



VERSION: 2.2
DATE CREATED: 01/10/2014

URALORGSINTEZ JSC

MATERIAL SAFETY DATA SHEET

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

BUTANE

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

1.1. Product identifier

Name of Substance: Butane
Synonyms: n-butane, methylethyl methane
Index No (CLP) 601-004-00-0
CAS #: 106-97-8
EC #: 203-448-7
Registration #: 01-2119474691-32-0008

1.2. Relevant identified uses of the substance

Most common technical function of substance:
Fuels and fuel additives
Intermediates
For the detailed identified uses of the product see Annex 1.

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

Only representative

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

Suppliers

Company name: Uralorgsintez JSC
Address: 617761, Chaykovsky, Perm Region, Russian Federation
Emergency phone: +7 34241 7-15-39; 7 00 to 16 00, GMT+3
Contact phone: +7 34241 7-16-89, 7-15-27
Fax: +7 34241 7-15-75
Email Address: UOS@UOS.ru

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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

n-butane

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;

Health Hazards:

Not classified

Environmental hazards:

Not classified

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

Physical/Chemical Hazards:

H220 Extremely flammable gas

H280 Liquefied gas; contains gas under pressure; may explode if heated

Health Hazards:

Not classified

Environmental hazards:

Not classified

2.2 LABELLING

2.2.1 EU LABELLING:

Indication of danger: Extremely Flammable



Symbol: F+

2.2.2 CLP LABELLING:

Signal word: Danger

Hazard pictogram:

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GHS02: flame



GHS04: gas cylinder

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

Hazard statement

H220 Extremely flammable gas

H280 Liquefied gas; contains gas under pressure; may explode if heated

2.3.2 Safety phrases and Precautionary statements:

Safety 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

S33 – Take precautionary measures against static discharges

Precautionary statements:

P102 Keep out of reach of children

P210 Keep away from heat/sparks/open flames/.../hot surfaces. ... No smoking

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely

P381 Eliminate all ignition sources if safe to do so

P243 Take precautionary measures against static discharge.

P410+P403 Protect from sunlight. Store in a well-ventilated place

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.



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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)
butane <i>Index No(CLP):</i> <i>601-004-00-0</i>	203-448-7	106-97-8	98.6-99.5	F+: R12 H220, H280

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.

SECTION 4. FIRST-AID MEASURES

4.1 Product-specific hazards:

Extremely flammable liquefied gas.
An asphyxiant at high concentrations – oxygen depletion can be fatal.
Contact with the liquid may result in frostbite.

4.2 Description of first aid measures

General Advice:

Warning before intervention:

Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply.

Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces.

Take care to self-protect by avoiding becoming contaminated – use approved positive pressure air supplied breathing apparatus with a full facepiece.

Move contaminated patient(s) out of the dangerous area.

Seek medical assistance - show the material safety data sheet or label if possible.

Inhalation:

Symptom(s): Exposure to high concentrations may cause asphyxiation.

Move to fresh air.

Do not leave the victim unattended.

Keep patient warm and at rest. If unconscious place in recovery position.

Seek immediate medical attention.

If breathing is difficult, give oxygen if possible, or assisted ventilation.

In the event of cardiac arrest, (no pulse), apply cardiopulmonary resuscitation.

Skin contact:

Symptom(s): Contact with product in liquid form may cause frostbite.

Do not remove clothing that adheres due to freezing.

Immediately flush affected area with plenty of water – continue for at least 15 minutes.



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If there are signs of frostbite, (blanching or redness of skin or burning or tingling sensation), do not rub, massage or compress the affected area. Send the casualty immediately to hospital

Eye contact:

Symptom(s): Contact with product in liquid form may cause frostbite.

Remove any contact lenses.

Flush eyes with water thoroughly and continuously for at least 15 minutes.

Keep eye wide open while rinsing.

If there are signs of frostbite, pain, swelling, lachrimation or photophobia persists, the patient should be seen in a specialist health care facility.

Ingestion:

Is not considered a likely route of exposure – frostbite to the lips and mouth may occur if in contact with the liquid.

4.3 Note to physician:

A simple asphyxiant gas at normal temperatures and pressures – there is no specific antidote.

In the event of contact with product in liquid form treat for frostbite.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 General information:

Where possible stop the flow of gas.

If the flow cannot be stopped allow the fire to burn out, whilst cooling containers and surroundings with a water spray.

5.2 Suitable Extinguishing media:

Large Fire: Use water spray, water fog or foam.

Small Fire: Dry powder or carbon dioxide (CO₂) extinguisher, dry sand or fire fighting foam.

5.3 Unsuitable Extinguishing Media:

Do NOT use water jet.

Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.4 Combustion products:

Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).

5.5 Specific hazards during fire fighting:

Vapour is denser than air – flashback may be possible over considerable distances.

Cylinders or other containment vessels may explode under fire conditions - use water spray to cool unopened containers.

Do not allow run-off from fire fighting to enter drains or water courses – may cause explosion hazard in drains and may reignite.

5.6 Protective measures in fire:

Special protective equipment for fire-fighters:

Wear an approved positive pressure self-contained breathing apparatus in addition to standard fire fighting gear.



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SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 General information:

Spillages of material generate large volumes of extremely flammable gas which is heavier than air and will accumulate in low areas or confined spaces.

Stop leak if safe to do so. Avoid direct contact with released material and breathing vapours. Stay upwind.

Keep non-involved personnel away from the area of spillage. Alert emergency personnel.

Enter area only if strictly necessary. A combustible gas detector can be used to check for flammable gas or vapours.

Eliminate all ignition sources if safe to do so (e.g. electricity, sparks, fires, flares, etc.).

If required, notify relevant authorities according to applicable regulations.

6.2 Methods and material for containment and cleaning up:

Contain spillage – ventilate area and allow to evaporate.

Spillages of liquid product will create a fire hazard and form an explosive atmosphere.

Ensure all equipment is non-sparking or electrically bonded.

Dispose of wastes safely.

6.3 Personal precautions:

Wear personal protective equipment, including self contained breathing apparatus, unless the atmosphere is proved to be safe.

6.4 Environmental precautions:

Land spillage:

Prevent further leakage or spillage if safe to do so.

Prevent spillage from entering drains or any place where accumulation may occur.

Ensure adequate ventilation, especially in confined areas.

Spillages in water or at sea:

Prevent further leakage or spillage if safe to do so.

Spillages of liquid product in the water will likely result in a quick and complete vaporization of the product. Isolate the area and prevent fire/explosion hazard for ships and other structures, taking into account wind direction and speed, until the material is completely dispersed.

If the spillage contaminates rivers, lakes or drains inform respective authorities.

6.5 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 General information:

Obtain special instructions before use.

Risk of explosive mixtures of vapour and air.



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7.2 Handling:

Consider technical advances and process upgrades (including automation) for the elimination of releases.

Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation.

Drain down systems and clear transfer lines prior to breaking containment.

Clean/flush equipment, where possible, prior to maintenance.

Consider the need for risk based health surveillance.

Ensure safe systems of work or equivalent arrangements are in place to manage risks.

Regularly inspect, test and maintain all control measures.

Smoking, eating and drinking should be prohibited.

Use only in well ventilated areas.

Avoid all sources of ignition, oxidising agents, chlorine and hydrogen chloride or hydrogen fluoride.

Take precautionary measures against static discharges, use proper bonding and/or grounding procedures.

Use piping and equipment designed to withstand the pressures to be encountered.

Use a check valve or other protective device to prevent reverse flow.

Cleaning, inspection and maintenance of the internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations.

Handle empty containers with care; vapour residue may be flammable.

Do not pressurise, cut, weld, braze, solder, drill, or grind on containers.

Dispose of rinse water in accordance with local and national regulations.

The vapour is heavier than air, beware of accumulation in pits and confined spaces.

Ensure that all relevant regulations regarding explosive atmospheres, and handling and storage facilities of flammable products are followed.

7.3 Storage:

To store only in supplied cylinders or approved vessels.

No smoking.

Store in a designated cool and well-ventilated place.

Cylinders should be secured vertical - and only transported in a secure position in a well ventilated vehicle or hand truck.

Cylinders which have been are opened must be carefully resealed and kept upright.

For maintenance work or conservation, emptied tanks should be purged, and blanketed with inert gas (i.e. nitrogen).

SECTION 8. EXPOSURE CONTROL/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

For n-butane (EC#203-448-7; CAS #106-97-8): International Limit Values¹⁾

SUBSTANCE n-butane CAS #106-97-8	LTEL 8 hr TWA ppm	LTEL 8 hr TWA mg/m ³	STEL ppm	STEL mg/m ³	Note
Austria	800	1600	1600	3800	

Belgium	800	1928	750	2250	
Denmark	500	1200	1000	2400	
European Union	-	-	-	-	
France	800	1900			
Germany (AGS)	1000	2400	4000 ⁽¹⁾	9600 ⁽¹⁾	(1) 15 minutes average value
Germany (DFG)	1000	2400	4000	9600	STV 15 minutes average value
Hungary		2350		9400	
Italy	-	-	-	-	
Latvia		300			
Poland		1900		3000	
Spain	800	1935			
Switzerland	800	1900			
USA - NIOSH	800	1900			
USA - OSHA	-	-	-	-	
United Kingdom	600	1450	750	1810	
¹⁾ GESTIS International Limit values: http://bgia-online.hvbg.de/LIMITVALUE/WebForm_ueliste.aspx					

8.1.2 DNEL/ PNEC values DN(M)ELs for workers

DN(M)ELs for workers Exposure pattern	Route	Descriptor	DNEL/DM EL	Corrected Dose descriptor	Most sensitive endpoint	Justification
Acute - systemic effects	Dermal	No data available: testing technically not feasible	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature.
Acute - systemic effects	Inhalation	No-threshold effect and/or no dose-response information available	NA	NA	NA	A DNEL cannot be derived for this endpoint as no LOAEL or NOAEL can be determined due to absence of adverse effects relevant to humans.
Acute - local effects	Dermal	No data available: testing technically not feasible	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room

						temperature.
Acute - local effects	Inhalation	No-threshold effect and/or no dose-response information available	NA	NA	NA	A DNEL cannot be derived for this endpoint as no LOAEL or NOAEL can be determined due to absence of adverse effects relevant to humans.
Long-term - systemic effects	Dermal	No data available: testing technically not feasible	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature.
Long-term - systemic effects	Inhalation	No-threshold effect and/or no dose-response information available	NA	NA	NA	A DNEL cannot be derived for this endpoint as no LOAEL or NOAEL can be determined due to absence of adverse effects relevant to humans
Long-term - local effects	Dermal	No data available: testing technically not feasible	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature.

DN(M)ELs for the general population

Exposure pattern	Route	Descriptor	DNEL/ DMEL	Corrected Dose descriptor	Most sensitive endpoint	Justification
Acute - systemic effects	Dermal	No data available: testing technically not feasible	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature.
Acute - systemic effects	Inhalation	No-threshold effect and/or no dose-response information available	NA	NA	NA	A DNEL cannot be derived for this endpoint as no LOAEL or NOAEL can be determined due to absence of adverse effects relevant to humans
Acute - systemic effects	Oral	No data available: testing technically not feasible	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature.
Acute - local effects	Dermal	No data available: testing technically not	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum

		feasible				Gases are flammable gases at room temperature.
Acute - local effects	Inhalation	No-threshold effect and/or no dose-response information available	NA	NA	NA	A DNEL cannot be derived for this endpoint as no LOAEL or NOAEL can be determined due to absence of adverse effects relevant to humans
Long-term - systemic effects	Dermal	No data available: testing technically not feasible	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature.
Long-term - systemic effects	Inhalation	No-threshold effect and/or no dose-response information available	NA	NA	NA	A DNEL cannot be derived for this endpoint as no LOAEL or NOAEL can be determined due to absence of adverse effects relevant to humans
Long-term - systemic effects	Oral	No data available: testing technically not	NA	NA	NA	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as

PNEC water

PNEC	Assessment factor	Remarks/Justification
Not applicable	Not applicable	Substance is a gas and is extremely unlikely to reside in the aquatic compartment. Deriving an aquatic PNEC for a gas is unreasonable and technically of little use for risk assessment as the substance will not be present in the aquatic environment

PNEC sediment

PNEC	Assessment factor	Remarks/Justification
Not applicable	Not applicable	Substance is a gas and is extremely unlikely to reside in the sediment compartment. Deriving an sediment PNEC for a gas is unreasonable and technically of little use for risk assessment as the substance will not be present in the sediment environment.

PNEC soil

PNEC	Assessment factor	Remarks/Justification
Not applicable	Not applicable	Substance is a gas and is extremely unlikely to reside in the soil compartment. Deriving an soil PNEC for a gas is unreasonable and technically of little use for risk assessment as the substance will not be present in the soil environment

PNEC sewage treatment plant

PNEC	Assessment factor	Remarks/Justification
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PNEC	Assessment factor	Remarks/Justification
Not applicable	Not applicable	The Petroleum gases are extremely unlikely to reside in the aquatic compartment. Deriving an aquatic PNEC for a gas is unreasonable and technically of little use for risk assessment as the substance will not be present in the aquatic environment

8.2 Exposure Controls

8.2.1 Appropriate engineering controls:

The substance is not classified for human health or for the environment, and is not PBT or vPvB so that no exposure assessment or risk characterisation is required. For tasks where the intervention of workers is required, the substance must be handled in accordance with good industrial hygiene and safety procedures.

The substance is classified as extremely flammable and therefore the following conditions must be met to ensure safe use: "Risks are controlled by storage and use under conditions which avoid all ignition sources."

8.2.2 Personal protection:

Respiratory protection:

Wear positive pressure self-contained breathing apparatus.

Hand protection:

Wear appropriate protective gloves to prevent skin exposure.

Eye protection:

Wear approved safety goggles.

Skin and Body Protection:

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

Wear protective clothing.

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.

8.2.3 Environmental exposure control measures:

No specific RMM are required beyond good industrial hygiene and safety procedures.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Results
Physical state at 20°C and 1013 hPa	Form: gaseous Colour: colourless Odour: odourless

Melting / freezing point	The melting point is (-138)°C (based on data from the CRC handbook, 2008)
Boiling point	The boiling point is (- 0.5)°C (based on data from the CRC handbook, 2008).
Absolute density	0.589 g/cm ³ at 25°C (based on data from the CRC handbook, 2008).
Vapour pressure	Not applicable In accordance with section 2 of REACH Annex XI and Chapter R7a: endpoint specific guidance, the vapour pressure study does not need to be conducted as the members of the category have boiling points of less than 30°C, and therefore will have a vapour pressure above the limit of measurement (10 ⁵ Pa).
Surface tension	Not applicable In accordance with Column 2 of REACH Annex VII, this study need only be conducted if surface activity is a desired property of the material
Water solubility	60.4 mg/l (based on data from the CRC handbook, 2008).
Partition coefficient n-octanol/water (log value)	log Kow = 2.8 Data were available for methane, ethane and isobutane from the CRC handbook (2008) which is considered reliable for use. The QSAR KOWWIN was used to calculate the log Kow for butane and propane.
Flash point	The flash point is < 60°C
Flammability	extremely flammable The maximum lower and upper explosion limits ranged from 5-15 %. Measured data were available for the members of the Petroleum gases from a peer reviewed handbook data (CRC 2008).
Self-ignition temperature	372°C. The data was obtained from peer reviewed handbooks (CRC 2008) which is considered reliable for assessment.
Viscosity	Not applicable. At normal ambient temperature and pressure these substances exist in the form of a gas. Hence, liquid viscosity values are not considered relevant.
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 members of the category do not contain any functional groups that dissociate and therefore testing does not appear scientifically necessary.
Explosive properties	Not applicable. In accordance with column 2 of REACH Annex VII, the explosive properties study does not need to be conducted as there are no chemical groups associated with explosive properties present in the structures of the Petroleum gases.
Oxidising properties	Not applicable. In accordance with column 2 of REACH Annex VII, this study does not need to be conducted as the members of the Petroleum gases are incapable of reacting exothermically with combustible materials, based on their chemical structures.



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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 does not need to be conducted as the stability of the Petroleum gases 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 members of the category do not contain any functional groups that dissociate and therefore testing does not appear scientifically necessary
Granulometry	Not applicable. In accordance with column 2 of REACH Annex VII the granulometry study does not need to be conducted as the Petroleum gases are not marketed or used in a non-solid or granular form. The members of the category are gases and so this endpoint is not relevant

SECTION 10. STABILITY AND REACTIVITY

10.1 Chemical stability:

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

10.2 Reactivity:

Oxidizes, halogenates.

10.3 Materials to avoid:

Strong oxidizing agents.

10.4 Conditions to avoid:

Ignition sources, excess heat.

10.5 Hazardous decomposition products:

(CO)_x: carbon monoxide, carbon dioxide.

10.6 Hazardous polymerization:

Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

Property	Value	Remarks
Skin irritation or corrosion	Not irritating	No guideline studies available Direct skin contact with liquid forms of butane may cause burns and frostbite due to the extreme cold of the liquid (rapid evaporation lowers the skin temperature causing frost injuries) (Cavender 1994).
Eye irritation	Not irritating	No guideline studies available Not relevant - gas at room temperature Direct mucous membrane contact with liquid forms of C1- C4 alkane gases may cause burns and frostbite due to the extreme cold of the liquid (Cavender 1994).
Respiratory tract	Not irritating	No data exist for the C1-C4 alkanes. There are no indications of

		irritation from repeat dose inhalation studies.
<p>Members of Petroleum Gases category are flammable gases at room temperature. Therefore, in accordance with section 2 of REACH Annex XI, neither skin nor eye irritation studies need be conducted. There are no indications that main constituents of the Petroleum Gases are skin or eye irritants. Direct skin or mucous membrane contact with liquid forms of C1- C4 alkane gases may cause burns and frostbite due to the extreme cold of the liquid.</p>		
Corrosivity	Not corrosive	No guideline studies available Direct skin contact with liquid forms of butane may cause burns and frostbite due to the extreme cold of the liquid.
Skin sensitisation	Not sensitising	In accordance with Section 2 of REACH Annex XI, studies on skin sensitisation do not need to be conducted as members of the Petroleum Gases category are flammable gases at room temperature. No studies have been conducted on skin sensitisation and there are no indications from repeat dose studies or the published literature that any of the gases cause skin sensitisation.
Respiratory sensitisation	Not sensitising	No respiratory sensitisation studies have been conducted on members of the Petroleum Gases category and there are no indications from other studies to suggest they cause respiratory sensitisation. Furthermore, there is a long history of the commercial use of Petroleum Gases and there are no reports from the available literature of respiratory sensitisation.
Carcinogenicity	low potential for carcinogenicity	Members of Petroleum Gases have a low potential for carcinogenicity and therefore do not warrant classification under Dir 67/548/EEC or GHS/CLP. No specific carcinogenicity data are available on the Petroleum Gases, however, their simple chemical structures with no reactive groups and no structural alerts for likely genotoxic carcinogenic activity, together with the conclusion that C1-C4 alkanes are not genotoxic, provide a strong case for concluding that none will show any significant carcinogenic activity
Toxicity for reproduction	<p>Reproductive toxicity data are available for the C2-C4 alkanes. Members of the Petroleum Gases category are flammable gases at room temperature and therefore exposure via the dermal or oral routes is unlikely and the requirement to test is waived in accordance with REACH Annex XI.</p>	
Mutagenicity	<p>Mutagenicity data exist for the Petroleum Gases category. A review of an extensive database indicates they are not genotoxic. There is no evidence that members of Petroleum Gases are genotoxic therefore no classification is warranted under Dir 67/548/EEC or GHS/CLP.</p>	
In vitro studies	Negative with metabolic activation	<p>key study National Toxicology Program (NTP) (2005) OECD Guideline 471 (Bacterial Reverse Mutation Assay) In accordance with section 1 of REACH Annex XI, testing does not appear to be scientifically necessary since negative genotoxicity data (across endpoints of bacterial gene mutation, in vitro clastogenicity and in vivo) and consideration of their simple chemical structures provide sufficient weight of evidence to conclude C1-C4 alkanes are unlikely to show any genotoxic activity.</p>
In vivo studies	Genotoxicity: negative (male/female)	<p>key study OECD Guideline 474 (Mammalian Erythrocyte Micronucleus Test) EPA OPPTS 870.5395 (In Vivo Mammalian Cytogenetics Tests:</p>

		Erythrocyte Micronucleus Assay) Huntingdon Life Sciences (HLS) (2009b)
Acute toxicity	Members of the Petroleum Gases category are flammable gases at room temperature and therefore the requirement for data on acute oral and dermal toxicity is waived in accordance with REACH Annex XI. Across species, the gases in this category show low acute inhalation toxicity. Indeed they are practically nontoxic for single exposures below their lower flammability limit, most of which range between 1.8-3.2%, circa 39,000 – 43,000 mg/m ³ .	
By oral route	Not relevant - gas at room temperature.	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature and capable of forming explosive mixtures with air. A high fire and explosion hazard would be associated with any testing at meaningful concentrations.
By inhalation	Low acute toxicity	Cavender (1994) confirmed that butane has low toxicity for single exposures below the lower flammability limit. Serious toxicity includes anaesthesia, CNS depression and cardiac sensitisation, all rapidly reversible if exposure ceases.
By dermal route	Not relevant - gas at room temperature.	In accordance with section 2 of REACH Annex XI, the study does not need to be conducted as Petroleum Gases are flammable gases at room temperature and capable of forming explosive mixtures with air. A high fire and explosion hazard would be associated with any testing at meaningful concentrations.
Repeated dose toxicity	Low sub-chronic toxicity by inhalation.	study technically not feasible Petroleum Gases are flammable gases at room temperature and therefore exposure via the dermal or oral routes is unlikely and the requirement to test is waived in accordance with REACH Annex XI. Members of the Petroleum Gases category show low sub-chronic toxicity by the inhalation route of exposure, the most relevant route. No significant exposure-related toxicological effects or target organ toxicity have been observed in inhalation studies up to 90 days duration for the C2-C4 alkanes, as well as Liquefied Petroleum Gas, the composition of which is mainly propane and propene.

SECTION 12. ECOLOGICAL INFORMATION

Property	Value	Remarks
AQUATIC TOXICITY		
Fish:		
<p>Short-term toxicity: No experimental data were available on the short-term toxic effects of category members on fish. Due to the difficulty associated with aquatic toxicity testing with gases, QSAR calculations are considered suitable to estimate the effect concentration. QSAR calculations were conducted for substances which are representative of the carbon numbers of the members of the category (methane, ethane, butane, isobutane and propane). The LC50 (96 hours) for fish is estimated to range from 24.11 to 147.54 mg.</p> <p>However, due to the volatility of the petroleum gases, the calculated effect concentrations are not relevant in practice, but are used as an indication of potential toxicity.</p> <p>Long-term toxicity: No experimental data were available on the short-term toxic effects of category members on aquatic invertebrates. Due to the difficulty associated with aquatic toxicity testing with gases, QSAR calculations are considered suitable to estimate the effect concentration. QSAR calculations were conducted for category members (methane, ethane, butane, isobutane and propane). The LC50 (96 hours) for invertebrates is estimated to range from 14.22 to 69.43 mg. l-lin fresh water.</p>		
Short-term toxicity testing on fish freshwater	LC50 (96h) = 24.11 mg/l	Based on key study. QSAR modelled data US Environmental Protection Agency's Office of Pollution Prevention (2008)



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Long-term toxicity to fish (<i>Oncorhynchus mykiss</i>)	LC50 (48 h): 14.22 mg/L test mat. (estimated)	Based on key study. QSAR modelled data US Environmental Protection Agency's Office of Pollution Prevention (2008)
<p>Aquatic invertebrates: Short-term toxicity: No experimental data were available on the short-term toxic effects of category members on aquatic invertebrates. Due to the difficulty associated with aquatic toxicity testing with gases, QSAR calculations are considered suitable to estimate the effect concentration. QSAR calculations were conducted for category members (methane, ethane, butane, isobutane and propane). The LC50 (96 hours) for invertebrates is estimated to range from 14.22 to 69.43 mg. l-1 in fresh water. Long-term toxicity: In accordance with column 2 of REACH Annex IX, the long term testing on invertebrates 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 on aquatic organisms.</p>		
Short-term toxicity to aquatic invertebrates (<i>Daphnids</i>)	LC50 (48 h): 14.22 mg/L test mat. (estimated)	Based on key study QSAR modelled data Calculation using ECOSAR Program v1.00. US Environmental Protection Agency's Office of Pollution Prevention (2008)
<p>Algae and aquatic plants: No experimental data were available on the toxic effects of category members on aquatic algae and cyanobacteria. Due to the difficulty associated with aquatic toxicity testing with gases, QSAR calculations are considered suitable to estimate the effect concentration. QSAR calculations were conducted for substances which were representative of the carbon numbers of the members of the category (methane, ethane, propane, butane, isobutane and propane) The EC50 for toxicity to aquatic algae is estimated to range from 7.71 to 16.5 mg. l-1 in fresh water.</p>		
<i>Green algae</i>	EC50 (96 h): 7.71 mg/L test mat. (estimated)	Based on key study QSAR modelled data Calculation using ECOSAR Program v1.00. US Environmental Protection Agency's Office of Pollution Prevention (2008)
<p>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.</p>		
<p>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 direct and indirect exposure of the soil compartment is unlikely.</p>		
<p>Toxicity to soil micro-organisms: Not applicable In accordance with column 2 of REACH Annex IX, the effects on soil microorganisms study does not need to be conducted as direct and indirect exposure of the soil compartment is unlikely.</p>		
<p>Toxicity to terrestrial plants: Not applicable In accordance with column 2 of REACH Annex X, the long term toxicity testing on plants study does not need to be conducted as direct and indirect exposure of the soil compartment is unlikely.</p>		
DEGRADATION		
Abiotic degradation:	Not applicable	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 members of the Petroleum gases are not expected to undergo hydrolysis in the environment due to a lack of hydrolyzable functional groups and therefore testing does not appear scientifically necessary.
Biodegradation:		
Biodegradation in water	Readily biodegradable % Degradation of test substance:	Calculated (Q)SAR BioHCwin v1.01 in EPISuite 4 (2009). BioHCwin is a predictive model for determining



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	50 after 3.46 d (quantitative primary biodegradation half-lives for individual petroleum hydrocarbons. Howard, P.H., W.M., Meylan, (2005)
Biodegradation in soil:	In accordance with Column 1 of REACH Annex IX, this study does not need to be conducted as the Petroleum gases have a low potential for adsorption to soil, and therefore testing is technically unjustified. In addition, in accordance with column 2 of REACH Annex IX, the soil simulation testing does not need to be conducted as the chemical safety assessment according to Annex I has not indicated a need to investigate further the degradation of the substance in soil.	
Degradation rates: Degradation rate in water: $K_{sw} = 0.047 \text{ d}^{-1}$ Degradation rate in sediment: $K_{sed} = 0.0023 \text{ d}^{-1}$ Degradation rate in soil: $K_{soil} = 0.023 \text{ d}^{-1}$ Degradation rate in air: not a REACH required endpoint	The Petroleum gases have been shown to be readily biodegradable and to degrade by indirect photolysis in air. Based on this, degradation rate constants for the Petroleum gases are presented in the table below, following the guidance given in R.16.4 (ECHA, 2010)	
ADSORPTION/DESORPTION: Not applicable In accordance with column 2 of REACH Annex VIII, this study does not need to be conducted as, based on their physicochemical properties, the Petroleum gases can be expected to have a low potential for adsorption ($\log K_{ow} < 3$).		
BIOACCUMULATION: In accordance with column 2 of REACH Annex IX, this study need not be conducted as the Petroleum gases have a low potential for bioaccumulation ($\log K_{ow} \leq 3$).		
PBT/vPvB Properties	n-butane is not found to meet the PBT / vPvB criteria	
Other adverse effects:	none	

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 General information:

It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.

13.2 Disposal recommendations:

Dispose of in accordance with local and national regulations.

Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.

The competence of the collector or contractor should be established beforehand. Do not dispose into the environment, in drains or in water courses. Given the nature and uses of this product, the need for disposal seldom arises.

If necessary, dispose by controlled combustion in purpose-designed equipment. 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

Do not cut, drill, grind, weld or perform similar operations on or near containers even when empty.

13.3 Disposal of contaminated packaging:

Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard. Do not pollute the soil, water or environment with the waste container. Return part-used or empty cylinders to the supplier. For tanks seek specialist advice from



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suppliers. Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

13.4 Local Legislation:

Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

EU Waste Disposal Code (EWC): 16 05 04 gases in pressure containers (including halons) containing dangerous substances.

13.5 Precautions required if material is released or spilled:

Evacuate area of all unnecessary personnel. Shut off source, if possible. Protect from ignition. Ventilate area thoroughly.

SECTION 14. TRANSPORT INFORMATION

Land transport:

ADR/ RID

UN number: 1011
UN Proper shipping name: BUTANE
Chemical name: BUTANE
Transport hazard class(es): 2
Classification Code: 2F
Labels: 2.1 Flammable gas
Packing group: Not applicable

Inland waterway transport (AND):

UN number: 1011
UN Proper shipping name: BUTANE
Chemical name: BUTANE
Transport hazard class(es): 2
Classification Code: 2F
Labels: 2.1 Flammable gas
Packing group: Not applicable

Marine transport (IMDG):

UN number: 1011
UN Proper shipping name: BUTANE
Chemical name: BUTANE
Transport hazard class(es): 2.1
Packing group: Not applicable
EmS number: F-D, S-U
Labels: 2.1 Flammable gas
Marine pollutant: No

Air transport (IATA/ICAO):

UN number: 1011
UN Proper shipping name: BUTANE
Chemical name: BUTANE
Classification Code: 2.1
Labels: 2.1 Flammable gas



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Packing group Class 2 - Gases: Flammable

Maximum Quantity for Passenger: Forbidden
Maximum Quantity for Cargo Only: 150 kg

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 n-butane.

Exposure scenarios was not performed in the CSR

15.3 Key literature references and sources

Documents, provided by consortium "Butane" (LOA-consortium): chemical safety report (CAS 106-97-8)

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).

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Major Accident Hazard Legislation 82/501/EWG.

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: 2.0	25/10/2010	All	Version was created after registration. Sections 1÷16 were fully updated
Version: 2.1	07/02/2011	All	Section 8 was updated
Version: 2.2	01/10/2014	All	Sections 2÷16 were fully reconfigured, new information was added.

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 _{oc}	Adsorption coefficient
K _{ow}	octanol-water partition coefficient
LC50	Lethal Concentration to 50 % of a test population
LD50	Lethal Dose to 50% of a test population (Median Lethal Dose)
LOAEC	Lowest Observable Adverse Effect Concentration
LTEL	Long Term Exposure Limit
MFSU	Manufacture Formulation Supply and Use
NIOSH	National Institute for Occupational Safety and Health (USA CDC)
NOEC	No Observed Effect Concentration
NOAEL	No Observed Adverse Effect Level
OECD	Organization for Economic Co-operation and Development
OSHA	Occupational Safety & Health Administration (USA)
PEC	Predicted No Effect Concentration
PNEC	Predicted No Effect Concentration
PBT	Persistent, bioaccumulative, toxic chemical
vPvB	Very Persistent, Very Bioaccumulative

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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 Liquefied gas; contains gas under pressure; may explode if heated

Annex I
Relevant identified uses of the substance
Uses by workers in industrial settings

Identified Use (IU) name	Use descriptors
Manufacture of substance	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 15: Use as laboratory reagent Environmental release category (ERC): ERC 1: Manufacture of substance ERC 6a: Industrial use resulting in manufacture of another substance (intermediate) Sector of end use (SU): SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals Subsequent service life relevant for that use?: yes</p>
Distribution of substance	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 15: Use as laboratory reagent Environmental release category (ERC): ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates) Sector of end use (SU): SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals</p>

Identified Use (IU) name	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 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 16: Using material as fuel sources, limited exposure to unburned product to be expected</p> <p>Environmental release category (ERC): ERC 7: Industrial use of substances in closed systems</p> <p>Sector of end use (SU): SU 0: Other: 3</p>
Blowing 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 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</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): SU 0: Other: 3</p>
Formulation and (re)packaging of substances and mixtures	<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</p>

Identified Use (IU) name	Use descriptors
	PROC 15: Use as laboratory reagent Environmental release category (ERC): ERC 2: Formulation of preparations Sector of end use (SU): SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
Polymer production	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 16: Using material as fuel sources, limited exposure to unburned product to be expected Environmental release category (ERC): ERC 5: Industrial use resulting in inclusion into or onto a matrix Sector of end use (SU): SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
Polymer processing	Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 6: Calendering operations PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 13: Treatment of articles by dipping and pouring PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation Environmental release category (ERC): ERC 5: Industrial use resulting in inclusion into or onto a matrix Sector of end use (SU): SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
Functional fluids	Process category (PROC):

Identified Use (IU) name	Use descriptors
	<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 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)</p> <p>Environmental release category (ERC): ERC 7: Industrial use of substances in closed systems</p> <p>Sector of end use (SU): SU 0: Other: 3</p>
Manufacture of substance	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 15: Use as laboratory reagent</p> <p>Sector of end use (SU): SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals</p>
<p><u>Uses by professional workers</u></p>	
Use as a fuel	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 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 16: Using material as fuel sources, limited exposure to unburned product to be expected</p> <p>Environmental release category (ERC):</p>

Identified Use (IU) name	Use descriptors
	ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems Sector of end use (SU): Other: 22
Propellants	Process category (PROC): PROC 11: Non industrial spraying Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems Sector of end use (SU): Other: 22
Polymer processing	Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 6: Calendering operations PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation PROC 21: Low energy manipulation of substances bound in materials and/or articles Sector of end Environmental release category (ERC): ERC 5: Industrial use resulting in inclusion into or onto a matrix Use (SU): Other: 22
Functional fluids	Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 20: Heat and pressure transfer fluids in dispersive, professional use but closed systems Environmental release category (ERC): ERC 7: Industrial use of substances in closed systems Sector of end use (SU): Other: 22
Uses by consumers	
Identified Use (IU) name	Use descriptors



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Identified Use (IU) name	Use descriptors
Use as a fuel	Chemical product category (PC): PC 13: Fuels Environmental release category (ERC): ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems
Propellants	Chemical product category (PC): PC 1: Adhesives, sealants PC 2: Adsorbents PC 3: Air care products PC 4: Anti-freeze and de-icing products PC 0: Other: 5, 10 PC 31: Polishes and wax blends PC 35: Washing and cleaning products (including solvent based products) PC 39: Cosmetic personal care products Environmental release category (ERC): ERC 8a: Wide dispersive indoor use of processing aids in open systems

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END OF SDS