Indication of danger:



Xn (harmful)



F+ (extremely flammable)



N (dangerous for the environment)

Symbol: Xn; F+; N

CLP LABELLING

Signal word: **Danger**

Hazard pictogram:



GHS02: flame



GHS07: exclamation mark



GHS08: health hazard



GHS09: environment



Other hazards:

Assessment PBT / vPvB:

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): Not fulfilling PBT (persistent/bioaccumulative/toxic) criteria.

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): Not fulfilling vPvB (very persistent/verybioaccumulative) criteria.

The Full Text for all S, P-Phrases is displayed in Section 16.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Name	EC No	CAS No	Content, %	Classification 67/548/EEC/ EC #1272/2008 (CLP) and EC # 790/2009
Pentane <i>Index No(CLP): 601-006-00-1:</i>	203-692-4	109-66-0	96.5-99.5	F+: R12; Xn: R65/66/67; N:R51/53 H224; H304; H336; H411
2-methylbutane <i>Index No(CLP): 601-085-00-2</i>	201-142-8	78-78-4	≤0.1	F+: R12; Xn:R65/66/67; N: R51/53 H224; H304; H336; H411
Cyclopentane <i>Index No(CLP): 601-030-00-2</i>	206-016-6	287-92-3	≤3.0	F; R11; N: R51/53 H225; H412
2,2-dimethyl- butane <i>Index No(CLP): 601-007-00-7</i>	200-906-8	75-83-2	≤0.5	F: R11; Xi: R38; Xn: R65; R67; R52/53 H225; H315; H412

* <http://apps.echa.europa.eu/registered/data/dossiers>

Specific Conc. Limits (CLP): none

M-factor: none

The product does not contain impurities or additives that could affect product's labelling and classification according to Regulation (EC) No 67/548/EEC and Regulation (EC) No 1272/2008 (CLP)

SECTION 4. FIRST-AID MEASURES

Inhalation:

Move any exposed person to fresh air at once. Keep warm and at rest. If there is respiratory distress give oxygen. If respiration stops or shows signs of failing, apply artificial respiration.

Get medical attention.

Ingestion:

Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have the exposed person lean forward.



Skin contact:

Remove contaminated clothing and wash skin with plenty of running water, under a shower if affected area is large enough to warrant this. Get medical attention if irritation develops and persists.

Eye contact:

Rinse immediately eye with plenty of low pressure water for at least 15 minutes. Remove any contact lenses. Get medical attention.

Note to physician:

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This light hydrocarbon material, or a component, may be associated with cardiac sensitisation following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing media:

Extremely flammable liquid and vapour.

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained.

Do NOT use straight streams of water.

Special fire fighting procedures:

Vapours may form an explosive mixture with air. Use water spray to keep fire-exposed containers cool. Containers may explode. Sensitive to static discharge.

Unusual Fire Hazards:

Extremely Flammable. Vapour is flammable and heavier than air. Vapour may travel across the ground and reach remote ignition sources, causing a flashback fire danger.

The vapour readily mixes with air and explosive mixtures can easily be formed.

Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products:

Smoke, Fume, Incomplete combustion products, Oxides of carbon

Specific hazards:

Combustion generates toxic fumes.

Protective measures in fire:

Wear full protective clothing and MSHA/NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode.



SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions:

See section 8.

Notification procedures:

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

Protective measures:

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material.

Spill management:

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. **Large Spills:** Water spray may reduce vapour, but may not prevent ignition in enclosed spaces.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

Environmental precautions:

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7. HANDLING AND STORAGE

Handling:

Avoid contact with skin. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Use only with adequate ventilation. Prevent small spills and leakage to avoid slip hazard. Tanker trucks shall have a steel tank and chassis and be equipped with conductive hoses. Bulk liquid containers shall be IMO Type 1 with 4 bar working pressure and 6 bar test pressure, filled between 80 and 95%.

A vapour return connection must be present on the truck or BLC to allow vapour return during unloading. The maximum loading/unloading velocity is 6M/second. Loading/unloading pumps shall be explosion proof. Bulk storage may be in above-ground or underground bullet type tanks. For above-ground tanks, a tank design pressure of at least 2.5 bar gauge is recommended. Tanks shall



have overflow protection. Pentane storage facilities are normally operated at near atmospheric pressure. However, to avoid exhaust to the atmosphere, storage tanks shall be fitted with a pressure vent and a vacuum vent. Drum types shall be selected so that the high vapour pressure of the liquids considered does not cause excessive deformation of the drum heads at the maximum transport and storage temperature.

If maximum allowed storage temperature indicated on drum label is exceeded, the drum shall be cooled down. It shall not be opened before having cooled down well below this temperature.

Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation.

Loading/Unloading Temperature: Ambient.

Storage:

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be earthed and bonded to prevent accumulation of static charge.

Storage Temperature: Ambient

Suitable Containers/Packing: Tank Trucks; Bulk Liquid Container (BLC); Barges; Drums
Suitable Materials and Coatings (Chemical Compatibility): Carbon Steel; Stainless Steel; Polyethylene; Polypropylene; Polyester; Teflon

Unsuitable Materials and Coatings: Natural Rubber; Butyl Rubber; Ethylene-propylene-diene monomer (EPDM); Polystyrene

Further information:

Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

For further information please refer to the "Pentane Handling Guidelines" published by ExxonMobil Chemical Company or contact ExxonMobil Chemical Company directly.

For more information please see the relevant exposure scenario in Appendix II of this SDS

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

International Limit values¹⁾

SUBSTANCE Butyl acrylate CAS #141-32-2	LTEL 8 hr TWA ppm	LTEL 8 hr TWA mg/m ³	STEL ppm	STEL mg/m ³	Note
Austria	600	1800	1200	3600	
Belgium	600	1800	750	2250	
Denmark	500	1500	1000	3000	
European Union	1000	3000			Occupational Exposure Limit Values
France	1000	3000			Restrictive statutory limit values
Germany (AGS)	1000	3000	2000 (1)	6000 (1)	(1) 15 minutes average value
Germany (DFG)	1000	3000	2000	6000	STV 15 minutes average value
Hungary		2950			
Italy	2000	667			
Poland		3000			
Spain	1000	3000			
Sweden	600	1800	750	2000	
Switzerland	600	1800	1200	3600	
The Netherlands		1800			
USA - NIOSH	120	350	610 (1)	1800 (1)	(1) ceiling limit value (15 min)
USA - OSHA	1000	2950			

¹⁾ GESTIS International Limit values:
http://bgia-online.hvbg.de/LIMITVALUE/WebForm_ueliste.aspx

8.1.2 DNEL/ PNEC values

DN(M)ELs for workers

Exposure pattern	Route	Descriptor	DNEL / DMEL	Justification/ Remarks
Acute - systemic effects	Dermal	No-threshold effect and/or no dose-response information available		
Acute - systemic effects	Inhalation	No-threshold effect and/or no dose-response information available		
Acute - local effects	Dermal	No-threshold effect and/or no dose-response information		

Exposure pattern	Route	Descriptor	DNEL / DMEL	Justification/ Remarks
		available		
Acute - local effects	Inhalation	No-threshold effect and/or no dose-response information available		
Long-term - systemic effects	Dermal	DNEL	432 mg/kg bw/day	NOAEL: 1296 mg/kg bw/day (based on AF of 3)
Long-term - systemic effects	Inhalation	DNEL	3000 mg/m ³	NOAEC: 9000 mg/m ³ (based on AF of 3)
Long-term - local effects	Dermal	No-threshold effect and/or no dose-response information available		
Long-term - local effects	Inhalation	No-threshold effect and/or no dose-response information available		

DN(M)ELs for the general population

Exposure pattern	Route	Descriptor	DNEL / DMEL	Justification/ Remarks
Acute - systemic effects	Dermal	No-threshold effect and/or no dose-response information available		
Acute - systemic effects	Inhalation	No-threshold effect and/or no dose-response information available		
Acute - systemic effects	Oral	No-threshold effect and/or no dose-response information available		
Acute - local effects	Dermal	No-threshold effect and/or no dose-response information available		
Acute - local effects	Inhalation	No-threshold effect and/or no dose-response information available		
Long-term - systemic effects	Dermal	DNEL	214 mg/kg bw/day	NOAEL: 1070 mg/kg bw/day (based on AF of 5)
Long-term - systemic effects	Inhalation	DNEL	643 mg/m ³	NOAEC: 3215 mg/m ³ (based on AF of 5)
Long-term - systemic effects	Oral	DNEL	214 mg/kg bw/day	NOAEL: 1,070 mg/kg bw/day (based on AF of 5)
Long-term - local	Dermal			



Exposure pattern	Route	Descriptor	DNEL / DMEL	Justification/ Remarks
effects				
Long-term - local effects	Inhalation			

Calculation of Predicted No Effect Concentration (PNEC)

PNEC for isopentane has been derived using the HC5 statistical extrapolation method and the target lipid model.

	PEC	units
Fresh Water	2,6E-06	mg/L
Fresh Water Sediment	3,6E-06	mg/kg w
Marine Water	5,5E-09	mg/L
Marine Sediment	6,7E-09	mg/kg w
Natural Soil	1,6E-08	mg/kg w
Air	9,2E-05	mg/m ³
Agricultural Soil	3,5E-08	mg/kg w
Drinking Water	1,3E-06	mg/L

For more information please see the relevant exposure scenario in Appendix II of this SDS

Secondary poisoning. Calculation of PNECoral

PNEC oral

PNEC	Assessment factor	Remarks/Justification
		A PNEC oral has not been derived because the substance is not classified on the basis of mammalian toxicity data, i.e. it is not classified as Very Toxic (T+) or Toxic (T) or harmful (Xn) with at least one of the risk phrases R48 "Danger of serious damage to health by prolonged exposure", R60 "May impair fertility", R61 "May cause harm to the unborn child", R62 "Possible risk of impaired fertility", R63 "Possible risk of harm to the unborn child", R64 "May cause harm to breastfed babies."

8.2 Exposure Controls

Engineering controls:

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Adequate ventilation should be provided so that exposure limits are not exceeded. Use explosion-proof ventilation equipment.



Personal protection:

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection:

If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator Type AX filter material, European Committee for Standardization (CEN) standards EN 136, 140 and 405 provide respirator masks and EN 149 and 143 provide filter recommendations.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection:

Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. Nitrile, CEN standards EN 420 and EN 374 provide general requirements and lists of glove types.

Eye Protection:

If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection:

Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include: chemical/oil resistant clothing is recommended.

Specific Hygiene Measures:

Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

For more information please see the relevant exposure scenario in Appendix II of this SDS

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Results
Physical state at 20°C and 1013 hPa	liquid Form: clear liquid Colour: Colourless Odour: faint

Property	Results
Melting / freezing point	The pour point is $< 20^{\circ}\text{C}$ for n-pentane based on ASTM D 5950 methodology.
Boiling point	The boiling range for the substance can be between 28°C and 70°C based on ASTM D 1078 methodology.
Relative density	The density is between 0.60 and 0.65 g/cm^3 for n-pentane based ISO 12185 methodology.
Vapour pressure	The vapour pressure is between 45 and 79 kPa at 20°C for n-pentane based on calculated values.
Surface tension	The surface tension is between 13 and 17 mN/m at 25°C for n-pentane, based on Wilhelmy plate methodology.
Water solubility	The water solubility is 38.5 mg/l at 20°C for n-pentane (McAuliffe, 1966).
Partition coefficient n-octanol/water (log value)	Log Kow (Pow): 3 at 20°C
Flash point	The flash point is $< -20^{\circ}\text{C}$ for n-pentane based on DIN 51755 methodology.
Flammability	extremely flammable The flammability is between 1.3 and 7.8 % v/v for n-pentane based on calculated values.
Self-ignition temperature	The auto ignition temperature is $> 200^{\circ}\text{C}$ for n-pentane based on ASTM E 659 methodology.
Viscosity	Viscosity is between 0.2 and 0.52 mm^2/s for n-pentane, at 20°C based on ASTM D 7042 methodology.
Explosive properties	Not available Examination of the pentanes structures indicates that there are no functional groups present associated with explosive properties. Therefore, negative results can be predicted and no testing for explosive properties has been carried out. This is in accordance with column 2 of REACH Annex VII, the study does not need to be conducted if there are no chemical groups associated with explosive properties present in the molecule.
Oxidising properties	Not available In accordance with column 2 of REACH Annex VII, the oxidising properties study does not need to be conducted as the substance is highly flammable
Granulometry	Not available In accordance with column 2 REACH Annex VII the granulometry study does not need to be conducted as the substance is marketed or used in a non solid or granular form.
Dissociation constant	Not available In accordance with section 1 of REACH Annex XI, the dissociation constant study does not need to be conducted as the substance does not contain any functional groups that dissociate and therefore testing does



Property	Results
	not appear scientifically necessary
Stability in organic solvents and identity of relevant degradation products	Not available In accordance with column 1 of REACH Annex IX the stability in organic solvents study is not required as stability of the substance is not considered to be critical

SECTION 10. STABILITY AND REACTIVITY

Stability:

Material is stable under normal conditions.

Volatile liquid. Extremely flammable. Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to avoid:

Avoid heat, sparks, open flames and other ignition sources.

Materials to avoid:

Strong oxidisers

Hazardous decomposition products:

Material does not decompose at ambient temperatures.

Hazardous polymerization:

Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

Property	Value	Remarks
In vitro genotoxicity studies	negative	key study, experimental result
In vivo genotoxicity studies	negative	key study, experimental result
Acute toxicity:		
N-pentane is classified as aspiration hazard based on the kinematic viscosity, 2.75 mm ² /sec at 20°C, of pentanes as a category.		
oral	>2000 mg/kg (rat, male/female)	key study, experimental result OECD TG 401 (Acute Oral Toxicity), BASF AG (1958)/ EU Method B.1 (Acute Toxicity (Oral))
	>5000 mg/kg (rat, male/female)	Read-across to cyclopentane (CAS 287-92-3) OECD TG 423 (Acute Oral toxicity - Acute Toxic Class Method)
inhalation	>25.3 mg/L (rat, male/female). Relevance to Category - Yes	key study, experimental result Read-across to cyclopentane (CAS 287-92-3) OECD TG 403 (Acute Inhalation Toxicity)
dermal	Not applicable	In accordance with column 2 of REACH Annex VIII, an acute toxicity test via the dermal route is not required because the physicochemical and toxicological properties of pentanes as a category do not suggest potential for a significant rate of absorption through the skin and the



Property	Value	Remarks
		main route of potential human exposure is via inhalation. The physicochemical properties of these substances (e. g. log Kow is 3.45; water solubility 38.5 mg/L at 20°C) indicate that they will not readily penetrate the skin. Based on the physicochemical data, acute dermal studies do not appear to be scientifically necessary or justified.
Irritation/Corrosivity:		
Based on negative results from key and read-across skin sensitisation studies, n-pentane is not considered to be a skin sensitizer and does not meet the criteria for classification as a dermal sensitizer under EU Dangerous Substances Directive 67/548/EEC or CLP EU Regulation 1272/2008.		
Skin irritation/ or skin corrosion	rabbit: not irritating/ not corrosion	key study, experimental result OECD TG 404 (Acute Dermal Irritation / Corrosion) EU Method B.4 (Acute Toxicity: Dermal Irritation / Corrosion)
Eye irritation	rabbit: not irritant	key study, experimental result OECD TG 405 (Acute Eye Irritation / Corrosion); EC Dangerous Substances Directive (67/548/EEC): Methods of Determination of Toxicity, Annex V, Part B.5
Skin sensitisation	guinea pig: not sensitising	key study, experimental result OECD TG 406 (Skin Sensitisation); EU Method B.6 (Skin Sensitisation)
Respiratory sensitisation	There are no data available for respiratory sensitisation for n-pentane.	
Repeated dose toxicity: n-pentane is not classified under EU Dangerous Substances Directive 67/548/EEC or CLP EU Regulation 1272/2008 for repeated dose toxicity.		
Using key and read-across information from repeated dose inhalation toxicity studies performed with pentanes, it can be assumed that n-pentane would not produce significant systemic toxicity when administered via inhalation. Although there were no key repeated dose toxicity studies identified for either oral or dermal exposure, physicochemical data suggests that absorption via the oral or dermal route is not significant and that oral and dermal toxicity is not a significant cause for concern. Additionally, acute oral toxicity data suggests that absorption via the oral route is not significant and that oral toxicity is not a significant cause for concern.		
oral	no NOAEL identified In accordance with column 2 of REACH Annex X, a long-term repeated oral toxicity study (12 months or more) is not appropriate because serious or severe toxicity effects of particular concern were not observed in the 28- or 90-day inhalation studies.	experimental result, supporting study OECD TG 407. rat / male
inhalation	NOAEC: 1000 ppm (rat, male)	experimental result, supporting study

Property	Value	Remarks
	<p>Changes in clinical chemistry; equivalent to 2951 mg/m³</p> <p>Read-across to 2-methylbutane: NOEC (subchronic toxicity): > 2220 ppm (rat, male/female) /organ weights</p> <p>NOEC (neurotoxicity): >= 6646 ppm (rat, male/female)/ overall effects</p>	<p>OECD TG 412 (Repeated Dose Inhalation Toxicity: 28/14-Day)</p> <p>key study, experimental result</p> <p>OECD TG 413 (Subchronic Inhalation Toxicity: 90-Day)</p>
dermal	no NOAEL identified	In accordance with column 2 of REACH Annex X, a long-term repeated dermal toxicity study (12 months or more) is not appropriate because serious or severe toxicity effects of particular concern were not observed in the 28- or 90-day inhalation studies.
Mutagenicity: negative		
In vitro data	<p>Negative: bacterial reverse mutation assay e.g. Ames test, gene mutation (S. typhimurium TA);</p> <p>cytogenicity in mammalian cells or micronucleus study</p>	<p>key study, experimental result</p> <p>OECD TG 471 (Bacterial Reverse Mutation Assay)</p> <p>EU Method B.10 (Mutagenicity - In Vitro Mammalian Chromosome Aberration Test)</p>
in vivo data	<p>Negative: micronucleus assay (chromosome aberration) / rat male/female/ inhalation: vapour</p>	<p>key study, experimental result</p> <p>EU Method B.12 (Mutagenicity - In Vivo Mammalian Erythrocyte Micronucleus Test)</p> <p>A read-across in vitro gene mutation study in bacteria (OECD 471) from 2-methylbutane also was identified. All genetic toxicity tests, both in vitro and in vivo, were negative.</p>
Toxicity for reproduction:		
Effects on fertility	<p>Reproductive toxicity data were not available for n-pentane</p> <p>Read-across to cyclohexane NOAEC = 2000 ppm (6880 mg/m³) rat male/female/inhalation: vapour</p>	<p>key study, experimental result</p> <p>OECD TG 416 (Two-Generation Reproduction Toxicity Study)</p>
Developmental toxicity	NOAEL = 1000 mg/kg/day oral: gavage (rats, female)	key study, experimental result OECD TG 414 (Prenatal Developmental Toxicity Study);

Property	Value	Remarks
		EU Method B.31 (Prenatal Developmental Toxicity Study) Data are also available on the developmental toxicity of cyclohexane. Cyclohexane was not a developmental toxin in female rabbits after exposure to 7000 ppm (24,080 mg/m ³) during pregnancy, and cyclohexane was not a developmental toxin in female rats exposed during pregnancy. The foetal NOAEC was 7000 ppm, and the maternal NOAEC was 500 ppm (based upon transient sedation) or 2000 ppm (based upon significant reductions in absolute and adjusted body weight gain).
Carcinogenicity study	Not applicable	According to REACH Annex X, this study does not need to be conducted because the substance is not classified as mutagen category 3 and there is no evidence from the repeated dose studies that the substance is able to induce hyperplasia and/or pre-neoplastic lesions.

SECTION 12. ECOLOGICAL INFORMATION

Property	Value	Remarks
AQUATIC TOXICITY		
Fish:		
Short-term toxicity testing on fish. (<i>Oncorhynchus mykiss</i>)	LC50 (96h) = 4.26 mg/l test mat. (meas. (arithm. mean))	key study, experimental result TG OECD TG 203 (Fish, Acute Toxicity Test)
Long-term toxicity to fish (<i>Oncorhynchus mykiss</i>)	NOELR (28 d): 6.165 mg/L test mat. (nominal) based on: growth rate	QSAR modelled data (The Petrotox computer model (v 3.04)) NOELR (No Observed Effect Loading Rate)
Aquatic invertebrates:		
Short-term toxicity to aquatic invertebrates for freshwater invertebrates (<i>Daphnia Magna</i>)	EC50 (48 h): 2.7 mg/L (value used for CSA) EC50 (48 h) = 9.1 mg/L EL50 (48 h): 2.8 mg/L	key study, experimental result Adema, D.M.M and van den Bos Baker, G.H (1987) Based on key study QSAR modelled data
Long-term toxicity to aquatic invertebrates (<i>Daphnia Magna</i>)	NOELR (21 d): 10.76 mg/L based on: reproduction	QSAR modelled data (The Petrotox computer model (v 3.04))
Algae and aquatic plants:		
algae, freshwater	EC50 (72 h): 10.7 mg/L (based on:	key study, experimental result

Property	Value	Remarks
<i>Scenedesmus capricornutum</i>	growth rate) NOEC growth rate = 2.04 mg/L. EC50 (72 h): 7.51 mg/L (based on: biomass) EC50 (72 h): 1.26 mg/L (based on: biomass) NOEC (72 h): 7.51 mg/L (based on: growth rate)	OECD TG 201 (Alga, Growth Inhibition Test)
Toxicity to aquatic micro-organisms (<i>Tetrahymena pyriformis</i> , freshwater)	EL50 (48 h): 105.9 mg/L test mat. (nominal) based on: growth inhibition NOEL (48 h): 23.7 mg/L test mat. (nominal) based on: growth inhibition	key study, QSAR modelled data (The Petrotox computer model (v. 3.04))
<p>Sediment organisms: Not applicable</p> <p>In accordance with column 2 of REACH Annex X, the long term toxicity to sediment organisms study does not need to be conducted as the chemical safety assessment according to Annex I has not indicated a need to investigate further the effects of the substance and/or degradation products on sediment organisms. In addition data indicates that the bioaccumulative and adsorption capacity to soil of the substance is very low as indicated by the substance Kow and Koc and therefore it is not expected that the substance will persist in the environment for long enough to cause adverse effects.</p>		
<p>Toxicity to soil macro-organisms: Not applicable</p> <p>In accordance with column 2 of REACH Annex X, the long term toxicity testing on invertebrates study does not need to be conducted as the chemical safety assessment according to Annex I has not indicated a need to investigate further the effects of the substance and/or degradation products on terrestrial organisms. In addition data indicates that the bioaccumulative and adsorption capacity to soil of the substance is very low as indicated by the substance Kow and Koc and therefore it is not expected that the substance will persist in the environment for long enough to cause adverse effects.</p>		
<p>Toxicity to soil micro-organisms: Not applicable</p> <p>In accordance with column 2 of REACH Annex IX, the toxicity to soil micro-organisms study does not need to be conducted as direct and indirect exposure of the soil compartment is unlikely. In addition data indicates that the bioaccumulative and adsorption capacity to soil of the substance is very low as indicated by the substance Kow and Koc and therefore it is not expected that the substance will persist in the environment for long enough to cause adverse effects.</p>		
<p>Toxicity to terrestrial plants: Not applicable</p> <p>In accordance with column 2 of REACH Annex IX, the toxicity to terrestrial plants study does not need to be conducted as direct and indirect exposure of the soil compartment is unlikely. In addition data indicates that the bioaccumulative and adsorption capacity to soil of the substance is very low as indicated by the substance Kow and Koc and therefore it is not expected that the substance will persist in the environment for long enough to cause adverse effects.</p>		
<p>Toxicity to birds: Not applicable.</p> <p>In accordance with column 2 of REACH Annex X, the study on birds does not need to be conducted as sufficient reliable data is available from the mammalian dataset. In addition and in accordance with ECHA (2008) Guidance on information requirements and chemical safety assessment, chapter R7c: endpoint specific guidance, the long term or reproductive toxicity to birds study does not need to be conducted as there is no indication that this substance has the potential to contaminate food chains as it is not persistent or bioaccumulative.</p>		

Property	Value	Remarks
Atmospheric compartment		
Direct Effects:		
<p>No data are available to characterize direct effects of airborne concentrations of this substance on vegetation. However, several EU risk assessment reports on individual hydrocarbons (e.g. n-pentane, cyclohexane, benzene, toluene, ethylbenzene) indicate vapor phase toxicity to terrestrial plants poses a low concern.</p>		
<p>Due to lack of standardized, long-term hazard test data, no formal PNECs were developed but qualitative risk assessments were used to conclude direct effects are not expected</p>		
Indirect Effects:		
<p>This substance may contribute to ozone formation in the near surface atmosphere. However, the photochemical formation of ozone depends on a complex interaction of other atmospheric pollutant sources and environmental conditions. Therefore, the contribution of this substance to ozone formation is outside the scope of this substance assessment and is more appropriately addressed via EU air quality directives.</p>		
DEGRADATION		
ABIOTIC DEGRADATION:		
Abiotic hydrolysis	<p>This chemical substance consists entirely of carbon and hydrogen and does not contain hydrolyzable groups. As such, it has a very low potential to hydrolyze. Therefore, this degradative process will not contribute to its removal from the environment.</p> <p>Hydrolysis is a reaction in which a water molecule or hydroxide ion substitutes for another atom or group of atoms present in a chemical resulting in a structural change of that chemical. Potentially hydrolyzable groups include alkyl halides, amides, carbamates, carboxylic acid esters and lactones, epoxides, phosphate esters, and sulfonic acid esters. The lack of a suitable leaving group renders compounds resistant to hydrolysis.</p>	
Phototransformation in air	Half-life (DT50):3.95 d	Calculated half life based on -OH radical concentration of 5 E5 molecules/cm ³ as specified in the TGD
<p>Phototransformation in water: The available data and available weight of evidence demonstrate that hydrocarbons contained within this substance do not absorb light within a range of 290 to 750 nm, the range in which photolysis occurs. Therefore, direct photolysis will not contribute to the degradation of this substance in the aquatic environment. Further testing is not required under Annex XI, section 1.2.</p>		
<p>Phototransformation in soil: The available data and available weight of evidence demonstrate that hydrocarbons contained within this substance do not absorb light within a range of 290 to 750 nm, the range in which photolysis occurs. Therefore, direct photolysis will not contribute to the degradation of this substance in the terrestrial environment. Further testing is not required under Annex XI, section 1.2.</p>		
BIODEGRADATION:		
readily biodegradable		
Biodegradation in water: readily biodegradable		



Property	Value	Remarks
87 % degradation of n-pentane occurred within 28 days and so the substance is considered readily biodegradable		
Biodegradation in soil	Not applicable	In accordance with column 2 of REACH Annex IX, the soil simulation testing does not need to be conducted as the substance is readily biodegradable
Fate and behaviour in the Environment:		
Adsorption/desorption screening	log Kow of 3.45 Koc at 20°C: 794.3; log Koc: 2.9	QSAR modelled data
Environmental distribution Percent distribution in media:	Air (%): 99.5 Water (%): 0.5 Soil (%): 0 Sediment (%): 0 Susp. sediment (%): 0 Biota (%): 0	estimated by calculation Calculation programme: PETRORISK Model, version 5.32
Bioaccumulation:		
The BCF of n-pentane was calculated to be 171, based on a log Kow of 3.45. The BCF indicates that n-pentane has a low potential to bioaccumulate in the lipids of ecological receptors.		
Aquatic bioaccumulation	BCF: 171 null (L/kg ww or dimensionless)	BCF was calculated using Log Kow of 3.45 and the equation defined in the TGD (Log BCF fish = 0.85. Log Kow -0.7). This is the TGD guideline QSAR
<u>PBT/vPvB</u> Properties	n-pentane, is not found to meet the PBT / vPvB criteria	
Emission Characterisation	Emission Characterisation is not required because the substance does not fulfill the PBT / vPvB criteria	
Conclusion on the environmental hazard assessment and on classification and labelling	The ecotoxicological data available indicate that n-pentane can be classified as chronic category 2 with the hazard statement "toxic to aquatic organisms; may cause long term adverse effects in the aquatic environment". These classifications have been agreed by the consortium to represent the respective substances.	
<u>PBT/vPvB</u> Properties	The substance n-pentane is not found to meet the PBT / vPvB criteria.	
Criterion	<u>PBT criteria</u>	<u>vPvB criteria</u>
P	Half-life (T _{1/2}) > 60 d in marine water or Half-life (T _{1/2}) > 40 d in fresh or estuarine water or Half-life (T _{1/2}) > 180 d in marine sediment or Half-life (T _{1/2}) > 120 d in fresh or estuarine water; sediment or Half-life (T _{1/2}) in soil > 120 d	Half-life (T _{1/2}) > 60 d in marine fresh or estuarine water or Half-life (T _{1/2}) > 180 d in marine, fresh or estuarine water; sediment Half-life (T _{1/2}) > 180 d in soil
B	BCF > 2000 L/kg in fresh or marine aquatic species	BCF > 5000 L/kg



Property	Value	Remarks
T	Chronic NOEC < 0.01 mg/l for marine or freshwater organisms, or Substance is classified as carcinogenic (category 1 or 2), mutagenic (category 1 or 2), or toxic for reproduction (category 1, 2 or 3) or There is other evidence of chronic toxicity, as identified by the classifications: T, R48, or Xn, R48 according to Directive 67/548/EEC.	Not applicable

SECTION 13. DISPOSAL CONSIDERATIONS

WATER HAZARD CLASSIFICATION

According to the German VwVwS: WGK-2 (danger for water pollution)

Disposal methods:

Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

Disposal recommendations:

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

Empty Container Warning Empty Container Warning (where applicable):

Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations.

DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14. TRANSPORT INFORMATION

General

The product is covered by international regulations on the transport of dangerous goods under UN DOT, hazard class 3.1 (flammable liquid).

Land transport

ADR/ RID

ID number: UN 1265
 Proper shipping name: PENTANES
 Hazard class: 3
 Classification code: F1
 Packing group: I
 Hazard label: 3, EHS



Remarks

Transport Document Name: UN1265, PENTANES, 3, PG I
Hazard ID Number: 33
Hazchem EAC: 3YE

Inland waterway transport

ADN

ID number: UN 1265
Proper shipping name: PENTANES, liquid (n-pentane)
Hazard class: 3
Packing group: I
Hazard label: 3 (N2), EHS

Remarks

Transport Document Name: UN1265, PENTANES, liquid (n-pentane), 3 (N2), PG I
Hazard ID Number: 33

Marine transport

IMDG

ID number: UN 1265
Proper shipping name: PENTANES
Hazard class: 3
Packing group: I
EmS number Emergency schedule
EMS Number: F-E, S-D
Hazard label: Class 3 (flammable)
Marine pollutant: yes (P)

Remarks

Transport Document Name: UN1265, PENTANES, 3, PG I, (-45°C c.c.), MARINE POLLUTANT

Air transport

IATA/ICAO

ID number: UN 1265
Proper shipping name: PENTANES
Hazard class: 3
Packing group: I
Hazard label: Class 3 (flammable)

Remarks

Transport Document Name: UN1265, PENTANES, 3, PG I

SECTION 15. REGULATORY INFORMATION

Chemical Safety Report has been developed for pentane.
[APPENDIX II TO THE eSDS: Exposure scenarios for pentane.](#)

REGULATORY

Key literature references and sources

Documents, provided by consortium “Pentane and 2-methylbutane” (HCS-consortium): chemical safety report (CAS 109-66-0)

<http://apps.echa.europa.eu/registered/data/dossiers> (for Pentane)



EU DIRECTIVES

REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

Regulation (EC) No 1272/2008 REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

Commission regulation (EU) no 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)

DIRECTIVE 1999/45/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations

Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances.

COMMISSION DECISION of 16 January 2001 amending Decision 2000/532/EC as regards the list of wastes (notified under document number (2001/118/EC)

UK REGULATORY REFERENCES

Chemicals (Hazard Information & Packaging) Regulations. The Control of Substances Hazardous to Health Regulations 1988. Health and Safety at Work Act 1974.

ENVIRONMENTAL LISTING

Control of Pollution Act 1974.

STATUTORY INSTRUMENTS

Notification of New Substances Regulations (NONS) 1993. The Export and Import of Dangerous Chemicals Regulations 2005 number 928.

APPROVED CODE OF PRACTICE

Classification and Labelling of Substances and Preparations Dangerous for Supply (EU 2001/59/EC). Safety Data Sheets for Substances and Preparations (REACH)

GUIDANCE NOTES

Workplace Exposure Limits EH40. Introduction to Local Exhaust Ventilation HS(G)37. CHIP for everyone HSG(108).

NATIONAL REGULATIONS

The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. No. 1689. Workplace Exposure Limits 2005 (EH40).

The Carriage of Dangerous Goods and use of transportable pressure equipment regulations 2004.
Control of Substances hazardous to health regulations 2002 (as amended).

NATIONAL REGULATIONS (GERMANY)
Major Accident Hazard Legislation 82/501/EWG.

SECTION 16. OTHER INFORMATION

16.1. Indication of changes

VERSION	15	Section	Description of changes
Version: 1	16/01/2010		Version created according to Regulations (EC) No 1907/2006 (Article 31.1)
Version: 2.1	08/02/2011		Version created according to Regulation (EC) No 1272/2008 (Regulation CLP) & 453/2010
Version: 2.2	17/10/2011	2-8; 10-16	Section 2-8; 10-16 was fully updated according to recommendations of 'Guidance on the compilation of safety data sheets (version 1.0 – September 2011)'

16.2 Abbreviations and acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN	The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
AGS	The German Committee on Hazardous Substances (Ausschuss für Gefahrstoffe – AGS)
BCF	Bioconcentration factor
DFG	Germany Research Foundation
DNEL	Derived No Effect Level
EAC	Emergency Action Code
EmS	Emergency Procedures for Ships Carrying Dangerous Goods
IMDG	International Maritime Dangerous Goods
ICAO-TI	Technical Instructions for the Safe Transport of Dangerous Goods by Air
K _{oc}	Adsorption coefficient
K _{ow}	octanol-water partition coefficient
LC50	Lethal Concentration to 50 % of a test population
LD50	Lethal Dose to 50% of a test population (Median Lethal Dose)
LOAEC	Lowest Observable Adverse Effect Concentration
LTEL	Long Term Exposure Limit
NIOSH	National Institute for Occupational Safety and Health (<i>USA CDC</i>)
NOEC	No Observed Effect Concentration
NOAEL	No Observed Adverse Effect Level
OECD	Organization for Economic Co-operation and Development
OSHA	Occupational Safety & Health Administration (<i>USA</i>)
PNEC	Predicted No Effect Concentration
PBT	Persistent, bioaccumulative, toxic chemical
vPvB	Very Persistent, Very Bioaccumulative
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
STEL	Short Term Exposure Limit
STOT	Specific Target Organ Toxicity
(STOT) RE	Repeated Exposure
(STOT) SE	Single Exposure



TWA Time Weighted Average
UN United Nations
WGK Wassergefährdungsklasse (*German: Water Hazard Class*)

16.3 Relevant R-phrases, Hazard- and EU Hazard-statements

R-phrases

R12 Extremely flammable
R65 Harmful: may cause lung damage if swallowed R20/21/22 Harmful by inhalation, in contact with skin and if swallowed
R67 Vapours may cause drowsiness and dizziness
R66 Repeated exposure may cause skin dryness or cracking.
R51/53 Dangerous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Safety Advice (S-phrases):

S2 - keep out of the reach of children
S9 - keep container in a well-ventilated place
S16 - keep away from sources of ignition - No smoking
S29 - do not empty into drains
S33 - take precautionary measures against static discharges
S61 - avoid release to the environment. refer to special instructions/safety data sheets
S62 - if swallowed, do not induce vomiting: seek medical advice immediately and show this container or label

Hazard statement

H224: Extremely flammable liquid and vapour.
H304: May be fatal if swallowed and enters airways.
H336: May cause drowsiness or dizziness.
H411: Toxic to aquatic life with long lasting effects.
EUH066: Repeated exposure may cause skin dryness or cracking.

Precautionary statements:

P210: Keep away from heat/sparks/open flames/... /hot surfaces.... No smoking. (Prevention)
P233: Keep container tightly closed.
P240: Ground/bond container and receiving equipment. (Prevention)
P241: Use explosion-proof electrical/ventilating/lighting/... / equipment. (Prevention)
P242: Use only non-sparking tools. (Prevention)
P243: Take precautionary measures against static discharge. (Prevention)
P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
P271: Use only outdoors or in a well-ventilated area.
P273: Avoid release to the environment.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P301+P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312: Call a POISON CENTER or doctor/physician if you feel unwell.
P331: Do NOT induce vomiting.

P370+P378: In case of fire: Use... for extinction.
P391: Collect spillage.
P403+P233: Store in a well-ventilated place. Keep container tightly closed.
P403+P235: Store in a well-ventilated place. Keep cool.
P405: Store locked up.
P501: Dispose of contents/container to... (Disposal)

16.4 List of ES (exposure scenario) given in Appendix I to the extended SDS

ES1	Manufacture of Substance – Industrial
ES2	Distribution of Substance – Industrial
ES3	Formulation & (Re)packing of Substances and Mixtures – Industrial
ES4	Uses in Coatings – Industrial
ES5	Uses in Coatings – Consumer
ES6	Use in Cleaning Agents – Industrial
ES7	Use in Cleaning Agents – Professional
ES8	Use in Cleaning Agents – Consumer
ES9	Use as Blowing Agents – Industrial
ES10	Use in Agrochemicals – Professional
ES11	Use as a Fuel – Industrial
ES12	Use as a Fuel – Professional
ES13	Use as a Fuel – Consumer
ES14	Use as Functional Fluids – Industrial
ES15	Use as Functional Fluids – Professional
ES16	Other Consumer Uses – Consumer
ES17	Use in Laboratories – Industrial
ES18	Use in Laboratories – Professional

DISCLAIMER

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



Annex I

Relevant identified uses of the substance

Uses by workers in industrial settings

Identified Use (IU) name	Use descriptors
Manufacture of substance	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 15: Use as laboratory reagent</p> <p>Environmental release category (ERC): ERC 1: Manufacture of substances ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles</p> <p>Sector of end use (SU): SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals SU 0: Other: SU 3</p> <p>Subsequent service life relevant for that use?: no</p>
Distribution of substance	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 15: Use as laboratory reagent</p> <p>Environmental release category (ERC): ERC 1: Manufacture of substances ERC 2: Formulation of preparations</p>



	<p>ERC 3: Formulation in materials ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC 6b: Industrial use of reactive processing aids ERC 6c: Industrial use of monomers for manufacture of thermoplastics ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers ERC 7: Industrial use of substances in closed systems Sector of end use (SU): SU 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>
<p>Formulation & (Re)packing of Substances and Mixtures</p>	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation PROC 15: Use as laboratory reagent Environmental release category (ERC): ERC 2: Formulation of preparations Sector of end use (SU): SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>
<p>Uses in Coatings: Industrial</p>	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where</p>



	<p>opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 7: Industrial spraying PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 10: Roller application or brushing PROC 13: Treatment of articles by dipping and pouring PROC 15: Use as laboratory reagent Environmental release category (ERC): ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles Sector of end use (SU): SU 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>
<p>Use in Cleaning Agents: Industrial</p>	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 7: Industrial spraying PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 10: Roller application or brushing PROC 13: Treatment of articles by dipping and pouring Environmental release category (ERC): ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles Sector of end use (SU): SU 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>
<p>Use as a Blowing Agent: Industrial</p>	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated</p>



	<p>facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 12: Use of blowing agents in manufacture of foam Environmental release category (ERC): ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles Sector of end use (SU): SU 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>
Use as a Fuel: Industrial	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 16: Using material as fuel sources, limited exposure to unburned product to be expected Environmental release category (ERC): ERC 7: Industrial use of substances in closed systems Sector of end use (SU): SU 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>
Use as Functional Fluids: Industrial	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) Environmental release category (ERC): ERC 7: Industrial use of substances in closed systems Sector of end use (SU): SU 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>



Use in Laboratories: Industrial	<p>Process category (PROC): PROC 10: Roller application or brushing PROC 15: Use as laboratory reagent</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles</p> <p>Sector of end use (SU): SU 0: Other: SU 3</p> <p>Subsequent service life relevant for that use?: no</p>
Polymer Production	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 6: Calendering operations PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation</p> <p>Environmental release category (ERC): ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles ERC 7: Industrial use of substances in closed systems</p> <p>Sector of end use (SU): SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU 11: Manufacture of rubber products SU 12: Manufacture of plastics products, including compounding and conversion SU 13: Manufacture of other non-metallic mineral products, e.g. plasters, cement</p> <p>Subsequent service life relevant for that use?: no</p>

Uses by professional workers

Identified Use (IU) name	Use descriptors
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<p>Use in Cleaning Agents: Professional</p>	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 10: Roller application or brushing PROC 11: Non industrial spraying PROC 13: Treatment of articles by dipping and pouring PROC 15: Use as laboratory reagent PROC 19: Hand-mixing with intimate contact and only PPE available. Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8d: Wide dispersive outdoor use of processing aids in open systems Sector of end use (SU): Subsequent service life relevant for that use?: no</p>
<p>Use as Functional Fluids: Professional</p>	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 20: Heat and pressure transfer fluids in dispersive, professional use but closed systems Environmental release category (ERC): ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems Sector of end use (SU): Subsequent service life relevant for that use?: no</p>
<p>Use in Laboratories: Professional</p>	<p>Process category (PROC): PROC 10: Roller application or brushing PROC 15: Use as laboratory reagent Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems Sector of end use (SU): Subsequent service life relevant for that use?: no</p>



Propellants	<p>Process category (PROC): PROC 11: Non industrial spraying</p> <p>Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8d: Wide dispersive outdoor use of processing aids in open systems</p> <p>Subsequent service life relevant for that use?: no</p>
Use in Agrochemicals	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 11: Non industrial spraying PROC 13: Treatment of articles by dipping and pouring</p> <p>Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8d: Wide dispersive outdoor use of processing aids in open systems</p> <p>Subsequent service life relevant for that use?: no</p>
Use as a Fuel	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 16: Using material as fuel sources, limited exposure to unburned product to be expected</p> <p>Environmental release category (ERC): ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems</p> <p>Subsequent service life relevant for that use?: no</p>

Uses by consumers

Identified Use (IU) name	Use descriptors
Uses in Coatings: Consumer	<p>Chemical product category (PC): PC 1: Adhesives, sealants PC 4: Anti-freeze and de-icing products PC 9a: Coatings and paints, thinners, paint removes PC 9b: Fillers, putties, plasters, modelling clay PC 9c: Finger paints</p>



	<p>PC 15: Non-metal-surface treatment products PC 18: Ink and toners PC 23: Leather tanning, dye, finishing, impregnation and care products PC 24: Lubricants, greases, release products PC 31: Polishes and wax blends PC 34: Textile dyes, finishing and impregnating products; including bleaches and other processing aids PC 0: Other: PC8 (excipient only) Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8d: Wide dispersive outdoor use of processing aids in open systems Subsequent service life relevant for that use?: no</p>
Use in Cleaning Agents: Consumer	<p>Chemical product category (PC): PC 3: Air care products PC 4: Anti-freeze and de-icing products PC 9a: Coatings and paints, thinners, paint removes PC 9b: Fillers, putties, plasters, modelling clay PC 9c: Finger paints PC 24: Lubricants, greases, release products PC 35: Washing and cleaning products (including solvent based products) PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products PC 0: Other: PC8 (excipient only) Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8d: Wide dispersive outdoor use of processing aids in open systems Subsequent service life relevant for that use?: no</p>
Use as a Fuel: Consumer	<p>Chemical product category (PC): PC 13: Fuels Environmental release category (ERC): ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems Subsequent service life relevant for that use?: no</p>
Other Consumer Uses	<p>Chemical product category (PC): PC 28: Perfumes, fragrances PC 39: Cosmetics, personal care products Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8d: Wide dispersive outdoor use of processing aids in open systems Subsequent service life relevant for that use?: no</p>
Propellants	<p>Chemical product category (PC): PC 1: Adhesives, sealants</p>



	<p>PC 3: Air care products PC 4: Anti-freeze and de-icing products PC 9a: Coatings and paints, thinners, paint removers PC 9b: Fillers, putties, plasters, modelling clay PC 9c: Finger paints PC 24: Lubricants, greases, release products PC 31: Polishes and wax blends PC 35: Washing and cleaning products (including solvent based products) Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8d: Wide dispersive outdoor use of processing aids in open systems Subsequent service life relevant for that use?: no</p>
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Most common technical function of substance (what it does):

Solvents