



VERSION: 1
DATE CREATED: 30/06/2011

SIBUR-KHIMPROM CJSC

SAFETY DATA SHEET

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

2-METHYLBUTANE

VERSION: 1
DATE CREATED: 30/06/2011
DATE UPDATED: -
Regulation: EC No 1272/2008

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

1.1 Product identifier

NAME OF SUBSTANCE: 2-methylbutane
SYNONYMS: isopentane
TRADE NAMES: 2-methylbutane, isopentane fraction
Index No (CLP) 601-085-00-2
CAS #: 78-78-4
EC #: 201-142-8
REGISTRATION #: 01-2119475602-38-0011

1.2 Relevant identified uses of the substance.

See Annex 1

Most common technical function of substance: Solvents.

Uses advised against

The use of the substance should be limited to those specified in Annex 1.

1.3 Details of the supplier of the safety data sheet

SUPPLIER:

Company name: Sibur-Khimprom CJSC
Address: 98, Promishlennaya str., Perm, Perm region,
614055, Russian Federation
Contact phone: +7 (3422) 90-83-72; 90-84-84; 90-82-82
Fax: +7 (3422) 90-81-61; 90-86-60
Email Address: mail@siburperm.ru
Emergency phone: +7 (3422) 90-87-05 (round the clock)
+7 (3422) 90-86-79, 290-87-18 (English, German,
8.00 to 18.00, GMT+5, leave the message.)

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*)



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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

2-methylbutane

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

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.

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2.2 LABELLING EU LABELLING

Indication of danger:

F+ - extremely flammable

N - dangerous for the environment

Xn - harmful



Xn (harmful)



F+ (extremely flammable)



N (dangerous for the environment)

Symbol: Xn; F+; N

CLP LABELLING

Signal word: Danger

Hazard pictogram:



GHS07: exclamation mark



GHS08: health hazard



GHS02: flame



GHS09: environment

The Full Text for all S, P-Phrases is displayed in Section 15.



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SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Name	EC-No	CAS-No	Content,%	Classification67/548/EEC and EU CLP 2008
2-methylbutane	201-142-8	78-78-49	97.5-99.8	F+:R12; Xn: R65/66/67; N: R51/53 H224; H304; H336; H411
pentane	203-692-4	109-66-0	0.2-2.5	F+:R12; Xn: R65/66/67; N:R51/53 H224; H304; H336; H411

Specific Conc. Limits (CLP): none

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.

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 if irritation develops.

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.



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UNUSUAL FIRE & 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.

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.

ENVIRONMENTAL PRECAUTIONS:

Take precautionary measures against discharges into the environment.

SPILL CLEAN UP METHODS:

Keep sparks, flames and other sources of ignition away. Wear personal protection (see section 8). Provide ventilation. Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. A vapour suppressing foam may be used to reduce vapours.

SECTION 7. HANDLING AND STORAGE

USAGE PRECAUTION:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapour), and can be dangerous. Take precautionary measures against static discharges. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty or full containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapour or mist.

STORAGE PRECAUTIONS:

Store in a cool, dry, well ventilated location in a tightly sealed container. Keep away from incompatible materials, ignition sources, heat, sparks and flames. Secure and label flammables area. Protect containers from physical damage. All equipment must be grounded.

DO NOT CUT, DRILL, GRIND, WELD OR PERFORM SIMILAR OPERATIONS ON OR NEAR CONTAINERS EVEN WHEN EMPTY.

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

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

DN(M)ELs for workers

Exposure pattern	Route	Descriptor	DNEL / DMEL *	(Corrected) Dose descriptor *)
Chronic - 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 ³	NOAEC: 9,000 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		

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

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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 ³	NOAEC: 3,215 mg/m ³ (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
Fresh Water	2,6E-06	mg/L
Fresh Water Sediment	3,6E-06	mg/kgw
Marine Water	5,5E-09	mg/L
Marine Sediment	6,7E-09	mg/kgw
Natural Soil	1,6E-08	mg/kgw

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Air	9,2E-05	mg/m ³
Agricultural Soil	3,5E-08	mg/kgw
Drinking Water	1,3E-06	mg/L

EXPOSURE LIMITS

NIOSH none listed
OSHA none listed
ACGIH 600 ppm TWA

PROTECTIVE EQUIPMENT

Protective gloves, safety goggles and protective clothing.

RESPIRATORY EQUIPMENT

Wear positive pressure self-contained breathing apparatus.

HAND PROTECTION

Wear appropriate protective gloves to prevent skin exposure.

EYE PROTECTION

Wear approved safety goggles.

HYGIENE MEASURES

Wash at the end of each work shift and before eating, drinking, smoking or using the toilet.

SKIN PROTECTION

Wear protective clothing.

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
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 for 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-

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	pentane, based on Wilhelmy plate methodology.
Water solubility	The water solubility is 38.5 mg/l at 20°C for n-pentane
Partition coefficient n-octanol/water (log value)	Log Kow (Pow): 3 at 20 °C
Flash point	The flash point is <-20°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°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.
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.

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SECTION 10. STABILITY AND REACTIVITY

STABILITY:

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

MATERIALS TO AVOID:

Strong oxidizing agents.

CONDITIONS TO AVOID:

Ignition sources, excess heat.

HAZARDOUS DECOMPOSITION PRODUCTS:

(CO)x: carbon monoxide, carbon dioxide

SECTION 11. TOXICOLOGICAL INFORMATION

Property	Relevance to Category	Value	Remarks
Skin irritation or skin corrosion	No	not irritating	Based on key study test data and Read across from n-pentane was used for this endpoint.
Eye irritation	No	not irritant	
Skin sensitisation	No	not sensitising	
Mutagenicity:			
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.
Human information		No additional information	
Acute toxicity			
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.	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 ² /sec at 20° C (this value is representative of pentanes as a category).

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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.
Repeated dose toxicity			
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) / overall effects	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 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.			

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Reproductive toxicity			
Effects on fertility	No	<p>Reproductive toxicity data were not available for 2-methylbutane.</p> <p>Based on Read across from cyclohexane was used for this endpoint.</p>	<p>One read-across two-generation reproductive toxicity study (OECD 416) on cyclohexane was identified.</p> <p>The reported NOAEC was 2000 ppm (6880 mg/m³) for reproductive toxicity</p>
Developmental toxicity	No	<p>Developmental toxicity data were not available for 2-methylbutane</p> <p>Based on Read across from n-pentane and cyclohexane was used for this endpoint.</p>	<p>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/m³) 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).</p>
<p>Toxicokinetics (based on key study test data and Read across from n-pentane):</p> <p>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.</p> <p>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.</p> <p>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).</p>			
Carcinogenicity			
Carcinogenicity study	No	Not applicable	<p>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.</p>

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 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
Aquatic invertebrates:		
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
Algae and aquatic plants:		
<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.: EC 50 growth rate = 10.7 mg/l, and NOEC growth rate = 2.04 mg/L.
Sediment organisms: 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		

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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:

Abiotic hydrolysis	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
Phototransformation in air	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.

Phototransformation in soil 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.

BIODEGRADATION:

readily biodegradable

Biodegradation in water: readily biodegradable

71.43% degradation of 2-methylbutane 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
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		readily biodegradable
Degradation rates:		
Degradation rate in water:	$K_{deg_{water}}: 4.7E-2 \text{ d}^{-1}$ (half-life = 15 days)	
Degradation rate in sediment:	$K_{deg_{sed}}: 0.00231 \text{ d}^{-1}$ (half-life = 300 days)	
Degradation rate in soil:	$K_{deg_{soil}}: 0.0231 \text{ d}^{-1}$ (half-life = 30 days)	
Degradation rate in air:	$K_{air} : 7.38E-13 \text{ cm}^3 \text{ molecule}^{-1}\text{sec}^{-1}$ (half-life = 2.3 days)	
Fate and behaviour in the Environment:		
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
BIOACCUMULATION:		
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		
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.
PBT/vPvB Properties	2-methylbutane, 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 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.	

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Criterion	PBT criteria	vPvB criteria
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
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

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

SECTION 13. DISPOSAL CONSIDERATIONS

GENERAL INFORMATION

Place into a suitable closed container for disposal.

DISPOSAL METHODS

Dispose of in accordance with local and national regulations. DO NOT CUT, DRILL, GRIND, WELD OR PERFORM SIMILAR OPERATIONS ON OR NEAR CONTAINERS EVEN WHEN EMPTY.

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).

	UN	ADR	RID	IMDG	ICAO
UN number	1265	1265	1265	1265	1265
Class	3	3	3	3	3
Packing group	I	I	I	I	I
Transport category		1	1		
Hazard label		3	3		

SECTION 15. REGULATORY INFORMATION

Chemical Safety Report has been developed for 2-methylbutane.

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

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

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)

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.

EU DIRECTIVES

System of specific information relating to Dangerous Preparations. 2001/58/EC. Dangerous Preparations Directive 1999/45/EC.



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

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

ISSUED BY HS&E Manager

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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 1
Relevant identified uses of the substance

Uses by workers in industrial settings

Identified Use (IU) name	Substance supplied to that use	Use descriptors
Manufacture of substance	as such (substance itself)	<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: 3</p> <p>Subsequent service life relevant for that use?: no</p>
Distribution of substance	as such (substance itself)	<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</p>

	<p>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 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: 3 SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals Subsequent service life relevant for that use?: no</p>
Formulation	<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 0: Other: SU 3 Subsequent service life relevant for that use?: no</p>
Uses in Coatings	<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</p>

	<p>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 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 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 in Cleaning Agents	<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>
Use as a blowing agent	<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 facilities PROC 9: Transfer of substance or preparation into small containers</p>

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		<p>(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 functional fluid		<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 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>
Uses in Laboratories		<p>Process category (PROC): PROC 10: Roller application or brushing PROC 15: Use as laboratory reagent 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 Subsequent service life relevant for that use?: no</p>

Uses by professional workers

Identified Use (IU) name	Substance supplied to that use	Use descriptors
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</p>

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

Uses by consumers

Identified Use (IU) name	Use descriptors
Use as a fuel	<p>Chemical product category (PC): PC 13: Fuels</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>
Other consumer uses	<p>Chemical product category (PC): PC 28: Perfumes, fragrances PC 39: Cosmetics, personal care products</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>

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