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

1.1 Product identifier
Product name: Refinery Gas Test Sample, Part Number 5080-8755
Part no.: 5080-8755

1.2 Relevant identified uses of the substance or mixture and uses advised against
Material uses: Reagents and Standards for Analytical Chemistry Laboratory Use
A pressurized gas cylinder containing 1 liter

1.3 Details of the supplier of the safety data sheet
Agilent Technologies LDA UK Ltd.
5500 Lakeside Cheadle Royal Business Park,
Cheadle, Cheshire, SK8 3GR
United Kingdom
Tel: +44 (0) 345 712 5292

e-mail address of person responsible for this SDS
pdl-msds_author@agilent.com

1.4 Emergency telephone number
Emergency telephone number (with hours of operation): CHEMTREC®: +(44)-870-8200418

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition: Mixture
Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

<table>
<thead>
<tr>
<th>Number</th>
<th>Hazard</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>H220</td>
<td>FLAMMABLE GASES</td>
<td>Category 1A</td>
</tr>
<tr>
<td>H280</td>
<td>GASES UNDER PRESSURE</td>
<td>Compressed gas</td>
</tr>
<tr>
<td>H360D</td>
<td>REPRODUCTIVE TOXICITY</td>
<td>Category 1A</td>
</tr>
<tr>
<td>H373</td>
<td>SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE</td>
<td>Category 2</td>
</tr>
<tr>
<td>H412</td>
<td>LONG-TERM (CHRONIC) AQUATIC HAZARD</td>
<td>Category 3</td>
</tr>
</tbody>
</table>

Percentage of the mixture consisting of ingredient(s) of unknown acute dermal toxicity: 1 - 10%
Percentage of the mixture consisting of ingredient(s) of unknown acute inhalation toxicity: 1 - 10%
Percentage of the mixture consisting of ingredient(s) of unknown acute oral toxicity: 1 - 10%
Contains 5% of components with unknown hazards to the aquatic environment

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:

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SECTION 2: Hazards identification

Signal word: Danger

Hazard statements:
H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.
H360D - May damage the unborn child.
H373 - May cause damage to organs through prolonged or repeated exposure.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements:
Prevention: P201 - Obtain special instructions before use.
P280 - Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

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

Storage: P403 - 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: - carbon monoxide

Supplemental label elements: Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles: Restricted to professional users.

2.3 Other hazards
Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII: This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

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.

SECTION 3: Composition/information on ingredients

3.2 Mixtures: Mixture

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Identifiers</th>
<th>%</th>
<th>Regulation (EC) No. 1272/2008 [CLP]</th>
<th>Type</th>
</tr>
</thead>
</table>

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**SECTION 3: Composition/information on ingredients**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Type</th>
<th>EC:</th>
<th>CAS:</th>
<th>Index:</th>
<th>Limit</th>
<th>Flammable Liquid</th>
<th>Explosion</th>
<th>Toxicity</th>
<th>Aquatic Chronic</th>
<th>EUH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopentane</td>
<td>[1] Substance classified with a health or environmental hazard</td>
<td>201-142-8</td>
<td>78-78-4</td>
<td>601-085-00-2</td>
<td>≤3</td>
<td>Flam. Liq. 1, H224</td>
<td>STOT SE 3</td>
<td>H336</td>
<td>Aquatic Chronic 2, H411</td>
<td>EUH066</td>
</tr>
</tbody>
</table>

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

**Type**

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

**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 it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. 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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

- **Skin contact**: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. 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. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

- **Ingestion**: As this product is a gas, 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**
SECTION 4: First aid measures

Potential acute health effects

Eye contact: Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation: At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen.

Skin contact: Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact: No specific data.

Inhalation: Adverse symptoms may include the following:
- Reduced foetal weight
- Increase in foetal deaths
- Skeletal malformations

Skin contact: Adverse symptoms may include the following:
- Reduced foetal weight
- Increase in foetal deaths
- Skeletal malformations

Ingestion: Adverse symptoms may include the following:
- Reduced foetal weight
- Increase in foetal deaths
- Skeletal malformations

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments: No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media: Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media: None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture: 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. This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products: Decomposition products may include the following materials:
- Carbon dioxide
- Carbon monoxide
- Nitrogen oxides

5.3 Advice for firefighters

Special precautions for fire-fighters: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. 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. 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.
### SECTION 5: Firefighting measures

**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. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

**Additional information**
- Dangerous fire and explosion risk.

### SECTION 6: Accidental release measures

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

**For non-emergency personnel**
- Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**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. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

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

**Methods for cleaning up**
- Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

#### 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.

### SECTION 7: Handling and storage

#### 7.1 Precautions for safe handling

**Protective measures**
- Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe gas. Avoid release to the environment. 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.

**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.

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

**Storage**
- 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**

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SECTION 7: Handling and storage

<table>
<thead>
<tr>
<th>Category</th>
<th>Notification and MAPP threshold</th>
<th>Safety report threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>10 tonne</td>
<td>50 tonne</td>
</tr>
</tbody>
</table>

7.3 Specific end use(s)

Recommendations: Industrial applications, Professional applications.

Industrial sector specific solutions: Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Exposure limit values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>EH40/2005 WELs (United Kingdom (UK), 1/2020). TWA: 23 mg/m³ 8 hours. TWA: 20 ppm 8 hours. STEL: 100 ppm 15 minutes. STEL: 117 mg/m³ 15 minutes.</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>EH40/2005 WELs (United Kingdom (UK), 1/2020). STEL: 27400 mg/m³ 15 minutes. STEL: 15000 ppm 15 minutes. TWA: 5000 ppm 8 hours. TWA: 9150 mg/m³ 8 hours.</td>
</tr>
<tr>
<td>Butane</td>
<td>EH40/2005 WELs (United Kingdom (UK), 1/2020). STEL: 1810 mg/m³ 15 minutes. STEL: 750 ppm 15 minutes. TWA: 1450 mg/m³ 8 hours. TWA: 600 ppm 8 hours.</td>
</tr>
<tr>
<td>Isopentane</td>
<td>EH40/2005 WELs (United Kingdom (UK), 1/2020). TWA: 600 ppm 8 hours. TWA: 1800 mg/m³ 8 hours.</td>
</tr>
<tr>
<td>pentane</td>
<td>EH40/2005 WELs (United Kingdom (UK), 1/2020). TWA: 600 ppm 8 hours. TWA: 1800 mg/m³ 8 hours.</td>
</tr>
</tbody>
</table>

Recommended monitoring procedures: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs
SECTION 8: Exposure controls/personal protection

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Type</th>
<th>Exposure</th>
<th>Value</th>
<th>Population</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>DNEL</td>
<td>Long term Inhalation</td>
<td>23 mg/m³</td>
<td>Workers</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Inhalation</td>
<td>23 mg/m³</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Short term Inhalation</td>
<td>35 mg/m³</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Short term Inhalation</td>
<td>117 mg/m³</td>
<td>Workers</td>
<td>Local</td>
</tr>
<tr>
<td>Isopentane</td>
<td>DNEL</td>
<td>Long term Oral</td>
<td>214 mg/kg bw/day</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>214 mg/kg bw/day</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>432 mg/kg bw/day</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term</td>
<td>643 mg/m³</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Inhalation</td>
<td>3000 mg/m³</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Oral</td>
<td>214 mg/kg bw/day</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>214 mg/kg bw/day</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>432 mg/kg bw/day</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term</td>
<td>643 mg/m³</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Inhalation</td>
<td>3000 mg/m³</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td>Pentane</td>
<td>DNEL</td>
<td>Long term Oral</td>
<td>214 mg/kg bw/day</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>214 mg/kg bw/day</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>432 mg/kg bw/day</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term</td>
<td>643 mg/m³</td>
<td>General population</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Inhalation</td>
<td>3000 mg/m³</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
</tbody>
</table>

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.

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.

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. 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.
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. 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. Refer to European Standard EN 1149 for further information on material and design requirements and test methods.

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: The gas can cause asphyxiation without warning by replacing the oxygen in the air. Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. If operating conditions cause high gas concentrations to be produced or any recommended or statutory exposure limit is exceeded, use an air-fed respirator or self-contained breathing apparatus. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

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

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.
- Colour: Colourless.
- Odour: Odourless.
- Odour threshold: Not available.
- Melting point/freezing point: -259°C
- Initial boiling point and boiling range: -253°C (-423.4°F)
- Flammability (solid, gas): Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat. Dangerous fire and explosion risk.
- Upper/lower flammability or explosive limits: Lower: 4% Upper: 74.2%
- Flash point: Not applicable.
- Auto-ignition temperature: 570°C (1058°F)
- Decomposition temperature: Not available.
- pH: Not applicable.
- Viscosity: Not applicable.
- Solubility(ies): Not available.
- Partition coefficient: n-octanol/water: Not available.
- Vapour pressure: Not available.
- Evaporation rate: Not available.
- Relative density: Not applicable.
- Vapour density: 0.07 [Air = 1]

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SECTION 9: Physical and chemical properties

Explosive properties: Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and oxidising materials.

Oxidising properties: Not available.

Particle characteristics
Median particle size: Not applicable.

No additional information.

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. Do not allow gas to accumulate in low or confined areas.

10.5 Incompatible materials: May react or be incompatible with oxidising materials.

Reactive or incompatible with the following materials: acids and alkalis.

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

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>LC50 Inhalation Gas.</td>
<td>Rat</td>
<td>1900 mg/m³</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LC50 Inhalation Gas.</td>
<td>Rat</td>
<td>1807 ppm</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LC50 Inhalation Vapour</td>
<td>Rat</td>
<td>280000 mg/m³</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat - Male, Female</td>
<td>&gt;2000 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>LC50 Inhalation Vapour</td>
<td>Rat</td>
<td>364 g/m³</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat - Male, Female</td>
<td>&gt;2000 mg/kg</td>
<td>-</td>
</tr>
</tbody>
</table>

Acute toxicity estimates

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Oral (mg/kg)</th>
<th>Dermal (mg/kg)</th>
<th>Inhalation (gases) (ppm)</th>
<th>Inhalation (vapours) (mg/l)</th>
<th>Inhalation (dusts and mists) (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery Gas Test Sample, Part Number 5080-8755</td>
<td>N/A</td>
<td>N/A</td>
<td>36140</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>N/A</td>
<td>N/A</td>
<td>1807</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Isopentane</td>
<td>N/A</td>
<td>N/A</td>
<td>280</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Pentane</td>
<td>N/A</td>
<td>N/A</td>
<td>364</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Irritation/Corrosion

Conclusion/Summary: Not available.

Sensitiser

Conclusion/Summary: Not available.

Mutagenicity
SECTION 11: Toxicological information

Conclusion/Summary: Not available.

Carcinogenicity
Conclusion/Summary: Not available.

Reproductive toxicity
Conclusion/Summary: Not available.

Teratogenicity
Conclusion/Summary: Not available.

Specific target organ toxicity (single exposure)

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Category</th>
<th>Route of exposure</th>
<th>Target organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopentane</td>
<td>Category 3</td>
<td>-</td>
<td>Narcotic effects</td>
</tr>
<tr>
<td>pentane</td>
<td>Category 3</td>
<td>-</td>
<td>Narcotic effects</td>
</tr>
<tr>
<td>Ethylene</td>
<td>Category 3</td>
<td>-</td>
<td>Narcotic effects</td>
</tr>
</tbody>
</table>

Specific target organ toxicity (repeated exposure)

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Category</th>
<th>Route of exposure</th>
<th>Target organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>Category 1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Aspiration hazard

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopentane</td>
<td>ASPIRATION HAZARD - Category 1</td>
</tr>
<tr>
<td>pentane</td>
<td>ASPIRATION HAZARD - Category 1</td>
</tr>
</tbody>
</table>

Information on likely routes of exposure

Routes of entry anticipated: Inhalation.

Potential acute health effects

Inhalation: At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen.

Ingestion: As this product is a gas, refer to the inhalation section.

Skin contact: Contact with rapidly expanding gas may cause burns or frostbite.

Eye contact: Contact with rapidly expanding gas may cause burns or frostbite.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: Adverse symptoms may include the following:
- Reduced foetal weight
- Increase in foetal deaths
- Skeletal malformations

Ingestion: Adverse symptoms may include the following:
- Reduced foetal weight
- Increase in foetal deaths
- Skeletal malformations

Skin contact: Adverse symptoms may include the following:
- Reduced foetal weight
- Increase in foetal deaths
- Skeletal malformations

Eye contact: No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects: Not available.

Potential delayed effects: Not available.
SECTION 11: Toxicological information

**Potential immediate effects**: Not available.

**Potential delayed effects**: Not available.

**Potential chronic health effects**

- **General**: May cause damage to organs through prolonged or repeated exposure.
- **Carcinogenicity**: No known significant effects or critical hazards.
- **Mutagenicity**: No known significant effects or critical hazards.
- **Reproductive toxicity**: May damage the unborn child.

SECTION 12: Ecological information

### 12.1 Toxicity

**Conclusion/Summary**: Not available.

### 12.2 Persistence and degradability

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Test</th>
<th>Result</th>
<th>Dose</th>
<th>Inoculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopentane</td>
<td>OECD 301F Ready Biodegradability - Manometric Respirometry Test</td>
<td>71.43 % - Readily - 28 days</td>
<td>25 to 33 mg/l</td>
<td>-</td>
</tr>
<tr>
<td>Pentane</td>
<td>OECD 301F Ready Biodegradability - Manometric Respirometry Test</td>
<td>87 % - Readily - 28 days</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### 12.3 Bioaccumulative potential

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogP_{ow}</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>0.83</td>
<td>-</td>
<td>low</td>
</tr>
<tr>
<td>Isopentane</td>
<td>3</td>
<td>171</td>
<td>low</td>
</tr>
<tr>
<td>Pentane</td>
<td>3.45</td>
<td>171</td>
<td>low</td>
</tr>
<tr>
<td>Ethylene</td>
<td>1.13</td>
<td>-</td>
<td>low</td>
</tr>
</tbody>
</table>

### 12.4 Mobility in soil

- **Soil/water partition coefficient (K_{oc})**: Not available.
- **Mobility**: Not available.

### 12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

### 12.6 Other adverse effects

No known significant effects or critical hazards.
SECTION 13: Disposal considerations

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**

**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.

**Special precautions**

This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

SECTION 14: Transport information

<table>
<thead>
<tr>
<th></th>
<th>ADR/RID</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>14.1 UN number</strong></td>
<td>UN1954</td>
<td>UN1954</td>
<td>UN1954</td>
</tr>
<tr>
<td><strong>14.2 UN proper shipping name</strong></td>
<td>COMPRESSED GAS, FLAMMABLE, N.O.S. (Hydrogen, Ethane, Isobutane)</td>
<td>COMPRESSED GAS, FLAMMABLE, N.O.S. (Hydrogen, Ethane, Isobutane)</td>
<td>Compressed gas, flammable, n.o.s. (Hydrogen, Ethane, Isobutane)</td>
</tr>
<tr>
<td><strong>14.3 Transport hazard class(es)</strong></td>
<td>2</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>14.4 Packing group</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>14.5 Environmental hazards</strong></td>
<td>No.</td>
<td>No.</td>
<td>No.</td>
</tr>
</tbody>
</table>

**Additional information**

**ADR/RID**

Hazard identification number 23
Limited quantity 0
Special provisions 274, 662, 392
Tunnel code (B/D)

**IMDG**

Emergency schedules F-D, S-U
Special provisions 274, 392

**IATA**

Special provisions A1, A807

**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 available.
SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (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.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>EC number</th>
<th>CAS number</th>
<th>Restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery Gas Test Sample, Part Number 5080-8755</td>
<td>200-857-2</td>
<td>75-28-5</td>
<td>30</td>
</tr>
<tr>
<td>isobutane</td>
<td>211-128-3</td>
<td>630-08-0</td>
<td>28, 29</td>
</tr>
<tr>
<td>carbon monoxide</td>
<td>203-448-7</td>
<td>106-97-8</td>
<td>30</td>
</tr>
<tr>
<td>butane</td>
<td>201-142-8</td>
<td>78-78-4</td>
<td>28, 29</td>
</tr>
<tr>
<td>2-methylbutane</td>
<td>203-692-4</td>
<td>109-66-0</td>
<td>3</td>
</tr>
<tr>
<td>pentane</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Label: Restricted to professional users.

Other EU regulations

Industrial emissions (integrated pollution prevention and control)
Air
Ozone depleting substances (1005/2009/EU)
Not listed.

Prior Informed Consent (PIC) (649/2012/EU)
Not listed.

Persistent Organic Pollutants
Not listed.

Seveso Directive
This product is controlled under the Seveso Directive.

Danger criteria

Category
P2

National regulations

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>List name</th>
<th>Name on list</th>
<th>Classification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>butane</td>
<td>UK Occupational Exposure Limits EH40 - WEL</td>
<td>butane</td>
<td>Carc.</td>
<td>-</td>
</tr>
</tbody>
</table>

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals
Not listed.

Montreal Protocol
Not listed.

Stockholm Convention on Persistent Organic Pollutants
Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)
SECTION 15: Regulatory information

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals
Not listed.

Inventory list

<table>
<thead>
<tr>
<th>Country</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Canada</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>China</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Europe</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Japan</td>
<td>Japan inventory (CSCL): All components are listed or exempted.</td>
</tr>
<tr>
<td>Japan</td>
<td>Japan inventory (ISHL): All components are listed or exempted.</td>
</tr>
<tr>
<td>New Zealand</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Philippines</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Taiwan</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Thailand</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Turkey</td>
<td>Not determined.</td>
</tr>
<tr>
<td>United States</td>
<td>All components are active or exempted.</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>All components are listed or exempted.</td>
</tr>
</tbody>
</table>

15.2 Chemical safety assessment

This product contains substances for which Chemical Safety Assessments might still be required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms

- ATE = Acute Toxicity Estimate
- CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
- DMEL = Derived Minimal Effect Level
- DNEL = Derived No Effect Level
- EUH statement = CLP-specific Hazard statement
- N/A = Not available
- PBT = Persistent, Bioaccumulative and Toxic
- PNEC = Predicted No Effect Concentration
- RRN = REACH Registration Number
- vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

<table>
<thead>
<tr>
<th>Classification</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flam. Gas 1A, H220</td>
<td>On basis of test data</td>
</tr>
<tr>
<td>Press. Gas (Comp.), H280</td>
<td>On basis of test data</td>
</tr>
<tr>
<td>Repr. 1A, H360D</td>
<td>Calculation method</td>
</tr>
<tr>
<td>STOT RE 2, H373</td>
<td>Calculation method</td>
</tr>
<tr>
<td>Aquatic Chronic 3, H412</td>
<td>Calculation method</td>
</tr>
</tbody>
</table>

Full text of abbreviated H statements

- H220: Extremely flammable gas.
- H224: Extremely flammable liquid and vapour.
- H225: Highly flammable liquid and vapour.
- H280: Contains gas under pressure; may explode if heated.
- H304: May be fatal if swallowed and enters airways.
- H331: Toxic if inhaled.
- H336: May cause drowsiness or dizziness.
- H360D: May damage the unborn child.
- H372: Causes damage to organs through prolonged or repeated exposure.
- H373: May cause damage to organs through prolonged or repeated exposure.

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Date of previous issue: 03/07/2020
Version: 5
**SECTION 16: Other information**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>5080-8755</td>
<td>Toxic to aquatic life with long lasting effects. Harmful to aquatic life with long lasting effects. Repeated exposure may cause skin dryness or cracking.</td>
</tr>
</tbody>
</table>

**Full text of classifications [CLP/GHS]**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H411</td>
<td>Toxic to aquatic life with long lasting effects.</td>
</tr>
<tr>
<td>H412</td>
<td>Harmful to aquatic life with long lasting effects.</td>
</tr>
<tr>
<td>EUH066</td>
<td>Repeated exposure may cause skin dryness or cracking.</td>
</tr>
<tr>
<td>Acute Tox. 3</td>
<td>ACUTE TOXICITY - Category 3</td>
</tr>
<tr>
<td>Aquatic Chronic 2</td>
<td>LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 2</td>
</tr>
<tr>
<td>Aquatic Chronic 3</td>
<td>LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 3</td>
</tr>
<tr>
<td>Asp. Tox. 1</td>
<td>ASPIRATION HAZARD - Category 1</td>
</tr>
<tr>
<td>Flam. Gas 1A</td>
<td>FLAMMABLE GASES - Category 1A</td>
</tr>
<tr>
<td>Flam. Liq. 1</td>
<td>FLAMMABLE LIQUIDS - Category 1</td>
</tr>
<tr>
<td>Flam. Liq. 2</td>
<td>FLAMMABLE LIQUIDS - Category 2</td>
</tr>
<tr>
<td>Press. Gas (Comp.)</td>
<td>GASES UNDER PRESSURE - Compressed gas</td>
</tr>
<tr>
<td>Repr. 1A</td>
<td>REPRODUCTIVE TOXICITY - Category 1A</td>
</tr>
<tr>
<td>STOT RE 1</td>
<td>SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1</td>
</tr>
<tr>
<td>STOT RE 2</td>
<td>SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2</td>
</tr>
<tr>
<td>STOT SE 3</td>
<td>SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE - Category 3</td>
</tr>
</tbody>
</table>

**Notice to reader**

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