

# SAFETY DATA SHEET



BUTYLENE

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifier

**Product name** : BUTYLENE

**EC number** : 289-339-5

**REACH Registration number**

**Registration number**

01-2119475607-28-0004

**CAS number** : Not available.

**Product description** : Liquefied Hydrocarbon Gas

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

**Intended Use** : Refinery process stream

#### Identified uses

Use as a fuel - Professional  
Use in polymer processing - Professional  
Manufacture of substance  
Distribution of substance  
Use as an intermediate  
Formulation and (re)packing of substances and mixtures  
Use in coatings - Industrial  
Use as a fuel - Industrial  
Use in polymer production - Industrial  
Use in polymer processing - Industrial

#### Uses advised against

Not applicable.

### 1.3 Details of the supplier of the safety data sheet

**Supplier** : Esso Petroleum Company Ltd.  
Ermyn Way  
Ermyn House  
KT22 8UX LEATHERHEAD, SURREY  
Great Britain

**Supplier General Contact** : (UK) (+44) (0) 1372 222 000

**e-mail address of person responsible for this SDS** : SDS-DS@exxonmobil.com

**SDS Internet Address** : www.sds.exxonmobil.com

### 1.4 Emergency telephone number

**National advisory body/** : (UK) 111

**Poison Centre**

**24 Hour Emergency** : +44 20 3807 3798 / +1-703-527-3887 (CHEMTREC)

**Telephone**

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## SECTION 2: Hazards identification

### 2.1 Classification of the substance or mixture

**Product definition** : UVCB

#### Classification according to UK CLP/GHS

Flam. Gas 1A, H220

Press. Gas (Liq.), H280

Muta. 1B, H340

Carc. 1A, H350

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

### 2.2 Label elements

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** : H220 - Extremely flammable gas.  
 H280 - Contains gas under pressure; may explode if heated.  
 H340 - May cause genetic defects.  
 H350 - May cause cancer.

#### Precautionary statements

**Prevention** : P201 - Obtain special instructions before use.  
 P202 - Do not handle until all safety precautions have been read and understood.  
 P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
 P280 - Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection.

**Response** : P308 + P313 - IF exposed or concerned: Get medical advice or attention.  
 P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
 P381 - In case of leakage, eliminate all ignition sources.

**Storage** : P405 - Store locked up.  
 P410 + P403 - Protect from sunlight. Store in a well-ventilated place.

**Disposal** : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

**Hazardous ingredients** : hydrocarbons, c4

**Supplemental label elements** : Not applicable.

**Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles** : 3, 28, 29

#### Special packaging requirements

**Containers to be fitted with child-resistant fastenings** : Not applicable.

**Tactile warning of danger** : Not applicable.

### 2.3 Other hazards

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## SECTION 2: Hazards identification

**Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII**

<b>PBT</b>	<b>P</b>	<b>B</b>	<b>T</b>	<b>vPvB</b>	<b>vP</b>	<b>vB</b>
N/A	N/A	N/A	Yes	N/A	N/A	N/A

**Other hazards which do not result in classification**

: Acts as a simple asphyxiant. At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen.

**Nota**

: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

## SECTION 3: Composition/information on ingredients

**3.1 Substances** : UVCB

Product/ingredient name	Identifiers	%	Classification	Type
hydrocarbons, c4	REACH #: 01-2119475607-28 EC: 289-339-5 CAS: 87741-01-3	100	Flam. Gas 1A, H220 Press. Gas (Liq.), H280 Muta. 1B, H340 Carc. 1A, H350	[1]
1,3-butadiene	REACH #: 01-2119471988-16 EC: 203-450-8 CAS: 106-99-0	>0.1	Flam. Gas 1A, H220 Press. Gas (Liq.), H280 Muta. 1B, H340 Carc. 1A, H350  <b>See Section 16 for the full text of the H statements declared above.</b>	[1]

There are no additional ingredients present which, within the current knowledge of the supplier, are classified and contribute to the classification of the substance and hence require reporting in this section.

Type

[1] Constituent

Occupational exposure limits, if available, are listed in Section 8.

## SECTION 4: First aid measures

### 4.1 Description of first aid measures

**Eye contact**

: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

**Inhalation**

: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

**Skin contact**

: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury. If burned by contact with hot material, molten material adhering to skin should be cooled as quickly as possible with water, and see a physician for removal of adhering material and treatment of burn. Wash clothing before reuse. Clean shoes thoroughly before reuse. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Wash

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## SECTION 4: First aid measures

- contaminated clothing thoroughly with water before removing it, or wear gloves. Get medical attention.
- Ingestion** : Get medical attention. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

### 4.2 Most important symptoms and effects, both acute and delayed

#### Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:  
frostbite
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:  
frostbite  
Local necrosis as evidenced by delayed onset of pain and tissue damage a few hours after injection.
- Ingestion** : Adverse symptoms may include the following:  
frostbite

### 4.3 Indication of any immediate medical attention and special treatment needed

- Notes to physician** : This material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.
- Specific treatments** : No specific treatment.

See toxicological information (Section 11)

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

- Suitable extinguishing media** : Use water fog, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.
- Unsuitable extinguishing media** : Do not use water jet.

### 5.2 Special hazards arising from the substance or mixture

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Hazardous combustion products** : Incomplete combustion products, Oxides of carbon

### 5.3 Advice for firefighters

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## SECTION 5: Firefighting measures

- Special protective actions for fire-fighters** : Use standard firefighting procedures and consider the hazards of other involved materials. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Assure an extended cooling down period to prevent re-ignition. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. No action shall be taken involving any personal risk or without suitable training.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

## SECTION 6: Accidental release measures

### NOTIFICATION PROCEDURES

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

#### 6.1 Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Put on appropriate personal protective equipment. Accidental releases pose a serious fire or explosion hazard. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Avoid breathing gas.
- For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

#### 6.2 Environmental precautions

- : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

#### 6.3 Methods and material for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

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

#### 6.4 Reference to other sections

- : See Section 1 for emergency contact information.  
See Section 8 for information on appropriate personal protective equipment.  
See Section 13 for additional waste treatment information.

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## SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

### 7.1 Precautions for safe handling

- Protective measures** : Thermal burn hazard - contact with hot material may cause thermal burns. Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Contact with rapidly expanding gas may cause burns or frostbite.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
- Static Accumulator** : This material is a static accumulator.

### 7.2 Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

#### Seveso Directive - Reporting thresholds

##### Danger criteria

Category	Notification and MAPP threshold	Safety report threshold
P2	10 tonne	50 tonne

### 7.3 Specific end use(s)

- Recommendations** : Not available.
- Industrial sector specific solutions** : Not available.

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Occupational exposure limits

Product/ingredient name	Exposure limit values
1,3-butadiene	<b>EH40/2005 WELs (United Kingdom (UK), 1/2020).</b> TWA: 1 ppm 8 hours. TWA: 2.2 mg/m <sup>3</sup> 8 hours. <b>EU OEL (Europe, 10/2019).</b> TWA: 1 ppm 8 hours. TWA: 2.2 mg/m <sup>3</sup> 8 hours. <b>ACGIH TLV (United States, 1/2023).</b> TWA: 2 ppm 8 hours. TWA: 4.4 mg/m <sup>3</sup> 8 hours.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

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## SECTION 8: Exposure controls/personal protection

**Recommended monitoring procedures** : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

### DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
hydrocarbons, c4	DNEL	Long term Inhalation	0.0664 mg/m <sup>3</sup>	General population	Systemic
	DNEL	Long term Inhalation	2.21 mg/m <sup>3</sup>	Workers	Systemic
1,3-butadiene	DNEL	Long term Inhalation	0.066 mg/m <sup>3</sup>	General population	Systemic
	DNEL	Long term Inhalation	2.21 mg/m <sup>3</sup>	Workers	Systemic

### PNECs

No PNECs available

## 8.2 Exposure controls

**Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields. Face shield.

### Skin protection

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. If product is hot, thermally protective, chemical resistant gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. < 1 hour (breakthrough time): Nitrile, minimum 0.38 mm thickness or comparable protective barrier material  
CEN standards EN 420 and EN 374 provide general requirements and lists of glove types.

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**SECTION 8: Exposure controls/personal protection**

- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. If product is hot, thermally protective, chemical resistant apron and long sleeves are recommended. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.  
European Committee for Standardization (CEN) standards EN 136, 140 and 405 provide respirator masks and EN 149 and 143 provide filter recommendations.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

**Section 9. Physical and chemical properties and safety characteristics**

**Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.**

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

**9.1 Information on basic physical and chemical properties****Appearance**

- Physical state** : Gas. [Compressed or Liquefied]
- Colour** : Colourless
- Odour** : Odourless
- Odour threshold** : Not available.
- pH** : Not applicable.
- Melting point/freezing point** : Not applicable.
- Boiling point, initial boiling point, and boiling range** : <-3°C (<26.6°F)
- Flash point** : Closed cup: <-18°C (<-0.4°F)
- Evaporation rate** : Not available.
- Flammability** : Flammable gases - Category 1
- Lower and upper explosive (flammable) limits** : Lower: 1.6%  
Upper: 12%
- Vapour pressure** : >1000 mm Hg [20 °C]
- Relative vapour density** : Not available.
- Relative density** : Not applicable.
- Solubility in water** : Negligible
- Partition coefficient: n-octanol/water** : <3  
Calculated value
- Auto-ignition temperature** : ≥364°C (≥687.2°F)
- Decomposition temperature** : Not available.
- Viscosity** : Not applicable.
- Particle characteristics**
- Median particle size** : Not applicable.

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## Section 9. Physical and chemical properties and safety characteristics

### SECTION 10: Stability and reactivity

- 10.1 Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- 10.2 Chemical stability** : The product is stable.
- 10.3 Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- 10.4 Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.
- 10.5 Incompatible materials** : Strong oxidisers
- 10.6 Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

### SECTION 11: Toxicological information

#### 11.1 Information on toxicological effects

##### Acute toxicity

Product/ingredient name	Test	Species	Result	Duration
hydrocarbons, c4	LC50 Inhalation Gas.	Rat	>5000 ppm_m	4 hours

##### **Conclusion/Summary**

- Inhalation** : Minimally Toxic. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
- Dermal** : Minimally Toxic. No end point data for material.
- Oral** : Minimally Toxic. No end point data for material.

##### Acute toxicity estimates

N/A

##### Irritation/Corrosion

##### **Conclusion/Summary**

- Skin** : Negligible irritation to skin at ambient temperatures. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
- Eyes** : May cause mild, short-lasting discomfort to eyes. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
- Respiratory** : Negligible hazard at ambient/normal handling temperatures. No end point data for material.

##### Sensitisation

##### **Conclusion/Summary**

- Skin** : Not expected to be a skin sensitizer. No end point data for material.
- Respiratory** : Not expected to be a respiratory sensitizer. No end point data for material.

##### Mutagenicity

##### **Conclusion/Summary**

- : May cause genetic defects. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 473 474 476 478 482

##### Carcinogenicity

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**SECTION 11: Toxicological information**

**Conclusion/Summary** : May cause cancer. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 453

**Reproductive toxicity**

**Conclusion/Summary** : Not expected to be a reproductive toxicant. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 414 421 422

**Specific target organ toxicity (single exposure)**

Not available.

**Conclusion/Summary** : Not expected to cause organ damage from a single exposure. No end point data for material.

**Specific target organ toxicity (repeated exposure)**

Not available.

**Conclusion/Summary** : Not expected to cause organ damage from prolonged or repeated exposure. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 407 422 453

**Aspiration hazard**

Not available.

**Conclusion/Summary** : Not expected to be an aspiration hazard. Based on physico-chemical properties of the material. Data available.

**Information on likely routes of exposure** : Not available.

**Other information**

**Contains** : 1,3- Butadiene. 1,3-Butadiene is a multi-site carcinogen in rodents. Epidemiology studies indicate an association between exposure to 1,3-butadiene and leukemia in humans. Mutations have been observed in in-vitro and in-vivo rodent assays. Although several older studies had conflicting results, a newer screening study in rats showed no adverse reproductive or developmental effects.

**Product** : May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage. Simple asphyxiant: Acts by displacing oxygen in the lungs thereby diminishing the supply of oxygen available to the blood and tissues. Symptoms include shortness of breath, rapid heart rate, incoordination, lethargy, headaches, nausea, vomiting, and disorientation. Continued lack of oxygen may result in convulsions, loss of consciousness and death. Since exercise increases the tissue need for oxygen, symptoms will occur more quickly during exertion in an oxygen-deficient environment. Oxygen in enclosed spaces should be maintained at 21 percent by volume. Exposure to this material, or one of its components, in situations where there is the potential for high levels, such as in confined spaces or with abuse, may result in abnormal heart rhythm (arrhythmia). High-level exposure to hydrocarbons (above occupational exposure limits) may initiate arrhythmia in a worker that is undergoing stress or is taking a heart-stimulating substance such as epinephrine, a nasal decongestant, or an asthma or cardiovascular drug.

**Section 12. Ecological information**

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

**12.1 Toxicity****Conclusion/Summary**

**Acute toxicity** : Not expected to be harmful to aquatic organisms.

**Chronic toxicity** : Not expected to demonstrate chronic toxicity to aquatic organisms

**12.2 Persistence and degradability**

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## Section 12. Ecological information

- Photolysis** : 4.064 day a component (s)
- Hydrolysis** : Material -- Transformation due to hydrolysis not expected to be significant.
- Photolysis** : Material -- Transformation due to photolysis not expected to be significant.
- Atmospheric Oxidation** : Material -- Expected to degrade rapidly in air

### 12.3 Bioaccumulative potential

- Conclusion/Summary** : Material -- Potential to bioaccumulate is low.

### 12.4 Mobility in soil

- Mobility** : Material -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

### 12.5 Results of PBT and vPvB assessment

Product/ingredient name	PBT	P	B	T	vPvB	vP	vB
hydrocarbons, c4	N/A	N/A	N/A	Yes	N/A	N/A	N/A

### 12.6 Other adverse effects

- Other adverse effects** : No known significant effects or critical hazards.

## SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

### 13.1 Waste treatment methods

#### Product

- Methods of disposal** : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

- Hazardous waste** : Yes.

#### Waste catalogue

Waste code	Waste designation
16 05 04*	gases in pressure containers (including halons) containing hazardous substances

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

#### Packaging

- Methods of disposal** : The generation of waste should be avoided or minimised wherever possible. Empty pressure vessels should be returned to the supplier. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

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### SECTION 13: Disposal considerations

**Special precautions** : Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

### SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
<b>14.1 UN number</b>	UN1965	UN1965	UN1965	UN1965
<b>14.2 UN proper shipping name</b>	HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (hydrocarbons, c4)	HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (hydrocarbons, c4)	HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (hydrocarbons, c4)	Hydrocarbon gas mixture, liquefied, n.o.s. (hydrocarbons, c4)
<b>14.3 Transport hazard class(es)</b>	2 	2 	2.1 	2.1 
<b>14.4 Packing group</b>	-	-	-	-
<b>14.5 Environmental hazards</b>	No.	No.	No.	No.

**Additional information**

**ADR/RID** : **Hazard identification number** 23  
**Limited quantity** 0  
**Special provisions** 274, 583, 652, 662, 392, 674  
**Tunnel code** (B/D)

**ADN** : **Special provisions** 274, 583, 662, 392, 674  
 CMR

**IMDG** : **Emergency schedules** \_F-D\_, S-U  
**Special provisions** 274, 392  
 Flash point <-18 °C C.C.

**IATA** : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Packaging instructions: Forbidden. Cargo Aircraft Only: 150 kg. Packaging instructions: 200. Limited Quantities - Passenger Aircraft: Forbidden. Packaging instructions: Forbidden.  
**Special provisions** A1

**14.6 Special precautions for user** : **Transport within user’s premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**14.7 Transport in bulk according to IMO instruments** : Not applicable.

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**SECTION 15: Regulatory information****15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture****UK (GB)/REACH****Annex XIV - List of substances subject to authorisation****Annex XIV**

None of the components are listed.

**Substances of very high concern**

None of the components are listed.

**Ozone depleting substances**

Not listed.

**Prior Informed Consent (PIC)**

Not listed.

**Persistent Organic Pollutants**

Not listed.

**Annex XVII - Restrictions** : 3, 28, 29  
**on the manufacture,  
 placing on the market  
 and use of certain  
 dangerous substances,  
 mixtures and articles**

**Seveso Directive**

This product is controlled under the Seveso Directive.

**Danger criteria****Category**

P2

**National regulations**

Product/ingredient name	List name	Name on list	Classification	Notes
1,3-butadiene	UK Occupational Exposure Limits EH40 - WEL	buta-1,3-diene; 1,3-butadiene	Carc.	-

**EU regulations**

**Industrial emissions  
 (integrated pollution  
 prevention and control) -  
 Air** : Not listed

**Industrial emissions  
 (integrated pollution  
 prevention and control) -  
 Water** : Not listed

**Inventory list**

**Australia inventory (AIC)** : Not determined.  
**Canada inventory (DSL-NDSL)** : All components are listed or exempted.  
**China inventory (IECSC)** : Not determined.  
**Japan inventory (CSCL)** : Not determined.  
**Japan inventory (Industrial Safety and Health Act)** : Not determined.  
**New Zealand Inventory of Chemicals (NZIoC)** : Not determined.  
**Philippines inventory (PICCS)** : Not determined.

BUTYLENE

## SECTION 15: Regulatory information

- Korea inventory (KECI)** : Not determined.
- Taiwan Chemical Substances Inventory (TCSI)** : All components are listed or exempted.
- United States inventory (TSCA 8b)** : Not determined.
- 15.2 Chemical safety assessment** : This product contains substances for which Chemical Safety Assessments are still required.

## SECTION 16: Other information

✔ Indicates information that has changed from previously issued version.

- Abbreviations and acronyms** :
- ATE = Acute Toxicity Estimate
  - GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
  - DMEL = Derived Minimal Effect Level
  - DNEL = Derived No Effect Level
  - EUH statement = GB CLP-specific Hazard statement
  - N/A = Not available
  - PBT = Persistent, Bioaccumulative and Toxic
  - PNEC = Predicted No Effect Concentration
  - RRN = REACH Registration Number
  - SGG = Segregation Group
  - vPvB = Very Persistent and Very Bioaccumulative

### Procedure used to derive the classification

Classification	Justification
Flam. Gas 1A, H220	Expert judgment
Press. Gas (Liq.), H280	Expert judgment
Muta. 1B, H340	Expert judgment
Carc. 1A, H350	Expert judgment

### Full text of abbreviated H statements

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H340	May cause genetic defects.
H350	May cause cancer.

### Full text of classifications

Carc. 1A	CARCINOGENICITY - Category 1A
Flam. Gas 1A	FLAMMABLE GASES - Category 1A
Muta. 1B	GERM CELL MUTAGENICITY - Category 1B
Press. Gas (Liq.)	GASES UNDER PRESSURE - Liquefied gas

- Date of issue/ Date of revision** : 15 May 2024
- Date of previous issue** : No previous edition
- Version** : 1
- Product code** : 1149890

### Notice to reader

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## Annex to the extended Safety Data Sheet (eSDS)

Professional

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Use as a fuel - Professional

List of use descriptors : **Identified use name:** Use as a fuel - Professional  
**Process Category:** PROC01, PROC02, PROC03, PROC08a, PROC08b, PROC16  
**Sector of end use:** SU22  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC09a, ERC09b

Environmental contributing scenarios : **General exposures** - ERC09a, ERC09b

Health Contributing scenarios : **General measures applicable to all activities** - PROC01, PROC02, PROC03, PROC08a, PROC08b, PROC16  
**Bulk transfers** - PROC08b  
**Drum/batch transfers** - PROC08b  
**Dipping, immersion and pouring** - PROC08b  
**General exposures (closed systems)** - PROC01, PROC02  
**Equipment cleaning and maintenance** - PROC08a  
**Vessel container cleaning** - PROC08a  
**Storage** - PROC01  
**Use as a fuel** - PROC03, PROC16

**Processes and activities covered by the exposure scenario** : Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

**Product characteristics** : Predominantly hydrophobic  
 Substance is complex UVCB.

**Amounts used** : Annual site tonnage (tonnes/year): 3.75 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 0.0005  
 Maximum daily site tonnage (kg/day): 10 kg/day  
 Regional use tonnage (tonnes/year): 7 500 tonnes/year

**Frequency and duration of use** : Continuous release  
 Emission days (days per year): 365 days per year

**Environment factors not influenced by risk management** : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

**Other conditions affecting environmental exposure** : Release fraction to air from process (initial release prior to RMM): 0.01  
 Release fraction to soil from process (initial release prior to RMM): 0.00001  
 Release fraction to wastewater from process (initial release prior to RMM): 0.00001

**Technical conditions and measures at process level (source) to prevent release** : Common practices vary across sites thus conservative process release estimates used.

<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Soil emission controls are not applicable as there is no direct release to soil. Treat air emission to provide a typical removal efficiency of =: 0 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: >=0 %
<b>Organisational measures to prevent/limit release from site</b>	: Not applicable.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 30 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: This substance is consumed during use and no waste from the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: This substance is consumed during use and no waste from the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: Bulk transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Clear transfer lines prior to de-coupling. Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

**Conditions and measures related to personal protection, hygiene and health evaluation**

<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
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**Contributing scenario controlling worker exposure for 4: Drum/batch transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Use drum pumps. Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

**Conditions and measures related to personal protection, hygiene and health evaluation**

<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
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**Contributing scenario controlling worker exposure for 5: Dipping, immersion and pouring**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

**Conditions and measures related to personal protection, hygiene and health evaluation**

<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
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**Contributing scenario controlling worker exposure for 6: General exposures (closed systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system. Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Equipment cleaning and maintenance**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 8: Vessel container cleaning**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to points where emissions occur.

**Organisational measures to prevent/limit releases, dispersion and exposure** : Clear spills immediately.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Respiratory protection** : Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 9: Storage**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Store substance within a closed system.  
Sample via a closed loop or other system to avoid exposure.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 10: Use as a fuel**

Closed systems

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 4 hours per day.

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Formulate in enclosed or ventilated mixing vessels.  
Transfer via enclosed lines.

**Ventilation control measures** : Handle substance within a predominantly closed system provided with extract ventilation.  
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).  
Provide extract ventilation to points where emissions occur.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

### Section 3 - Exposure estimation and reference to its source

**Website:** : Not applicable.

**Exposure estimation and reference to its source - Environment: 1: General exposures**

**Exposure assessment (environment):** : Hydrocarbon Block Method (Petrorisk)

**Exposure estimation and reference to its source** : ESVOC SPERC 9.12b.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 3: Bulk transfers**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: Drum/batch transfers**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Dipping, immersion and pouring**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: General exposures (closed systems)**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Equipment cleaning and maintenance**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Vessel container cleaning**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Storage**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: Use as a fuel**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

<b>Environment</b>	<p>: Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.</p> <p>Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.</p> <p>Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.</p>
<b>Health</b>	<p>: Available hazard data do not support the need for a DNEL to be established for other health effects.</p> <p>Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.</p> <p>Risk management measures are based on qualitative risk characterisation.</p> <p>Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.</p>

### Additional good practice advice beyond the REACH CSA

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Professional

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Use in polymer processing - Professional

List of use descriptors : **Identified use name:** Use in polymer processing - Professional  
**Process Category:** PROC01, PROC02, PROC06, PROC08a, PROC08b, PROC14, PROC21  
**Sector of end use:** SU22  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC08a, ERC08d

Environmental contributing scenarios : **General exposures** - ERC08a, ERC08d

Health Contributing scenarios : **General measures applicable to all activities** - PROC01, PROC02, PROC06, PROC08a, PROC08b, PROC14, PROC21  
**Bulk transfers** - PROC01, PROC02  
**Material transfers** - PROC08b  
**Injection moulding of articles** - PROC06  
**Rework of articles** - PROC21  
**Equipment maintenance** - PROC08a  
**Storage** - PROC01, PROC02

Processes and activities covered by the exposure scenario : Processing of formulated polymers including material transfers, moulding and forming activities, material re-works and associated maintenance

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

Product characteristics : Predominantly hydrophobic  
 Substance is complex UVCB.

Amounts used : Annual site tonnage (tonnes/year): 0.05 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 0.0005  
 Maximum daily site tonnage (kg/day): 0.14 kg/day  
 Regional use tonnage (tonnes/year): 100 tonnes/year

Frequency and duration of use : Continuous release  
 Emission days (days per year): 365 days per year

Environment factors not influenced by risk management : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

Other conditions affecting environmental exposure : Release fraction to air from process (initial release prior to RMM): 0.98  
 Release fraction to soil from process (initial release prior to RMM): 0.01  
 Release fraction to wastewater from process (initial release prior to RMM): 0.01

Technical conditions and measures at process level (source) to prevent release : Common practices vary across sites thus conservative process release estimates used.

<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Soil emission controls are not applicable as there is no direct release to soil. Treat air emission to provide a typical removal efficiency of =: 0 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: 0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 400 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: This substance is consumed during use and no waste from the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: This substance is consumed during use and no waste from the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: Bulk transfers**

Closed systems

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: Material transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Injection moulding of articles**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Restrict area of openings to equipment.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Rework of articles**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Equipment maintenance**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Drain down and flush system prior to equipment break-in or maintenance.  
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.

**Organisational measures to prevent/limit releases, dispersion and exposure** : Clear spills immediately.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 8: Storage**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Store substance within a closed system.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source**

**Website:** : Not applicable.

**Exposure estimation and reference to its source - Environment: 1: General exposures**

**Exposure assessment (environment):** : Hydrocarbon Block Method (Petrorisk)

**Exposure estimation and reference to its source** : ESVOC SPERC 8.21b.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 3: Bulk transfers**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: Material transfers**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Injection moulding of articles**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: Rework of articles**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Equipment maintenance**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Storage**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

<b>Environment</b>	<p>: Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.</p> <p>Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.</p> <p>Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.</p>
<b>Health</b>	<p>: Available hazard data do not support the need for a DNEL to be established for other health effects.</p> <p>Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.</p> <p>Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.</p>

**Additional good practice advice beyond the REACH CSA**

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Manufacture of substance

List of use descriptors : **Identified use name:** Manufacture of substance  
**Process Category:** PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC15  
**Sector of end use:** SU03, SU08, SU09, SU10  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC01, ERC04

Environmental contributing scenarios : **General exposures** - ERC01, ERC04

Health Contributing scenarios : **General measures applicable to all activities** - PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC15  
**General exposures (closed systems)** - PROC01, PROC03  
**General exposures (open systems)** - PROC04  
**Process sampling** - PROC08b  
**Laboratory activities** - PROC15  
**Bulk transfers** - PROC08b  
**Equipment cleaning and maintenance** - PROC08a  
**Storage** - PROC02  
**With sample collection** - PROC02

Processes and activities covered by the exposure scenario : Manufacture of the substance or use as an intermediate, process chemical or extracting agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

Product characteristics : Predominantly hydrophobic  
 Substance is complex UVCB.

Amounts used : Annual site tonnage (tonnes/year): 50 000 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 1  
 Maximum daily site tonnage (kg/day): 170 000 kg/day  
 Regional use tonnage (tonnes/year): 50 000 tonnes/year

Frequency and duration of use : Continuous release  
 Emission days (days per year): 300 days per year

Environment factors not influenced by risk management : Local freshwater dilution factor 40  
 Local marine water dilution factor 100

Other conditions affecting environmental exposure : Release fraction to air from process (initial release prior to RMM): 0.000002  
 Release fraction to soil from process (initial release prior to RMM): 0.0001  
 Release fraction to wastewater from process (initial release prior to RMM): 0.00001

Technical conditions and measures at process level (source) to prevent release : Common practices vary across sites thus conservative process release estimates used.

<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Treat air emission to provide a typical removal efficiency of =: 90 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: >=0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 10 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 90 000 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: During manufacturing, no waste of the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: During manufacturing, no waste of the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: General exposures (closed systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Handle substance within a predominantly closed system provided with extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: General exposures (open systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Handle substance within a predominantly closed system provided with extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Process sampling**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Laboratory activities**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Bulk transfers**

Open systems/Closed systems

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Use dry-break couplings for material transfer.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure material transfers are under containment or extract ventilation.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 8: Equipment cleaning and maintenance**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to points where emissions occur.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 9: Storage**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure. Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to material transfer points and other openings.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 10: With sample collection**

General exposures (closed systems)

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Handle substance within a predominantly closed system provided with extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source**

<b>Website:</b>	: Not applicable.
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**Exposure estimation and reference to its source - Environment: 1: General exposures**

<b>Exposure assessment (environment):</b>	: Hydrocarbon Block Method (Petrorisk)
<b>Exposure estimation and reference to its source</b>	: ESVOC SPERC 1.1.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

<b>Exposure assessment (human):</b>	: Not applicable.
<b>Exposure estimation and reference to its source</b>	: Not applicable.

**Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems)**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: General exposures (open systems)**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Process sampling**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: Laboratory activities**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Bulk transfers**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Equipment cleaning and maintenance**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Storage**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: With sample collection**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Environment** : Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

<b>Health</b>	: Available hazard data do not support the need for a DNEL to be established for other health effects. Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
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**Additional good practice advice beyond the REACH CSA**

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Distribution of substance

List of use descriptors : **Identified use name:** Distribution of substance  
**Process Category:** PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC09, PROC15  
**Sector of end use:** SU03, SU08, SU09  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC01, ERC02, ERC03, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC07

Environmental contributing scenarios : **General exposures** - ERC01, ERC02, ERC03, ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC07

Health Contributing scenarios : **General measures applicable to all activities** - PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC09, PROC15  
**General exposures (closed systems)** - PROC01, PROC02, PROC03  
**General exposures (open systems)** - PROC04  
**Process sampling** - PROC03  
**Laboratory activities** - PROC15  
**Bulk transfers** - PROC08b  
**Drum and small package filling** - PROC09  
**Equipment cleaning and maintenance** - PROC08a  
**Storage** - PROC02

Processes and activities covered by the exposure scenario : Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities.

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

Product characteristics : Predominantly hydrophobic  
 Substance is complex UVCB.

Amounts used : Annual site tonnage (tonnes/year): 100 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 0.002  
 Maximum daily site tonnage (kg/day): 5 000 kg/day  
 Regional use tonnage (tonnes/year): 50 000 tonnes/year

Frequency and duration of use : Continuous release  
 Emission days (days per year): 20 days per year

Environment factors not influenced by risk management : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

Other conditions affecting environmental exposure : Release fraction to air from process (initial release prior to RMM): 0.0001  
 Release fraction to soil from process (initial release prior to RMM): 0.00001  
 Release fraction to wastewater from process (initial release prior to RMM): 0.00001

Technical conditions and measures at process level (source) to prevent release : Common practices vary across sites thus conservative process release estimates used.

<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Treat air emission to provide a typical removal efficiency of =: 90 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: 0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 11 000 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: During manufacturing, no waste of the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: During manufacturing, no waste of the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances.

Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: General exposures (closed systems)**

With sample collection

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: General exposures (open systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure. Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Process sampling**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Laboratory activities**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Bulk transfers**

Open systems/Closed systems

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Clear transfer lines prior to de-coupling. Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure material transfers are under containment or extract ventilation.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 8: Drum and small package filling**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 9: Equipment cleaning and maintenance**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to points where emissions occur.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 10: Storage**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Transfer via enclosed lines. Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide extract ventilation to points where emissions occur. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source**

**Website:** : Not applicable.

**Exposure estimation and reference to its source - Environment: 1: General exposures**

<b>Exposure assessment (environment):</b>	: Hydrocarbon Block Method (Petrorisk)
<b>Exposure estimation and reference to its source</b>	: ESVOC SPERC 1.1b.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

<b>Exposure assessment (human):</b>	: Not applicable.
<b>Exposure estimation and reference to its source</b>	: Not applicable.

**Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems)**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: General exposures (open systems)**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Process sampling**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: Laboratory activities**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Bulk transfers**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Drum and small package filling**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Equipment cleaning and maintenance**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: Storage**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Environment** : Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

<b>Health</b>	: Available hazard data do not support the need for a DNEL to be established for other health effects. Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
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**Additional good practice advice beyond the REACH CSA**

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Use as an intermediate

List of use descriptors : **Identified use name:** Use as an intermediate  
**Process Category:** PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC15  
**Sector of end use:** SU03, SU08, SU09  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC06a

Environmental contributing scenarios : **General exposures - ERC06a**

Health Contributing scenarios : **General measures applicable to all activities - PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC15**  
**General exposures (closed systems) - PROC01, PROC03**  
**General exposures (open systems) - PROC04**  
**Process sampling - PROC08b**  
**Laboratory activities - PROC15**  
**Bulk transfers - PROC08b**  
**Equipment cleaning and maintenance - PROC08a**  
**Storage - PROC02**  
**With sample collection - PROC02**

Processes and activities covered by the exposure scenario : Use of substance as an intermediate (not related to Strictly Controlled Conditions). Includes recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

Product characteristics : Predominantly hydrophobic  
 Substance is complex UVCB.

Amounts used : Annual site tonnage (tonnes/year): 15 000 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 0.6  
 Maximum daily site tonnage (kg/day): 50 000 kg/day  
 Regional use tonnage (tonnes/year): 25 000 tonnes/year

Frequency and duration of use : Continuous release  
 Emission days (days per year): 300 days per year

Environment factors not influenced by risk management : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

Other conditions affecting environmental exposure : Release fraction to air from process (initial release prior to RMM): 0.005  
 Release fraction to soil from process (initial release prior to RMM): 0.001  
 Release fraction to wastewater from process (initial release prior to RMM): 0.0003

Technical conditions and measures at process level (source) to prevent release : Common practices vary across sites thus conservative process release estimates used.

<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by freshwater sediment. Treat air emission to provide a typical removal efficiency of =: 80 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: >=0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 11 000 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: This substance is consumed during use and no waste from the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: This substance is consumed during use and no waste from the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: General exposures (closed systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Handle substance within a predominantly closed system provided with extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: General exposures (open systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Handle substance within a predominantly closed system provided with extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Process sampling**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Laboratory activities**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 15 minutes
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Bulk transfers**

Open systems &amp; Closed systems

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour.
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Use dry-break couplings for material transfer.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure material transfers are under containment or extract ventilation.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 8: Equipment cleaning and maintenance**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to points where emissions occur.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 9: Storage**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure. Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide extract ventilation to material transfer points and other openings.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 10: With sample collection**

General exposures (closed systems)

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Sample via a closed loop or other system to avoid exposure.
<b>Ventilation control measures</b>	: Handle substance within a predominantly closed system provided with extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source****Website:** : Not applicable.**Exposure estimation and reference to its source - Environment: 1: General exposures**

<b>Exposure assessment (environment):</b>	: Hydrocarbon Block Method (Petrorisk)
<b>Exposure estimation and reference to its source</b>	: ESVOC SPERC 6.1a.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

<b>Exposure assessment (human):</b>	: Not applicable.
<b>Exposure estimation and reference to its source</b>	: Not applicable.

**Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems)**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: General exposures (open systems)**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Process sampling**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: Laboratory activities**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Bulk transfers**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Equipment cleaning and maintenance**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Storage**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: With sample collection**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Environment** : Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.  
Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.  
Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

<b>Health</b>	: Available hazard data do not support the need for a DNEL to be established for other health effects. Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
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**Additional good practice advice beyond the REACH CSA**

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

**Short title of the exposure scenario** : Formulation and (re)packing of substances and mixtures

**List of use descriptors** : **Identified use name:** Formulation and (re)packing of substances and mixtures  
**Process Category:** PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC14, PROC15  
**Sector of end use:** SU03, SU10  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC02

**Environmental contributing scenarios** : **General exposures** - ERC02

**Health Contributing scenarios** : **General measures applicable to all activities** - PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC14, PROC15  
**General exposures (closed systems)** - PROC01, PROC03  
**With sample collection** - PROC02  
**General exposures (open systems)** - PROC04  
**Batch processes at elevated temperatures** - PROC03  
**Process sampling** - PROC03  
**Laboratory activities** - PROC15  
**Bulk transfers** - PROC08b  
**Mixing operations (open systems)** - PROC05  
**Transfer from/pouring from containers** - PROC08a  
**Drum/batch transfers** - PROC08b  
**Production of preparation or articles by tableting, compression, extrusion or pelletisation** - PROC14  
**Drum and small package filling** - PROC09  
**Equipment cleaning and maintenance** - PROC08a  
**Storage** - PROC02

**Processes and activities covered by the exposure scenario** : Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

**Product characteristics** : Predominantly hydrophobic  
 Substance is complex UVCB.

**Amounts used** : Annual site tonnage (tonnes/year): 25 000 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 1  
 Maximum daily site tonnage (kg/day): 83 000 kg/day  
 Regional use tonnage (tonnes/year): 25 000 tonnes/year

**Frequency and duration of use** : Continuous release  
 Emission days (days per year): 300 days per year

**Environment factors not influenced by risk management** : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

<b>Other conditions affecting environmental exposure</b>	: Release fraction to air from process (initial release prior to RMM): 0.0001 Release fraction to soil from process (initial release prior to RMM): 0.0001 Release fraction to wastewater from process (initial release prior to RMM): 0.00001
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Common practices vary across sites thus conservative process release estimates used.
<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Treat air emission to provide a typical removal efficiency of =: 0 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: >=0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 2 700 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: During manufacturing, no waste of the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: During manufacturing, no waste of the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

### Contributing scenario controlling worker exposure for 3: General exposures (closed systems)

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Handle substance within a closed system.  
Sample via a closed loop or other system to avoid exposure.

**Ventilation control measures** : Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.  
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

### Conditions and measures related to personal protection, hygiene and health evaluation

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

### Contributing scenario controlling worker exposure for 4: With sample collection

General exposures (closed systems)

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Handle substance within a closed system.  
Sample via a closed loop or other system to avoid exposure.

**Ventilation control measures** : Provide extract ventilation to points where emissions occur.  
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

### Conditions and measures related to personal protection, hygiene and health evaluation

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

### Contributing scenario controlling worker exposure for 5: General exposures (open systems)

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Formulate in enclosed or ventilated mixing vessels.  
Sample via a closed loop or other system to avoid exposure.

**Ventilation control measures** : Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.  
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Batch processes at elevated temperatures**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Operation is carried out at elevated temperature (> 20°C above ambient temperature)

**Technical conditions and measures at process level (source) to prevent release** : Handle substance within a closed system.  
Sample via a closed loop or other system to avoid exposure.

**Ventilation control measures** : Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.  
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Process sampling**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Handle substance within a closed system.  
Sample via a closed loop or other system to avoid exposure.

**Ventilation control measures** : Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.  
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 8: Laboratory activities**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

#### Contributing scenario controlling worker exposure for 9: Bulk transfers

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Clear transfer lines prior to de-coupling.  
Transfer via enclosed lines.

**Ventilation control measures** : Ensure material transfers are under containment or extract ventilation.

#### Conditions and measures related to personal protection, hygiene and health evaluation

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

#### Contributing scenario controlling worker exposure for 10: Mixing operations (open systems)

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.  
Provide extract ventilation to points where emissions occur.

#### Conditions and measures related to personal protection, hygiene and health evaluation

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Respiratory protection** : Wear a respirator conforming to EN140 with type A filter or better.

#### Contributing scenario controlling worker exposure for 11: Transfer from/pouring from containers

Manual

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 4 hours

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Use drum pumps or carefully pour from container.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.  
Provide extract ventilation to points where emissions occur.

**Organisational measures to prevent/limit releases, dispersion and exposure** : Avoid spillage when withdrawing pump.

#### Conditions and measures related to personal protection, hygiene and health evaluation

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 12: Drum/batch transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Use drum pumps or carefully pour from container.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 13: Production of preparation or articles by tableting, compression, extrusion or pelletisation**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Provide extract ventilation to points where emissions occur. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 14: Drum and small package filling**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Clear transfer lines prior to de-coupling. Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 15: Equipment cleaning and maintenance**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Apply vessel entry procedures including use of forced supplied air. Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 16: Storage**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Store substance within a closed system.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source**

<b>Website:</b>	: Not applicable.
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**Exposure estimation and reference to its source - Environment: 1: General exposures**

<b>Exposure assessment (environment):</b>	: Hydrocarbon Block Method (Petrorisk)
<b>Exposure estimation and reference to its source</b>	: ESVOC SPERC 2.2.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

<b>Exposure assessment (human):</b>	: Not applicable.
<b>Exposure estimation and reference to its source</b>	: Not applicable.

**Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems)**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: With sample collection**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: General exposures (open systems)**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: Batch processes at elevated temperatures**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Process sampling**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Laboratory activities**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Bulk transfers**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: Mixing operations (open systems)**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 11: Transfer from/pouring from containers**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 12: Drum/batch transfers**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 13: Production of preparation or articles by tableting, compression, extrusion or pelletisation**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 14: Drum and small package filling**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 15: Equipment cleaning and maintenance**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 16: Storage**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

<b>Environment</b>	: Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
<b>Health</b>	: Available hazard data do not support the need for a DNEL to be established for other health effects. Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

**Additional good practice advice beyond the REACH CSA**

**Environment** : Not available.

**Health** : Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Use in coatings - Industrial

List of use descriptors : **Identified use name:** Use in coatings - Industrial  
**Process Category:** PROC01, PROC02, PROC03, PROC04, PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC14, PROC15  
**Sector of end use:** SU03  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC04

Environmental contributing scenarios : **General exposures - ERC04**

Health Contributing scenarios : **General measures applicable to all activities - PROC01, PROC02, PROC03, PROC04, PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC13, PROC14, PROC15**  
**General exposures (closed systems) - PROC01, PROC02**  
**Film formation - force drying (50 - 100°C). Stoving (>100°C). UV/EB radiation curing - PROC02**  
**Mixing operations - PROC03**  
**Film formation - air drying - PROC04**  
**Mixing operations (open systems) - PROC05**  
**Spraying (automatic/robotic) - PROC07**  
**Manual spraying - PROC07**  
**Material transfers - PROC08a, PROC08b**  
**Roller, spreader, flow application - PROC10**  
**Dipping, immersion and pouring - PROC13**  
**Laboratory activities - PROC15**  
**Transfer from/pouring from containers - PROC09**  
**Production of preparation or articles by tableting, compression, extrusion or pelletisation - PROC14**  
**Equipment cleaning and maintenance - PROC08a**  
**Storage - PROC02**

**Processes and activities covered by the exposure scenario** : Covers the use in coatings (paints, inks, adhesives, etc) including exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application by spray, roller, spreader, dip, flow, fluidised bed on production lines and film formation) and equipment cleaning, maintenance and associated laboratory activities.

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

**Product characteristics** : Predominantly hydrophobic  
 Substance is complex UVCB.

**Amounts used** : Annual site tonnage (tonnes/year): 100 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 1  
 Maximum daily site tonnage (kg/day): 5 000 kg/day  
 Regional use tonnage (tonnes/year): 100 tonnes/year

**Frequency and duration of use** : Continuous release  
 Emission days (days per year): 20 days per year

<b>Environment factors not influenced by risk management</b>	: Local freshwater dilution factor 10 Local marine water dilution factor 100
<b>Other conditions affecting environmental exposure</b>	: Release fraction to air from process (initial release prior to RMM): 0.098 Release fraction to soil from process (initial release prior to RMM): 0 Release fraction to wastewater from process (initial release prior to RMM): 0.0007
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Common practices vary across sites thus conservative process release estimates used.
<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Treat air emission to provide a typical removal efficiency of =: 90 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: >=0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 44 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: This substance is consumed during use and no waste from the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: This substance is consumed during use and no waste from the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: General exposures (closed systems)**

With sample collection/Use in contained systems

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 4 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures at process level (source) to prevent release** : Handle substance within a closed system.

**Ventilation control measures** : Ensure material transfers are under containment or extract ventilation.  
Provide enhanced general ventilation by mechanical means.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: Film formation - force drying (50 - 100°C). Stoving (>100°C). UV/EB radiation curing**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 4 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Ventilation control measures** : Ensure material transfers are under containment or extract ventilation.  
Provide enhanced general ventilation by mechanical means.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Mixing operations**

General exposures (closed systems)

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Technical conditions and measures to control dispersion from source towards the worker** : Formulate in enclosed or ventilated mixing vessels.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.  
Provide extract ventilation to points where emissions occur.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Film formation - air drying**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Avoid carrying out activities involving exposure for more than 1 hour

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.  
Provide extract ventilation to points where emissions occur.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Mixing operations (open systems)**

Preparation of material for application

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Ventilation control measures** : Provide enhanced general ventilation by mechanical means.  
Provide extract ventilation to points where emissions occur.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Respiratory protection** : Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 8: Spraying (automatic/robotic)**

**Product characteristics** : Liquid

**Concentration of substance in mixture or article** : Covers percentage substance in the product up to 100 %.

**Frequency and duration of use/exposure** : Covers daily exposures up to 8 hours (unless stated differently)

**Other conditions affecting workers exposure** : Assumes use at not more than 20°C above ambient temperature.

**Ventilation control measures** : Carry out in a vented booth provided with laminar airflow.

**Conditions and measures related to personal protection, hygiene and health evaluation**

**Advice on general occupational hygiene** : Assumes a good basic standard of occupational hygiene is implemented

**Respiratory protection** : Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 9: Manual spraying**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Minimise exposure by extracted full enclosure for the operation or equipment.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 10: Material transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Clear transfer lines prior to de-coupling.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 11: Roller, spreader, flow application**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 12: Dipping, immersion and pouring**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 13: Laboratory activities**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 14: Transfer from/pouring from containers**

Material transfers/Drum/batch transfers

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hours
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 15: Production of preparation or articles by tableting, compression, extrusion or pelletisation**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)

<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Use ventilation to extract vapours from freshly coated articles/objects and surfaces.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

#### Contributing scenario controlling worker exposure for 16: Equipment cleaning and maintenance

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hours
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to points where emissions occur.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

#### Contributing scenario controlling worker exposure for 17: Storage

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system. Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

### Section 3 - Exposure estimation and reference to its source

<b>Website:</b>	: Not applicable.
<b>Exposure estimation and reference to its source - Environment: 1: General exposures</b>	
<b>Exposure assessment (environment):</b>	: Hydrocarbon Block Method (Petrorisk)
<b>Exposure estimation and reference to its source</b>	: ESVOC SPERC 4.3a.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems)**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 4: Film formation - force drying (50 - 100°C). Stoving (>100°C). UV/EB radiation curing**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 5: Mixing operations**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 6: Film formation - air drying**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 7: Mixing operations (open systems)**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 8: Spraying (automatic/robotic)**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 9: Manual spraying**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 10: Material transfers**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 11: Roller, spreader, flow application**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 12: Dipping, immersion and pouring**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 13: Laboratory activities**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 14: Transfer from/pouring from containers**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 15: Production of preparation or articles by tableting, compression, extrusion or pelletisation**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 16: Equipment cleaning and maintenance**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Exposure estimation and reference to its source - Workers: 17: Storage**

**Exposure assessment (human):** : Not available.

**Exposure estimation and reference to its source** : Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

<b>Environment</b>	: Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
<b>Health</b>	: Available hazard data do not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

**Additional good practice advice beyond the REACH CSA**

**Environment** : Not available.

**Health** : Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Use as a fuel - Industrial

List of use descriptors : **Identified use name:** Use as a fuel - Industrial  
**Process Category:** PROC01, PROC02, PROC03, PROC08a, PROC08b, PROC16  
**Sector of end use:** SU03  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC07

Environmental contributing scenarios : **General exposures - ERC07**

Health Contributing scenarios : **General measures applicable to all activities - PROC01, PROC02, PROC03, PROC08a, PROC08b, PROC16**  
**Bulk transfers - PROC08b**  
**Drum/batch transfers - PROC08b**  
**Use in contained batch processes - PROC03**  
**General exposures (closed systems) - PROC01, PROC02**  
**Equipment cleaning and maintenance - PROC08a**  
**Storage - PROC01, PROC02**  
**Use as a fuel - PROC16, PROC03**  
**Disposal of wastes - PROC08a**

**Processes and activities covered by the exposure scenario** : Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

**Product characteristics** : Predominantly hydrophobic  
 Substance is complex UVCB.

**Amounts used** : Annual site tonnage (tonnes/year): 10 000 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 1  
 Maximum daily site tonnage (kg/day): 33 000 kg/day  
 Regional use tonnage (tonnes/year): 10 000 tonnes/year

**Frequency and duration of use** : Continuous release  
 Emission days (days per year): 300 days per year

**Environment factors not influenced by risk management** : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

**Other conditions affecting environmental exposure** : Release fraction to air from process (initial release prior to RMM): 0.0025  
 Release fraction to soil from process (initial release prior to RMM): 0  
 Release fraction to wastewater from process (initial release prior to RMM): 0.00001

**Technical conditions and measures at process level (source) to prevent release** : Common practices vary across sites thus conservative process release estimates used.

<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Treat air emission to provide a typical removal efficiency of =: 95 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: >=0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 120 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: This substance is consumed during use and no waste from the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: This substance is consumed during use and no waste from the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: Bulk transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: Drum/batch transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Use drum pumps.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Use in contained batch processes**

General exposures (closed systems)

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: General exposures (closed systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperaure.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Equipment cleaning and maintenance**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperaure.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down and flush system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented
<b>Respiratory protection</b>	: Wear a respirator conforming to EN140 with type A filter or better.

**Contributing scenario controlling worker exposure for 8: Storage**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperaure.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system. Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 9: Use as a fuel**

Closed systems

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Handle substance within a predominantly closed system provided with extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 10: Disposal of wastes**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	: Transfer via enclosed lines.
<b>Ventilation control measures</b>	: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Provide extract ventilation to points where emissions occur.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source****Website:** : Not applicable.**Exposure estimation and reference to its source - Environment: 1: General exposures**

<b>Exposure assessment (environment):</b>	: Hydrocarbon Block Method (Petrorisk)
<b>Exposure estimation and reference to its source</b>	: ESVOC SPERC 7.12a.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

<b>Exposure assessment (human):</b>	: Not applicable.
<b>Exposure estimation and reference to its source</b>	: Not applicable.

**Exposure estimation and reference to its source - Workers: 3: Bulk transfers**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: Drum/batch transfers**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Use in contained batch processes**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: General exposures (closed systems)**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Equipment cleaning and maintenance**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Storage**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Use as a fuel**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: Disposal of wastes**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Environment** : Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.  
 Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.  
 Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

<b>Health</b>	: Available hazard data do not support the need for a DNEL to be established for other health effects. Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
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**Additional good practice advice beyond the REACH CSA**

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Use in polymer production - Industrial

List of use descriptors : **Identified use name:** Use in polymer production - Industrial  
**Process Category:** PROC01, PROC02, PROC03, PROC04, PROC05, PROC06, PROC08a, PROC08b, PROC14  
**Sector of end use:** SU08, SU09, SU10, SU11, SU12, SU13  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC04, ERC07

Environmental contributing scenarios : **General exposures** - ERC04, ERC07

Health Contributing scenarios : **General measures applicable to all activities** - PROC01, PROC02, PROC03, PROC04, PROC05, PROC06, PROC08a, PROC08b, PROC14  
**General exposures (closed systems)** - PROC01  
**Polymerisation** - PROC02, PROC03  
**Finishing operations** - PROC03  
**Intermediate polymer storage** - PROC04  
**Additivition and stabilisation** - PROC03  
**Mixing operations (open systems)** - PROC05  
**Pelletisation and pellet screening** - PROC06, PROC08b, PROC14  
**Storage** - PROC02  
**Equipment maintenance** - PROC08a  
**Bulk transfers** - PROC03, PROC08b  
**Transport** - PROC08b

Processes and activities covered by the exposure scenario : Manufacture of polymers from monomers in continuous and batch processes. Including production, re-cycling and recovery, degassing, discharging, reactor maintenance and immediate polymer product formation (i.e. compounding, pelletisation, product off-gassing)

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

Product characteristics : Predominantly hydrophobic  
 Substance is complex UVCB.

Amounts used : Annual site tonnage (tonnes/year): 5 000 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 1  
 Maximum daily site tonnage (kg/day): 50 000 kg/day  
 Regional use tonnage (tonnes/year): 5 000 tonnes/year

Frequency and duration of use : Continuous release  
 Emission days (days per year): 100 days per year

Environment factors not influenced by risk management : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

Other conditions affecting environmental exposure : Release fraction to air from process (initial release prior to RMM): 0.002  
 Release fraction to soil from process (initial release prior to RMM): 0.0001  
 Release fraction to wastewater from process (initial release prior to RMM): 0.0003

<b>Technical conditions and measures at process level (source) to prevent release</b>	: Common practices vary across sites thus conservative process release estimates used.
<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by freshwater sediment. Treat air emission to provide a typical removal efficiency of =: 80 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: >=0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 400 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: This substance is consumed during use and no waste from the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: This substance is consumed during use and no waste from the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: General exposures (closed systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: Polymerisation**

Bulk/Batch

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Ensure operation is undertaken outdoors. Formulate in enclosed or ventilated mixing vessels.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Finishing operations**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Formulate in enclosed or ventilated mixing vessels.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Intermediate polymer storage**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Additivation and stabilisation**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Formulate in enclosed or ventilated mixing vessels.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 8: Mixing operations (open systems)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 9: Pelletisation and pellet screening**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Limit the substance in product to 1% [Production] Limit the substance in product to 5% [Material transfers]
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Handle substance within a closed system.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 10: Storage**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide a good standard of controlled ventilation (10 to 15 air changes per hour). Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 11: Equipment maintenance**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide extract ventilation to points where emissions occur.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 12: Bulk transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperaure.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Formulate in enclosed or ventilated mixing vessels.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 13: Transport**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperaure.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source**

<b>Website:</b>	: Not applicable.
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**Exposure estimation and reference to its source - Environment: 1: General exposures**

<b>Exposure assessment (environment):</b>	: Hydrocarbon Block Method (Petrorisk)
<b>Exposure estimation and reference to its source</b>	: ESVOC SPERC 4.20.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

<b>Exposure assessment (human):</b>	: Not applicable.
<b>Exposure estimation and reference to its source</b>	: Not applicable.

**Exposure estimation and reference to its source - Workers: 3: General exposures (closed systems)**

<b>Exposure assessment (human):</b>	: Not applicable.
<b>Exposure estimation and reference to its source</b>	: Not applicable.

**Exposure estimation and reference to its source - Workers: 4: Polymerisation**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Finishing operations**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: Intermediate polymer storage**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Additivation and stabilisation**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Mixing operations (open systems)**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Pelletisation and pellet screening**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: Storage**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 11: Equipment maintenance**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 12: Bulk transfers**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Exposure estimation and reference to its source - Workers: 13: Transport**

Exposure assessment (human): : Not applicable.

Exposure estimation and reference to its source : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

<b>Environment</b>	<p>: Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.</p> <p>Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.</p> <p>Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.</p>
<b>Health</b>	<p>: Available hazard data do not support the need for a DNEL to be established for other health effects.</p> <p>Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.</p> <p>Risk management measures are based on qualitative risk characterisation.</p> <p>Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.</p>

### Additional good practice advice beyond the REACH CSA

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

## Annex to the extended Safety Data Sheet (eSDS)

Industrial

### Identification of the substance or mixture

Product definition : UVCB  
 Code : 1149890  
 Product name : BUTYLENE

### Section 1 - Title

Short title of the exposure scenario : Use in polymer processing - Industrial

List of use descriptors : **Identified use name:** Use in polymer processing - Industrial  
**Process Category:** PROC01, PROC02, PROC03, PROC04, PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC13, PROC14, PROC21  
**Sector of end use:** SU03, SU10  
**Subsequent service life relevant for that use:** No.  
**Environmental Release Category:** ERC04

Environmental contributing scenarios : **General exposures - ERC04**

Health Contributing scenarios : **General measures applicable to all activities - PROC01, PROC02, PROC03, PROC04, PROC05, PROC06, PROC08a, PROC08b, PROC09, PROC13, PROC14, PROC21**  
**Bulk transfers - PROC01, PROC02, PROC08b, PROC09**  
**Bulk weighing - PROC01, PROC02**  
**Small scale weighing - PROC09**  
**Additive premixing - PROC03, PROC05**  
**Additive - PROC04**  
**Calendering (including Banburys) - PROC06**  
**Production of articles by dipping and pouring - PROC13**  
**Extrusion and masterbatching - PROC14**  
**Injection moulding of articles - PROC14**  
**Finishing operations - PROC21**  
**Equipment maintenance - PROC08a**  
**Storage - PROC02**

Processes and activities covered by the exposure scenario : Processing of formulated polymers including material transfers, additives handling (e. g. pigments, stabilisers, fillers, plasticisers, etc.), moulding, curing and forming activities, material re-works, storage and associated maintenance

### Section 2 - Exposure controls

**Contributing scenario controlling environmental exposure for 1: General exposures**

Product characteristics : Predominantly hydrophobic  
 Substance is complex UVCB.

Amounts used : Annual site tonnage (tonnes/year): 100 tonnes/year  
 Fraction of EU tonnage used in region: 0.1  
 Fraction of Regional tonnage used locally: 1  
 Maximum daily site tonnage (kg/day): 5 000 kg/day  
 Regional use tonnage (tonnes/year): 100 tonnes/year

Frequency and duration of use : Continuous release  
 Emission days (days per year): 20 days per year

Environment factors not influenced by risk management : Local freshwater dilution factor 10  
 Local marine water dilution factor 100

Other conditions affecting environmental exposure : Release fraction to air from process (initial release prior to RMM): 0.15  
 Release fraction to soil from process (initial release prior to RMM): 0.00001  
 Release fraction to wastewater from process (initial release prior to RMM): 0

<b>Technical conditions and measures at process level (source) to prevent release</b>	: Common practices vary across sites thus conservative process release estimates used.
<b>Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	: If discharging to municipal sewage treatment plant, no on-site wastewater treatment required. Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). Treat air emission to provide a typical removal efficiency of =: 80 % Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of =: 0 %
<b>Organisational measures to prevent/limit release from site</b>	: Do not apply industrial sludge to natural soils. Prevent discharge of undissolved substance to or recover from onsite wastewater. Sewage sludge should be incinerated, contained or reclaimed.
<b>Conditions and measures related to sewage treatment plant</b>	: Assumed domestic sewage treatment plant flow: 2 000 m <sup>3</sup> /day Estimated substance removal from wastewater via municipal sewage treatment: 96.7 % Maximum allowable site tonnage (MSafe) [Assumed domestic sewage treatment plant flow]: 29 000 kg/day Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs: 96.7 %
<b>Conditions and measures related to external treatment of waste for disposal</b>	: This substance is consumed during use and no waste from the substance is generated.
<b>Conditions and measures related to external recovery of waste</b>	: This substance is consumed during use and no waste from the substance is generated.

### Contributing scenario controlling worker exposure for 2: General measures applicable to all activities

#### General measures (flammability) - Extremely flammable gas.

Risks from the physicochemical hazards of substances, such as flammability or explosiveness can be controlled by implementing risk management measures at the workplace. It is recommended to follow the Dangerous Substances and Explosion Atmospheres Regulations (DSEAR) and The Equipment and Protective Systems Intended for use in Potentially Explosive Atmosphere Regulations (EPS). Based on the implementation of a selection of handling and storage risk management measures for the identified uses, the risk can be regarded as controlled to an acceptable level.

Use in contained systems. Keep away from sources of ignition - No smoking. Handle in well ventilated area to prevent formation of explosive atmosphere. Use equipment and protective systems approved for flammable substances. Restrict line velocity during pumping to avoid generation of electrostatic discharge. Ground/bond container and receiving equipment. Use non-sparking tools. Refer to relevant technical standards/EU regulations/national regulations. Review SDS for additional advice..

#### General measures (carcinogens)

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down and flush system prior to equipment break-in or maintenance. Cleaning manufacturing equipment for maintenance purposes. Exposure (Potential) Only allow access to authorised persons. Ensure operatives are trained to minimise exposures. Wear suitable coveralls to prevent exposure to the skin. Wear respiratory protection when its use is identified for certain contributing scenarios. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Ensure control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 3: Bulk transfers**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Transfer via enclosed lines. Use drum pumps.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 4: Bulk weighing**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 5: Small scale weighing**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Use drum pumps.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 6: Additive premixing**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperaure.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Formulate in enclosed or ventilated mixing vessels.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 7: Additive**

Additive premixing

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperaure.
<b>Ventilation control measures</b>	: Ensure material transfers are under containment or extract ventilation. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 8: Calendering (including Banburys)**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Operation is carried out at elevated temperature (> 20°C above ambient temperature)
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Restrict area of openings to equipment.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 9: Production of articles by dipping and pouring**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 10: Extrusion and masterbatching**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide enhanced general ventilation by mechanical means.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 11: Injection moulding of articles**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Restrict area of openings to equipment.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Contributing scenario controlling worker exposure for 12: Finishing operations**

<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Covers daily exposures up to 8 hours (unless stated differently)

<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Formulate in enclosed or ventilated mixing vessels.
<b>Ventilation control measures</b>	: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

<b>Contributing scenario controlling worker exposure for 13: Equipment maintenance</b>	
<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 1 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Drain down system prior to equipment break-in or maintenance. Retain drain-downs in sealed storage pending disposal or for subsequent recycle.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Organisational measures to prevent/limit releases, dispersion and exposure</b>	: Clear spills immediately.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

<b>Contributing scenario controlling worker exposure for 14: Storage</b>	
<b>Product characteristics</b>	: Liquid
<b>Concentration of substance in mixture or article</b>	: Covers percentage substance in the product up to 100 %.
<b>Frequency and duration of use/exposure</b>	: Avoid carrying out activities involving exposure for more than 4 hour
<b>Other conditions affecting workers exposure</b>	: Assumes use at not more than 20°C above ambient temperature.
<b>Technical conditions and measures at process level (source) to prevent release</b>	: Store substance within a closed system.
<b>Ventilation control measures</b>	: Provide enhanced general ventilation by mechanical means. Provide extract ventilation to points where emissions occur.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Advice on general occupational hygiene</b>	: Assumes a good basic standard of occupational hygiene is implemented

**Section 3 - Exposure estimation and reference to its source**

<b>Website:</b>	: Not applicable.
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**Exposure estimation and reference to its source - Environment: 1: General exposures**

**Exposure assessment (environment):** : Hydrocarbon Block Method (Petrorisk)  
**Exposure estimation and reference to its source** : ESVOC SPERC 4.21a.v1

**Exposure estimation and reference to its source - Workers: 2: General measures applicable to all activities**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 3: Bulk transfers**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 4: Bulk weighing**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 5: Small scale weighing**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 6: Additive premixing**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 7: Additive**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 8: Calendering (including Banburys)**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 9: Production of articles by dipping and pouring**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 10: Extrusion and masterbatching**

**Exposure assessment (human):** : Not applicable.  
**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 11: Injection moulding of articles**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 12: Finishing operations**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 13: Equipment maintenance**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Exposure estimation and reference to its source - Workers: 14: Storage**

**Exposure assessment (human):** : Not applicable.

**Exposure estimation and reference to its source** : Not applicable.

**Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

<b>Environment</b>	: Further details on scaling and control technologies are provided in SPERC factsheet. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
<b>Health</b>	: Available hazard data do not support the need for a DNEL to be established for other health effects. Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Risk management measures are based on qualitative risk characterisation. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

**Additional good practice advice beyond the REACH CSA**

<b>Environment</b>	: Not available.
<b>Health</b>	: Not available.

BUTYLENE