1. **IDENTIFICATION**

1.1 **GHS Product Identifier** : Liquefied Petroleum Gas (LPG)

1.2 **Recommended Use**

Restrictions of Use: Process Stream, Process fuel and Sales

1.3 **Supplier’s details**:

Petroleum Development Oman LLC (PDO)
P.O. Box 81
Postal Code 100
Muscat – Sultanate of Oman

Phone Number : +968 24678111

24 hrs Emergency phone number : +968 24675555

2. **HAZARDS IDENTIFICATION**

2.1 **GHS Classification of the substance or mixture**:

<table>
<thead>
<tr>
<th>Hazard Classes / Hazard Categories</th>
<th>Hazard Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable gas, Category 1</td>
<td>H220</td>
</tr>
</tbody>
</table>

2.2 **GHS Label Elements**

**Symbol(s)** :

![Flame symbol]

**Signal Words** : Danger

**Hazard Statement**

PHYSICAL HAZARDS:

H220: Extremely flammable gas.

HEALTH HAZARDS:

Asphyxiation. CNS Impair. Narcosis and respiratory tract irritation

ENVIRONMENTAL HAZARDS:

Not classified as an environmental hazard under GHS criteria.
Safety Data Sheet (SDS)

GHS 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/sparks/open flames/hot surfaces. - No smoking.
- P243: Take precautionary measures against static discharge.
- P260: Do not breathe dust/fume/gas/mist/vapors/spray.
- P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response:
- P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
- P381: Eliminate all ignition sources if safe to do so.

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

Disposal:
- P501: Dispose of contents/container to appropriate waste site or reclaimed in accordance with local/regional/national/international regulations.

Additional Information:
- This product is intended for use in closed systems only.

Other Hazards which do not result in classification:
- Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire.
- Vapours are heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger.
- High gas concentrations will displace available oxygen from the air; Unconsciousness and death may occur suddenly from lack of oxygen.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance Description:
- A combination of hydrocarbons produced by the distillation of crude oil.

3.2 Mixtures:

<table>
<thead>
<tr>
<th>Name</th>
<th>Product Identifier</th>
<th>%</th>
<th>GHS classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquefied Petroleum Gas</td>
<td>(CAS No.) 68476-85-7</td>
<td>100</td>
<td>Simple Asphy. Flam. Gas 1, H220</td>
</tr>
<tr>
<td>89.65% (i+n)Butane (CAS No.)</td>
<td>106-97-8 / 9.44% Propane (CAS No.)</td>
<td></td>
<td>74-98-6</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

4.1 Description of necessary first-aid measures

First-aid measures general: Never give anything by mouth to an unconscious person. If exposed or concerned: Get medical advice/attention

Inhalation: Obtain medical attention immediately. Remove victim to an open air and ventilated area and provide artificial respiration or CPR if needed.

Skin Contact: Do not remove clothing that adheres to skin due to freezing. In the event of frostbite, slowly warm the exposed area by rinsing with warm water. Otherwise: Obtain medical treatment immediately. Contaminated clothing may be a fire hazard and therefore should be soaked with water before being removed. Loosen tight clothing. Keep warm and at rest.

Eye Contact: DO NOT DELAY. Obtain medical treatment immediately. Remove contact lenses, if present and easy to do. Continue rinsing. Flush eye with copious quantities of water.

Ingestion: In the unlikely event of ingestion, obtain medical attention immediately.

4.2 Most Important Symptoms/Effect acute & delayed

High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued exposure may result in unconsciousness and/or death.

4.3 Indication of Immediate medical attention and special treatment needed, if necessary

Treat symptomatically. Administer oxygen if necessary.

5. FIRE FIGHTING MEASURES

5.1 Suitable Extinguishing Media

Shut off supply. If not possible and no risk to surroundings, let the fire burn itself out. Use foam, water fog for major fires. Use dry chemical powder, carbon dioxide, sand or earth for minor fires.

5.2 Specific hazards arising from the chemical

Hazardous combustion products may include: Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds. Sustained fire attack on vessels may result in a Boiling Liquid Expanding Vapour Explosion (BLEVE). Contents are under pressure and can explode when Exposed to heat or flames. The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Safety Data Sheet (SDS)

5.3 Special protective actions for fire-fighters: Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards.

Additional Advice: Firefighters must use full bunker gear including certified-approved positive-pressure self-contained breathing apparatus (SCBA) to protect against potential hazardous combustion and decomposition products. Do not enter fire area without proper protective equipment, including respiratory protection.

6. ACCIDENTAL RELEASE MEASURES
Observe the relevant local and international regulations. Evacuate the area of all non-essential personnel. Avoid contact with skin, eyes and clothing. Ventilate contaminated area thoroughly.

6.1 Personal Precautions, Protective Equipment and Emergency Procedures: Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area and evacuate all personnel. Attempt to disperse the gas or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Monitor area with combustible gas meter. Test atmosphere for flammable gas concentrations to ensure safe working conditions before personnel are allowed to enter the area.

6.2 Environmental Precautions: Avoid release to the environment.

6.3 Methods and Material for Containment and Clean Up: Allow to evaporate. Attempt to disperse the gas or to direct its flow to a safe location, for example by using fog sprays.

Additional Advice: Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Vapour may form an explosive mixture with air. Risk of explosion. Inform the emergency services if product enters surface water drains.

7. HANDLING AND STORAGE

General Precautions: Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Air-dry contaminated clothing in a well-ventilated area before laundering. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Take precautionary measures against static discharges.
Safety Data Sheet (SDS)

7.1 Precautions for Safe Handling

This product can create a low temperature exposure hazard when released as a liquid. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Avoid prolonged or repeated contact with skin. Electrostatic charges may be generated during handling. Electrostatic discharge may cause fire. Earth all equipment. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.

7.2 Conditions for Safe storage, including any incompatibilities

Store only in purpose-designed, appropriately labeled pressure vessels or cylinders. Must be stored in a well-ventilated area, away from sunlight, ignition sources and other sources of heat. Do not store near cylinders containing compressed oxygen or other strong oxidizers. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Container Advice

Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.

Additional information

This product is intended for use in closed systems only. Ensure that all local regulations regarding handling and storage facilities are followed.

8. EXPOSURE CONTROLS/PERSOAL PROTECTION

These Threshold Limit Values (TLVs) and Biological Exposure Index (BEIs) are provided by the American Conference of Governmental Industrial Hygienists (ACGIH 2016). The reference here is only for information purposes.

8.1 Control Parameters

8.1.1 Occupational Exposure Limits (OEL)

<table>
<thead>
<tr>
<th>Substance</th>
<th>Source</th>
<th>Type</th>
<th>ppm</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquefied Petroleum Gas</td>
<td>ACGIH</td>
<td>-</td>
<td>-</td>
<td>Asphyxia</td>
</tr>
<tr>
<td>Butane</td>
<td>ACGIH</td>
<td>STEL</td>
<td>1000</td>
<td>CNS impair</td>
</tr>
<tr>
<td>Propane</td>
<td>ACGIH</td>
<td>-</td>
<td>-</td>
<td>Asphyxia</td>
</tr>
</tbody>
</table>

8.1.2 Biological Exposure Index (BEI)

<table>
<thead>
<tr>
<th>Substance</th>
<th>Determinant</th>
<th>Sampling Time</th>
<th>BEI</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquefied Petroleum Gas</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Butane</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Propane</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

8.2 Appropriate

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local
Safety Data Sheet (SDS)

Enginee-ring Controls circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Exhaust emission systems should be designed in accordance with local conditions; the air should always be moved away from the source of vapour generation and the person working at this point. Firewater monitors and deluge systems are recommended. Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping. Define procedures for safe handling and maintenance of controls. Educate and train workers in the hazards and control measures relevant to normal activities associated with this product. Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation. Drain down system prior to equipment break-in or maintenance.

8.3 Individual Protection Measures, such as personal protective equipment (PPE)

Eye Protection : Chemical goggles (chemical monogoggles) or safety glasses in accordance to certified standards.

Hand Protection : Insulate gloves in accordance to certified standards.

Protective Clothing : Chemical and cold resistant gloves/gauntlets, boots, and apron.

Respiratory Protection : A certified-approved self-contained breathing apparatus (SCBA) operated in a pressure demand or other positive pressure mode or equivalent respirator should be used in situations of oxygen deficiency (concentration less than 19.5%), unknown exposure concentrations, conditions that are immediately dangerous to life or health (IDLH), or when exposure levels are above ACGIH exposure limits.

Thermal Hazards : Wear suitable protective clothing.

Monitoring Methods : Gas detectors should be used when flammable gases/vapours may be released.

Environmental exposure controls : Local guidelines on emission limits for gas substances must be observed for the discharge of exhaust air containing gases. Take appropriate measures to fulfill the requirements of relevant environmental protection legislation.
9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odour</td>
<td>Distinctive and unpleasant if stencched, odourless if unstencched.</td>
</tr>
<tr>
<td>Odour threshold</td>
<td>Data not available (for H₂S 0.47 ppb)</td>
</tr>
<tr>
<td>pH</td>
<td>Data not available</td>
</tr>
<tr>
<td>Melting Point (Butane)</td>
<td>-138.3°C</td>
</tr>
<tr>
<td>Initial Boiling Point and Boiling Range</td>
<td>-0.5°C to – 42.1°C</td>
</tr>
<tr>
<td>Boiling Point (Butane)</td>
<td>-0.5°C</td>
</tr>
<tr>
<td>Flash point</td>
<td>ca. -104 to -60 °C</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Data not available</td>
</tr>
<tr>
<td>Flammability</td>
<td>Extremely Flammable gas</td>
</tr>
<tr>
<td>Upper / lower Flammability or Explosion limits</td>
<td>1.9% to 8.5% (Butane)</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>Typical 380 – 840 kPa</td>
</tr>
<tr>
<td>Vapor density (air=1)</td>
<td>&gt; 1.5</td>
</tr>
<tr>
<td>Relative Density @ 15°C; air =1</td>
<td>1.965</td>
</tr>
<tr>
<td>Water solubility</td>
<td>Slightly soluble.</td>
</tr>
<tr>
<td>Solubility in other solvents</td>
<td>Data not available</td>
</tr>
<tr>
<td>n-octanol/water partition coefficient (log Pow)</td>
<td>ca. 2.3 – 2.8</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>187°C (Butane)</td>
</tr>
<tr>
<td>Percent Volatiles</td>
<td>100% (by gas volume)</td>
</tr>
<tr>
<td>Dynamic and Kinematic viscosity</td>
<td>Data not available</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

10.1 Reactivity: No hazardous reaction is expected when handled and stored according to provisions.

10.2 Chemical Stability: Extremely flammable gas

10.3 Possibility of Hazardous reaction: No hazardous reaction is expected when handled and stored according to provisions


10.5 Incompatible Materials: Strong oxidising agents.

10.6 Hazardous Decomposition Products: Hazardous decomposition products are not expected to form during normal storage.
11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological effects

Basis for Assessment: Information given is based on product data, knowledge of the components and the toxicology of similar products. Unless indicated otherwise, the data presented is representative of individual component(s).

<table>
<thead>
<tr>
<th>Substance</th>
<th>Acute Oral Toxicity (LD50 oral rat)</th>
<th>Acute Dermal Toxicity (LD50 dermal rabbit)</th>
<th>Acute Inhalation Toxicity (LC50 inhalation rat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butane</td>
<td>-</td>
<td>-</td>
<td>658 mg/l (exposure time: 4 h)</td>
</tr>
<tr>
<td>Propane</td>
<td>-</td>
<td>-</td>
<td>382000 ppmV/4h</td>
</tr>
</tbody>
</table>

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitisation: Not classified.

Germ Cell Mutagenicity: Not classified

Carcinogenicity: Not classified

Reproductive and Developmental Toxicity: No classified

Specific target organ toxicity - single exposure: Central nervous system

Aspiration Hazard: Not classified

Information on the likely routes of Exposure: Exposure may occur via inhalation, skin or eye contact.

Symptoms related to the physical, chemical and toxicological characteristics: See Table 11.1
12. ECOLOGICAL INFORMATION

Basis for Assessment : Ecotoxicological data have not been determined specifically for this product. Information given is based on knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

12.1 Toxicity
Acute Toxicity : Physical properties indicate that petroleum gases will rapidly volatilise from the aquatic environment and that acute and chronic effects would not be observed in practice. Practically non toxic: LL/EL/IL50 > 100 mg/l LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.

12.2 Persistence and degradability : Expected to be readily biodegradable. Oxidises rapidly by photochemical reactions in air.

12.3 Bioaccumulative Potential : Not expected to bioaccumulate significantly.

Table 12.1

<table>
<thead>
<tr>
<th>Substance</th>
<th>Log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butane (106-97-8)</td>
<td>2.89</td>
</tr>
<tr>
<td>Propane (74-98-6)</td>
<td>2.3</td>
</tr>
</tbody>
</table>

12.4 Mobility in Soil : Due to the extreme volatility of petroleum gases, air is the only environmental compartment in which they will be found. In air, these hydrocarbons undergo photo-degradation by reaction with hydroxyl radicals with half-lives ranging from 3.2 days for n-butane to 7 days for propane.

12.5 Other Adverse Effects : Avoid release to the environment.

Table 11.1

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>Acute Effects</th>
<th>Chronic Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propane, Butane</td>
<td>Asphyxiation. Headaches, giddiness, nausea, cold burns (frostbite) from liquefied gas</td>
<td>None known</td>
</tr>
</tbody>
</table>
13. DISPOSAL CONSIDERATION

13.1 Disposal methods : This material is a gas and would not typically be managed as a waste.
Disposal Containers and methods : Not applicable

14. TRANSPORT INFORMATION

Land transport  ADR / RID
14.1 UN number : UN 1965
14.2 UN proper shipping name : hydrocarbon gas mixture, liquefied, n.o.s. (lpg)
14.3 Transport hazard class(es) : Class 2  Division 1
14.4 Packing group : I
Danger label (primary risk) : Flammable gas
14.5 Environmental hazards : No

Sea transport (IMDG Code)
14.1 UN number : UN 1965
14.2 UN proper shipping name : hydrocarbon gas mixture, liquefied, n.o.s. lpg
14.3 Transport hazard class(es) : Class 2  Division 1
14.4 Packing group : I
14.5 Environmental hazards : No

14.6 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Pollution Category : Not applicable.
Ship Type : Not applicable.
Product Name : Not applicable.
Special Precaution : Not applicable.
Additional Information : MARPOL Annex 1 rules apply for bulk shipments by sea.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this product.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
Other regulator Information Authorisations and/or restrictions on use : Product is not subject to Authorization under REACH.
Safety Data Sheet (SDS)

15.2 Chemical Safety Assessment : Not applicable.

16. OTHER INFORMATION

GHS Hazard Statement

H220 Extremely flammable gas

Additional Information : This product is exempt from the obligation to register under REACH in accordance with Article 2(7)(b).
Further Information : This product is intended for use in close systems only.

Abbreviations and Acronyms :

Flam. Gas = Flammable Gas
Asp. Tox. = Aspiration hazard
ACGIH = American Conference of Governmental Industrial Hygienists
ADR = European Agreement concerning the International Carriage of Dangerous Goods by Road
BEI = Biological Exposure Index
Br = Bromium
CAS = Chemical Abstracts Service
Cl = Chlore
CLP = Classification Packaging and Labelling
CPR = Cardio Pulmonary Resuscitation
EC = European Commission
EL50 = Effective Loading fifty
EU = European Union
F = Fluor
GHS = Globally Harmonized System of Classification and Labeling of Chemicals
I = Iodine
IDHL = Immediate Danger for Health and Life
IMDG = International Maritime Dangerous Goods
LC50 = Lethal Concentration fifty
LDS50 = Lethal Dose fifty per cent.
MARPOL = International Convention for the Prevention of Pollution From Ships
OEL = Occupational Exposure Limit
PBT = Persistent, Bioaccumulative and Toxic
PPE = Personal Protective Equipment
REACH = Registration Evaluation And Authorisation Of Chemicals
RID = Regulations Relating to International Carriage of Dangerous Goods by Rail
SCBA = Self Container Breathing Apparatus
SOPEP = Shipboard Oil Pollution Emergency Plan
STEL = Short term exposure limit
TRA = Targeted Risk Assessment
TWA = Time-Weighted Average
UN = United Nations
<table>
<thead>
<tr>
<th>Safety Data Sheet (SDS)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SDS Distribution</strong></td>
<td>The information in this document should be made available to all who may handle the product.</td>
</tr>
<tr>
<td><strong>SDS Version Number</strong></td>
<td>1.0</td>
</tr>
<tr>
<td><strong>SDS Effective Date</strong></td>
<td>17.05.2016</td>
</tr>
<tr>
<td><strong>SDS Revisions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>SDS Regulation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Disclaimer</strong></td>
<td>This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.</td>
</tr>
</tbody>
</table>