

## SIBUR TOBOLSK LLC

### SAFETY DATA SHEET

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

### 2-METHYLBUTANE

Version: 2.5

Date created: 17/05/2016

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

##### 1.1 Product identifier

Name of substance	2-methylbutane
Synonyms	isopentane
Trade names	2-methylbutane, isopentane fraction
IUPAC Name	2-methylbutane
Index No (CLP)	601-085-00-2
CAS #	78-78-4
EC #	201-142-8
Registration #	01-2119475602-38-0004

##### 1.2 Relevant identified uses of the substance

**Most common technical function of substance:** Solvents

For the detailed identified uses of the product 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: SIBUR Tobolsk LLC  
Address: Promzona, Tobolsk, 626150, Tumen region, Russian Federation  
Phone: +7 3456 398 7 42; +7 3456 398 9 51  
Fax: +7 3456 39 89 51  
Email Address: [tnhk@tn.tob.ru](mailto:tnhk@tn.tob.ru)  
Emergency phone: +7 3456 398 7 63;  
+7 912 922 33 24(offices hours only)

###### Only representative

Company name: Gazprom Marketing and Trading France  
Address: 68 avenue des Champs-Élysées, 75008, Paris, France  
Contact Telephone: +33 1 42 99 73 50  
Fax: +33 1 42 99 73 99  
Email Address: [Yury.severinchik@gazprom-mt.com](mailto:Yury.severinchik@gazprom-mt.com)

##### 1.4 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)

## SECTION 2. HAZARDS IDENTIFICATION

### 2.1 CLASSIFICATION

2-methylbutane

#### 2.1.1 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; 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

#### 2.1.2 Classification and labelling according to EC/1272/2008 Annex VI (CLP):

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.)

#### 2.1.3 Additional labelling requirements:

EUH066: Repeated exposure may cause skin dryness or cracking.

### 2.2 LABELLING

#### 2.2.1 EU LABELLING:

Indication of danger:

Symbol: Xn; F+; N



F+ (extremely flammable)



N (dangerous for the environment)



Xn (harmful)

### 2.2.2 CLP LABELLING:

**Signal word: Danger**

**Hazard pictogram:**



**GHS07: exclamation mark**



**GHS08: health hazard**



**GHS02: flame**



**GHS09: environment**

### 2.3. Risk phrases (R-phrases), Hazard statement, Safety Advice (S-phrases) and Precautionary statements:

#### 2.3.1 Risk phrases and Hazard statement:

##### **Risk phrases**

R12 Extremely flammable

R65 Harmful: may cause lung damage if swallowed.

R66 Repeated exposure may cause skin dryness or cracking.

R67 Vapours may cause drowsiness and dizziness.

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

##### **Hazard statement**

H224: Extremely flammable liquid and vapour.

H304: May be fatal if swallowed and enters airways.

H336: May cause drowsiness or dizziness.

EUH066: Repeated exposure may cause skin dryness or cracking.

#### 2.3.2 Safety phrases and Precautionary statements:

##### **Safety phrases:**

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

### 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)

### 2.4 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;
- not fulfilling vPvB (very persistent/very bioaccumulative) criteria.

## SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Name EC No	EC No	CAS No	Content (w/w) %	Classification Regulation (EC) No 67/548 and (EC) No 1272/2008 (CLP)
2-methylbutane <i>Index No(CLP):</i> 601-085-00-2	201-142-8	78-78-49	97.5-99.8	F+: R12; Xn: R65, 66, 67; N: R51/53 H224; H304; H336; H411
butane <i>Index No(CLP):</i> 601-004-00-0	203-448-7	106-97-8	0.05-1.5	F+: R12 H220, H280
pentane <i>Index No(CLP):</i> 601-006-00-1	203-692-4	109-66-0	0.1-2.5	F+: R12; Xn: R65, 66, 67 H224; H304; H336; H411

The product does not contain impurities or additives that could affect product's labelling and classification according to 67/548/EEC and EU CLP 2008.

Specific Conc. Limits (CLP): none.

M-factor: none.

Relevant R-phrases, Hazard- and EU Hazard-statements are given in Section 16.

## **SECTION 4. FIRST-AID MEASURES**

### **4.1 Description of first aid measures**

#### **If inhaled**

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

#### **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.

#### **Contact with eyes**

Rinse immediately eye with plenty of low pressure water for at least 15 minutes.

Remove any contact lenses.

Get medical attention if irritation develops.

### **4.2 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.

Causes central nervous system depression. Dermatitis may result from prolonged or repeated exposure. Call a doctor or poison control centre for guidance.

## **SECTION 5. FIRE-FIGHTING MEASURES**

### **5.1 Suitable 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.

### **5.2 Unsuitable Extinguishing Media**

Do NOT use straight streams of water.

### **5.3 Unusual fire and explosion hazards**

Vapour may cause flash fire.

Vapours are heavier than air. It may travel along the ground and be ignited at a distant location. The vapour readily mixes with air and explosive mixtures can easily be formed.

#### **5.4 Specific hazards during fire fighting**

Combustion generates toxic fumes.

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

#### **5.5. 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**

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

#### **6.1 Personal precautions**

Wear personal protection (see section 8).

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

Ensure adequate ventilation and absence of sources of ignition.

Keep sparks, flames and other sources of ignition away

#### **6.2 Methods and material for containment and cleaning up:**

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. 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.

#### **6.3 Environmental precautions**

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

#### **6.4 Reference to other sections**

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

### **SECTION 7. HANDLING AND STORAGE**

#### **7.1 Handling**

Keep containers tightly sealed.

Store in cool, dry place in tightly closed containers.

Open and handle container with care.

Avoid contact with skin, eyes, and clothing. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Ensure electrical continuity by bonding and grounding (earthing) all equipment.

Restrict line velocity during pumping in order to avoid generation of electrostatic discharge.

Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

The vapour is heavier than air, spreads along the ground and distant ignition is possible.

Handle and open container with care in a well-ventilated area. Ventilate workplace in such a way that the Occupational Exposure Limit (OEL) is not exceeded. Do not empty into drains.

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 overfill 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. 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).

Loading/Unloading Temperature: < 28°C (82°F)

Transport Temperature: < 28°C (82°F)

Transport Pressure: [Ambient]

## 7.2 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: < 28°C (82°F).

Storage Pressure: [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.

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**

For iso-Pentane (EC#201-142-8; CAS #78-78-4): International Limit Values <sup>1)</sup>

SUBSTANCE 2-methylbutane CAS #78-78-4	LTEL 8 hr TWA ppm	LTEL 8 hr TWA mg/m <sup>3</sup>	STEL ppm	STEL mg/m <sup>3</sup>	Note
Austria	600	1800	1200	3600	
Belgium	600	1800	750	2250	
Denmark	500	1500	1000	3000	
European Union	1000	3000			Indicative Occupational Exposure Limit Values (IOELV) and Limit Values for Occupational Exposure
France	1000	3000			Indicative statutory limit values
Germany (AGS)	1000	3000	2000 <sup>(1)</sup>	6000 <sup>(1)</sup>	(1) 15 minutes average value
Germany (DFG)	1000	3000	2000	6000	STV 15 minutes average value
Hungary		3000			
Ireland	1000	3000			
Italy	667	2000			
Latvia	1000	3000			
Poland		3000			
Spain	1000	3000			
Sweden	600	1800	750 <sup>(1)</sup>	2000 <sup>(1)</sup>	(1) Short-term value, 15 minutes average value
Switzerland	600	1800	1200	3600	
The Netherlands		1800			
United Kingdom	600	1800			

<sup>1)</sup> GESTIS International Limit values:  
[http://bgia-online.hvbg.de/LIMITVALUE/WebForm\\_ueliste.aspx](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*	(Corrected) Dose descriptor *)
cute - systemic effects	Dermal	No-threshold effect and/or no dose-response information available		
Acute - systemic effects	Inhalation	No-threshold effect and/or no dose-response information available		
Acute - local effects	Dermal	No-threshold effect and/or no dose-response information available		
Acute - local effects	Inhalation	No-threshold effect and/or no dose-response information available		
Long-term - systemic effects	Dermal	DNEL (Derived No Effect Level)	432 mg/kg bw/day	NOAEL: 1,296 mg/kg bw/day (based on AF of 3)
Long-term - systemic effects	Inhalation	DNEL (Derived No Effect Level)	3000 mg/m <sup>3</sup>	NOAEC: 9,000 mg/m <sup>3</sup> (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		

\*This DNEL is derived from the Indicative Occupational Exposure Limit (IOEL) for Pentane, Isopentane, and Neopentane

#### DN(M)ELs for the general population

Exposure pattern	Route	Descriptor	DNEL / DMEL*	(Corrected) Dose descriptor
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 (Derived No Effect Level)	214 mg/kg bw/day	NOAEL: 1,070 mg/kg bw/day (based on AF of 5)
Long-term - systemic effects	Inhalation	DNEL (Derived No Effect Level)	643 mg/m <sup>3</sup>	NOAEC: 3,215 mg/m <sup>3</sup> (based on AF of 5)
Long-term - systemic effects	Oral	DNEL (Derived No Effect Level)	214 mg/kg bw/day	NOAEL: 1,070 mg/kg bw/day (based on AF of 5)
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		

\*This DNEL is derived from the Indicative Occupational Exposure Limit (IOEL) for Pentane, Isopentane, and Neopentane

### 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
<b>Fresh Water</b>	2,6E-06	mg/L
<b>Fresh Water Sediment</b>	3,6E-06	mg/kgw
<b>Marine Water</b>	5,5E-09	mg/L
<b>Marine Sediment</b>	6,7E-09	mg/kgw
<b>Natural Soil</b>	1,6E-08	mg/kgw
<b>Air</b>	9,2E-05	mg/m <sup>3</sup>
<b>Agricultural Soil</b>	3,5E-08	mg/kgw
<b>Drinking Water</b>	1,3E-06	mg/L

## 8.2 Exposure Controls

### 8.2.2 Personal protective equipment

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: If prolonged or repeated contact is likely, chemical-resistant gloves are recommended. If contact with forearms is likely, wear gauntlet-style gloves. 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. Approved to EU Standard EN166.

Do not wear contact lenses in any work area.

### 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: If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

### General safety and 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.

### 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.

### 8.2.3 Environmental exposure control measures

Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

### 8.3 Reference to other sections

Information about concentration PEC (Environmental Exposure) please see in Annex III of this SDS.

For more information please see The Relevant Exposure Scenario in Annex 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

Melting / freezing point	The freezing point is <-20°C for 2-methylbutane (based on literature values).
Boiling point	The boiling range is 25°C to 65°C for 2-methylbutane (based on ASTM D 1078 methodology).
Relative density	The density is between 0.61 and 0.65 g/cm <sup>3</sup> at 15°C for 2-methylbutane (based ISO 12185 methodology).
Vapour pressure	The vapour pressure is between 74 and 79 kPa at 20°C for 2-methylbutane (based on calculated values).
Surface tension	The surface tension is between 13.7 and 16 mN/m at 25°C for 2-methylbutane (based on Wilhelmy plate methodology, CRC Handbook, Lide, 2008).
Water solubility	The water solubility is 0.0485 g/l at 25°C for 2-methylbutane (Lide 2008).
Partition coefficient n-octanol/water (log value)	The log partition coefficient for 2-methylbutane has been read across within the category. The log Kow is between 3 and 3.45 (based on the CRC Handbook, Lide, 2008).
Flash point	The flash point is <0°C for 2-methylbutane (based on DIN 51755 methodology, CRC Handbook, Lide, 2008).
Flammability	extremely flammable The flammability is between 1.3 and 7.8 % v/v for 2-methylbutane, (based on calculated values, CRC Handbook, Lide 2008).
Self-ignition temperature	The auto ignition temperature is >250°C for 2-methylbutane (based on ASTM E 659 methodology).
Viscosity	Viscosity is between 0.31 and 0.52 mm <sup>2</sup> /s at 20°C for 2-methylbutane (based on ASTM D 445 methodology).
Dissociation constant	Not applicable. 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 not appear scientifically necessary.
Explosive properties	Not applicable. 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 applicable. 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.
Stability in organic solvents and identity of relevant degradation products	Not applicable. 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.

Dissociation constant	Not applicable 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 not appear scientifically necessary.
Granulometry	Not applicable. 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.

## SECTION 10. STABILITY AND REACTIVITY

### 10.1 Chemical stability

Stable under normal operating conditions of storage, handling and use.  
Volatile liquid. Extremely flammable.

### 10.2 Reactivity

No specific data.

### 10.3 Conditions to avoid

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

### 10.4 Materials to avoid

Strong oxidizers.

### 10.5 Hazardous decomposition products

Material does not decompose at ambient temperatures.  
Thermal decomposition products: in the presence of air may yield carbon monoxide and/or carbon dioxide.

### 10.6 Hazardous polymerization

Will not occur.

## SECTION 11. TOXICOLOGICAL INFORMATION

Property	Relevance to Category	Value	Remarks
<b>Skin irritation or skin corrosion</b>	No	not irritating	Based on key study test data and Read across from n-pentane was used for this endpoint.
<b>Eye irritation</b>	No	not irritant	
<b>Skin sensitisation</b>	No	not sensitising	
<b>Mutagenicity</b>			
In vitro genotoxicity studies	No	negative	Based on key study test data and Read across from n-pentane was used for this endpoint.
In vivo genotoxicity studies	No	negative	Based on key study test data and Read across from n-pentane was used for this endpoint.

Property	Relevance to Category	Value	Remarks
Human information		No additional information	
<b>Acute toxicity</b>			
By oral route	No	>2000 mg/kg in the rat study for n-pentane. >5000 mg/kg in the rat for acute oral toxicity study for cyclopentane	There were no studies identified for 1-methylbutane for acute oral or inhalation toxicity. Read across from n-pentane and cyclopentane was used for this endpoint.
By inhalation	Yes	> 25.3 mg/L in the rat for cyclopentane.	Read across from 2-methylbutane, like other pentanes, classified as Xn; R65 and as Category 1 for aspiration toxicity based on the kinematic viscosity of 2.75 mm <sup>2</sup> /sec at 20° C (this value is representative of pentanes as a category).
By dermal route	No	Not applicable	There were no acute studies identified for dermal exposure, physicochemical data suggests that absorption via the dermal route is not significant and that dermal toxicity is not a significant cause for concern. Additionally, oral exposure studies within pentanes did not report any potential for serious or severe toxicity by this route of exposure, therefore it is unlikely that toxicity via dermal exposure poses a significant risk.
<b>Repeated dose toxicity</b>			
Repeated dose toxicity: chronic, oral	No	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.
Sub-chronic toxicity study (90-day): oral	No	no NOAEL identified	In accordance with column 2 of REACH Annex IX, a subchronic repeated dose toxicity test via the oral route is not required because the physicochemical and toxicological properties of pentanes do not suggest potential for oral/gastrointestinal absorption.
Repeated dose toxicity: chronic, inhalation	No	NOEC (subchronic toxicity): > 2220 ppm (male/female)/ organ weights NOEC (neurotoxicity): >= 6646 ppm (male/female) /	In accordance with column 2 of REACH Annex X, a long-term repeated inhalation 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 and because limited

Property	Relevance to Category	Value	Remarks
		overall effects	systemic doses are expected due to low systemic absorption.
Repeated dose toxicity: chronic, dermal	No	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.
Repeated dose toxicity: Human information		No additional information	

**Conclusion: No oral or dermal repeated dose toxicity studies were identified for 2-methylbutane.**

**Reproductive toxicity**

Effects on fertility	No	Reproductive toxicity data were not available for 2-methylbutane.  Based on Read across from cyclohexane was used for this endpoint.	One read-across two-generation reproductive toxicity study (OECD 416) on cyclohexane was identified.  The reported NOAEC was 2000 ppm (6880 mg/m <sup>3</sup> ) for reproductive toxicity
Developmental toxicity	No	Developmental toxicity data were not available for 2-methylbutane  Based on Read across from n-pentane and cyclohexane was used for this endpoint.	A key oral developmental study (OECD 414) was identified, in which n-pentane was administered to female rats from days 6 through 15 of gestation. There were no signs of maternal or developmental toxicity. The maternal and developmental NOAEL is 1000 mg/kg/day. 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 <sup>3</sup> ) 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).

**Toxicokinetics** (based on key study test data and Read across from n-pentane):

Key toxicokinetics study was identified for 2-methylbutane. In this study rats were exposed to a variety of hydrocarbon vapours, including pentane, via inhalation for 80 minutes for 5 consecutive days.

Read-across study (OECD 417) was identified on the inhalation kinetics of cyclopentane in the rat. A bioaccumulation factor of 2.5 was calculated for lower concentrations and increased to about 9.1 at 1000 ppm with a maximum value of 11.5, which is the thermodynamic partition coefficient of whole body to air.



Property	Relevance to Category	Value	Remarks
Two read-across studies were identified on the toxicokinetics of n-pentane. In one study (OECD 417), rats were exposed to radiolabeled n-pentane via inhalation. Tissue and organ results from experiment 1 showed that the liver, small intestine, and kidneys contained the highest radioactivity per gram of tissue (wet weight). Muscle and liver accounted for the largest proportion of the estimated total of radioactivity expressed as a percentage of the total radioactivity injected into the chamber. In the other study (non-guideline), F344 rats were exposed to a variety of hydrocarbon vapours, including pentane, via inhalation for 80 minutes for 5 consecutive days. When pentane was inhaled at 100 ppm, the uptake ranges were 3.6±0.2 and 4.2±0.4 nmol/kg/min/ppm (the mean of two experiments).			
<b>Carcinogenicity</b>			
Carcinogenicity study	No	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
<b>AQUATIC TOXICITY</b>		
<b>Fish</b>		
Short-term toxicity testing on fish. ( <i>Oncorhynchus mykiss</i> )	LC50 (96h) = 4.26 mg/l LL50 (96h)=34.05mg/L	Based on key study. QSAR modelled data
Long-term toxicity to fish ( <i>Oncorhynchus mykiss</i> )	NOELR (28d) =7.618 mg/L	QSAR modelled data
<b>Aquatic invertebrates</b>		
Short-term toxicity to aquatic invertebrates ( <i>Daphnia Magna</i> )	EC50 (48 h): 2.3 mg/L EC50 (48 h) = 4.2 mg/L EL50 (48 h): 59.44 mg/L	Based on key study Based on key study QSAR modelled data
Long-term toxicity to aquatic invertebrates ( <i>Daphnia Magna</i> )	NOELR (21 d): 13.29 mg/L based on: reproduction	QSAR modelled data
<b>Algae and aquatic plants</b>		
<i>green algae</i> (algae)	EC50 (96 h): 5.2 mg/L	QSAR modelled data
<i>Scenedesmus capricornutum</i> (algae), freshwater	EC50 (72 h): 10.7 mg/L (based on: growth rate) 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)	Based on key study. The toxicity of 2-methylbutane to algae has been read across within the category from n-pentane.: <b>EC 50 growth rate = 10.7 mg/l, and NOEC growth rate = 2.04 mg/L.</b>
<b>Sediment organisms:</b> Not applicable		

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.

**Toxicity to soil macro-organisms:** Not applicable

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.

**Toxicity to soil micro-organisms:** Not applicable

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.

**Toxicity to terrestrial plants:** Not applicable

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.

**DEGRADATION**

2-methylbutane is not expected to persist in the environment because as it is readily biodegradable, has a low potential for adsorption to organic matter and low potential for bioaccumulation. The substance is expected to have a low potential for bioaccumulation and adsorption to soil and sediment based on the read across log Kow of 3.45. Structural analysis of 2-methylbutane indicates that it is not expected to undergo hydrolysis in the environment due to the lack of hydrolysable functional groups. The physico-chemical properties of 2-methylbutane indicate that the majority of the substances will ultimately be distributed to the atmosphere where they are quickly photooxidised. The photooxidative half lives for 2-methylbutane are 2.3 days.

**ABIOTIC DEGRADATION**

<b>Abiotic hydrolysis</b>	Not applicable	Study scientifically unjustified In accordance with the General Rules for Adaptation of the Standard Testing Regime (Annexes VII-X) as stated in REACH Annex XI, this endpoint can be waived as the substances are not expected to undergo hydrolysis in the environment due to a lack of hydrolysable functional groups and therefore testing does not appear scientifically necessary
<b>Phototransformation in air</b>	Half-life (DT50):2.3 d	Based on key study (Reference)

**Phototransformation in water:**

The available data and available weight of evidence demonstrate that the hydrocarbons contained by 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 these substances in the aquatic environment. Further testing is not required under Annex XI, section 1.2.

<p><b>Phototransformation in soil</b> The available data and available weight of evidence demonstrate that the hydrocarbons contained by 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 these substances in the terrestrial environment. Further testing is not required under Annex XI, section 1.2.</p>		
<p><b>BIODEGRADATION:</b> Readily biodegradable</p>		
<p><b>Biodegradation in water:</b> readily biodegradable 71.43% degradation of 2-methylbutane occurred within 28 days and so the substance is considered readily biodegradable</p>		
<b>Biodegradation in soil</b>	<b>Not applicable</b>	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
<p><b>Degradation rates:</b></p>		
Degradation rate in water	Kdeg <sub>water</sub> : 4.7E-2 d <sup>-1</sup> (half-life = 15 days)	
Degradation rate in sediment	Kdeg <sub>sed</sub> : 0.00231 d <sup>-1</sup> (half-life = 300 days)	
Degradation rate in soil:	Kdeg <sub>soil</sub> : 0.0231 d <sup>-1</sup> (half-life = 30 days)	
Degradation rate in air:	K <sub>air</sub> : 7.38E-13 cm <sup>3</sup> molecule <sup>-1</sup> sec <sup>-1</sup> (half-life = 2.3 days)	
<p><b>Fate and behaviour in the Environment</b></p>		
Adsorption/desorption screening	log Kow of 3.45 Koc at 20°C: 794.3; log Koc: 2.9	Based on across from n-pentane was used for this endpoint
Environmental distribution Percent distribution in media:	Air (%): 95.9 Water (%): 3 Soil (%): 0.1 Sediment (%): 0.9 Susp. sediment (%): 0 Biota (%): 0	estimated by calculation  Calculation programme: PETRORISK Model, version 5.32
<p><b>BIOACCUMULATION</b> There is no data for the bioaccumulation or Kow of 2-methylbutane, so this value has been read across from n-pentane as it has the most protective value within the category. The BCF of n-pentane was calculated as 171 based on a log Kow of 3.45</p>		
Aquatic bioaccumulation	BCF: 171 null (L/kg ww or dimensionless)	BCF was calculated using Log Kow of 3.45 which is the value reported for n-pentane and equation defined in TGD (Log BCF fish = 0.85. Log Kow - 0.7). This is the TGD guideline QSAR. It is acceptable to use this value for the calculations because there is no published measured value for isopentane. This value was also used for read-across for the log Kow for

	isopentane and therefore using it for this calculation is acceptable.
<b>PBT/vPvB Properties</b>	2-methylbutane, is not found to meet the PBT / vPvB criteria
<b>Emission Characterisation</b>	Emission Characterisation is not required because the substance does not fulfill the PBT / vPvB criteria
<b>Conclusion on the environmental hazard assessment and on classification and labelling</b>	The ecotoxicological data available indicate that 2-methylbutane 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.

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

## SECTION 13. DISPOSAL CONSIDERATIONS

### 13.1 General information

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

### 13.2 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.

### 13.3 Disposal of contaminated packaging

Empty Container Warning. 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.**

### 13.4 Local Legislation

These codes are assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste producers need to assess the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code(s).

EU Waste Disposal Code (EWC) for most common technical function of substance:

13 07 01: wastes of liquid fuels (fuel oil and diesel);

13 07 03: wastes of liquid fuels (other fuels (including mixtures));

20 01 13: separately collected fractions wastes of solvents (solvents);

07 01 04: wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals (other organic solvents, washing liquids and mother liquors);

07 03 04: wastes from the MFSU of organic dyes and pigments (other organic solvents, washing liquids and mother liquors).

## SECTION 14. TRANSPORT INFORMATION

### Land transport

#### ADR/ RID

UN number: 1265  
UN Proper shipping name: PENTANES  
Transport hazard class(es): 3  
Classification Code: F1  
Labels: 3, EHS  
Packing group (Packing Instruction) I  
Transport Document Name: UN1265, PENTANES, 3, PG I  
Hazard ID Number: 33  
Emergency Action Code (Hazchem EAC): 3YE

### Inland waterway transport (AND)

UN number: UN 1265  
Proper shipping name: PENTANES (2-METHYLBUTANE)  
Transport hazard class(es): 3  
Packing group: I  
Labels: 3 (N2), EHS  
Transport Document Name: UN1265, PENTANES (2-METHYLBUTANE), 3 (N2), PG I  
Hazard ID Number: 33

### Marine transport (IMDG)

UN number: UN 1265  
UN Proper shipping name: PENTANES  
Transport hazard class(es): 3  
Packing group: I  
EmS number: F-E, S-D  
Labels: 3  
Marine pollutant: Yes  
Transport Document Name: UN1265, PENTANES, 3, PG I, (-18°C), MARINE POLLUTANT

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Substance name: PENTANE (ALL ISOMERS)  
Ship type required: 3  
Pollution category: Y

### Air transport (IATA/ICAO)

UN number: UN 1265  
UN Proper shipping name: PENTANES  
Transport hazard class(es): 3  
Packing group: I  
Labels: 3  
Transport Document Name: Transport Document Name: UN1265, PENTANES, 3, PG I

## SECTION 15. REGULATORY INFORMATION

### 15.1 EU regulations

Authorisations: Not applicable.

Restrictions on use: Not applicable.

SEVESO (2003/105/EC, 2012/18/EU): Flammable Gases (P2). Flammable gases, Category 1 or 2.

## 15.2 Chemical Safety Assessment

Chemical Safety Report has been developed for 2-methylbutane.

APPENDIX II AND III TO THE eSDS: Exposure scenarios for 2-methylbutane

## 15.3 Key literature references and sources

**Documents, provided by consortium “Pentane and 2-methylbutane” (HCS-consortium):** chemical safety report (CAS 78-78-4)

### EU DIRECTIVES

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

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

Regulations. Commission regulation (EU) no 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).

### NATIONAL REGULATIONS (GERMANY)

Major Accident Hazard Legislation 82/501/EWG.

MARPOL 73/78 International Convention for the Prevention of Pollution from Ships, 1973 Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973

## SECTION 16. OTHER INFORMATION

### 16.1 Indication of changes

Version	Date of change	Section	Description of changes
Version: 1.0	16/03/2010	All	Initial SDS. Version created according to Regulations (EC) No 1907/2006 (Article 31.1).
Version: 2.0	08/12/2010	All	Version created according to Regulation (EC)



Version	Date of change	Section	Description of changes
			No 1272/2008 (Regulation CLP) & 453/2010.
Version: 2.1	08/02/2011	11; 12	Sections 11; 12 were fully reconfigured.
Version: 2.2	30/06/2011	8	Section 8 was fully reconfigured
Version: 2.3	09/01/2014	All	1. Sections 2; 4; 5 were fully reconfigured. 2. Sections 6; 7; 8; 10; 13; 14; 15; 16 were fully reconfigured, new information was added. 3. Version was checked for compliance with Candidate List of Substances of Very High Concern for Authorisation updated on December, 16, 2013.
Version: 2.4	26/09/2014	8.1.1; 9; 16.1	Sections 8.1.1; 9; 16.1 were corrected.
Version: 2.5	17/05/2016	Title, 1.3	Company name of the Supplier was changed from «Tobolsk-Neftekhim» on «SIBUR Tobolsk».

## 16.2 Abbreviations and acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AGS	The German Committee on Hazardous Substances (Ausschuss für Gefahrstoffe – AGS)
BOULV	Binding Occupational Exposure Limit Values
BCF	Bioconcentration factor
DFG	Germany Research Foundation
DNEL	Derived No Effect Level
ErC50	Means EC50 in terms of reduction of growth rate
EC50	Half effective concentration; the molarity of an agonist that produces 50% of the maximal possible effect of that agonist
ErL50 and EbL50	Are defined as the effective loading rate of the test substance that reduced growth rate and biomass, respectively, by 50% as compared with the control
IOELV	Indicative Occupational Exposure Limit Values
IMDG	International Maritime Dangerous Goods
ICAO-TI	Technical Instructions for the Safe Transport of Dangerous Goods by Air
K <sub>oc</sub>	Adsorption coefficient
K <sub>ow</sub>	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
MFSU	Manufacture Formulation Supply and Use
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> )
PEC	Predicted No Effect Concentration
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

H220: Extremely flammable gas

H280: Contains gas under pressure; may explode if heated.

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

ES1	Manufacture of Substance – Industrial (Uses by workers in industrial settings)
ES2	Distribution of Substance – Industrial
ES3	Formulation & (Re)packing of Substances and Mixtures – Industrial
ES4	Uses in Coatings – Industrial
ES5	Uses in Cleaning Agents– Industrial
ES6	Use as a Blowing Agent– Industrial
ES7	Use as a Fuel – Professional
ES8	Use as a Fuel - Consumer
ES9	Use as Functional Fluids – Industrial
ES10	Use as Functional Fluids – Professional
ES11	Other Consumer Uses – Consumer
ES12	Use in Laboratories – Industrial
ES13	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**

<b>Identified Use (IU) name</b>	<b>Substance supplied to that use</b>	<b>Use descriptors</b>
Manufacture of substance	as such (substance itself)	<p><b>Process category (PROC):</b>            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><b>Environmental release category (ERC):</b>            ERC 1: Manufacture of substances            ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles</p> <p><b>Sector of end use (SU):</b>            SU 8: Manufacture of bulk, large scale chemicals (including petroleum products)            SU 9: Manufacture of fine chemicals            SU 0: Other: 3</p> <p><b>Subsequent service life relevant for that use: no</b></p>
Distribution of substance	as such (substance itself)	<p><b>Process category (PROC):</b>            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><b>Environmental release category (ERC):</b>            ERC 1: Manufacture of substances            ERC 2: Formulation of preparations            ERC 3: Formulation in materials            ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles</p>

	<p>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  <b>Sector of end use (SU):</b>  SU 0: Other: 3  SU 8: Manufacture of bulk, large scale chemicals (including petroleum products)  SU 9: Manufacture of fine chemicals  <b>Subsequent service life relevant for that use: no</b></p>
Formulation	<p><b>Process category (PROC):</b>  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  <b>Environmental release category (ERC):</b>  ERC 2: Formulation of preparations  <b>Sector of end use (SU):</b>  SU 0: Other: SU 3  <b>Subsequent service life relevant for that use: no</b></p>
Uses in Coatings	<p><b>Process category (PROC):</b>  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 7: Industrial spraying  PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p>

	<p>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                  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  <b>Environmental release category (ERC):</b>                  ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles  <b>Sector of end use (SU):</b>                  SU 0: Other: SU 3  <b>Subsequent service life relevant for that use: no</b></p>
<p>Use in Cleaning Agents</p>	<p><b>Process category (PROC):</b>                  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  <b>Environmental release category (ERC):</b>                  ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles  <b>Sector of end use (SU):</b>                  SU 0: Other: SU 3  <b>Subsequent service life relevant for that use: no</b></p>
<p>Use as a blowing agent</p>	<p><b>Process category (PROC):</b>                  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 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  <b>Environmental release category (ERC):</b>                  ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles  <b>Sector of end use (SU):</b></p>

		SU 0: Other: SU 3 <b>Subsequent service life relevant for that use: no</b>
Use as a functional fluid		<b>Process category (PROC):</b> 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 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) <b>Environmental release category (ERC):</b> ERC 7: Industrial use of substances in closed systems <b>Sector of end use (SU):</b> SU 0: Other: SU 3 <b>Subsequent service life relevant for that use: no</b>
Uses in Laboratories		<b>Process category (PROC):</b> PROC 10: Roller application or brushing PROC 15: Use as laboratory reagent <b>Environmental release category (ERC):</b> ERC 2: Formulation of preparations ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles <b>Subsequent service life relevant for that use: no</b>

**Uses by professional workers**

Identified Use (IU) name	Substance supplied to that use	Use descriptors
Use as a fuel		<b>Process category (PROC):</b> 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 <b>Environmental release category (ERC):</b> ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems <b>Sector of end use (SU):</b> <b>Subsequent service life relevant for that use: no</b>
Functional		<b>Process category (PROC):</b>

Fluids	<p>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</p> <p><b>Environmental release category (ERC):</b>          ERC 9a: Wide dispersive indoor use of substances in closed systems          ERC 9b: Wide dispersive outdoor use of substances in closed systems</p> <p><b>Subsequent service life relevant for that use: no</b></p>
Uses in laboratories	<p><b>Process category (PROC):</b>          PROC 10: Roller application or brushing          PROC 15: Use as laboratory reagent</p> <p><b>Environmental release category (ERC):</b>          ERC 8a: Wide dispersive indoor use of processing aids in open systems</p> <p><b>Sector of end use (SU):</b>  <b>Subsequent service life relevant for that use: no</b></p>

**Uses by consumers**

Identified Use (IU) name	Use descriptors
Use as a fuel	<p><b>Chemical product category (PC):</b>          PC 13: Fuels</p> <p><b>Environmental release category (ERC):</b>          ERC 9a: Wide dispersive indoor use of substances in closed systems          ERC 9b: Wide dispersive outdoor use of substances in closed systems</p> <p><b>Subsequent service life relevant for that use: no</b></p>
Other consumer uses	<p><b>Chemical product category (PC):</b>          PC 28: Perfumes, fragrances          PC 39: Cosmetics, personal care products</p> <p><b>Environmental release category (ERC):</b>          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><b>Subsequent service life relevant for that use: no</b></p>

**Most common technical function of substance (what it does):** Solvents

END OF SDS