

Safety Data Sheet

Safety Data Sheet according to Regulation (EC) No.
1907/2006 (REACH)



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

1.1. Product identifier

Substance name:	Fuel gases, refinery
Safety Data Sheet Number:	817647
REACH Registration Number:	Exempt from REACH registration (Regulation EC 1907/2006)

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

Relevant identified uses	Refinery Stream
Uses advised against	All others

1.3. Details of the supplier of the safety data sheet

Manufacturer/Supplier	Irving Oil Whitegate Refinery Limited Whitegate, Midleton, Co. Cork, Ireland
SDS Information	Email: esds@irvingoil.com

1.4. Emergency telephone number	+ 353 21 4622 200
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SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

CLP Classification (EC No 1272/2008)

H220 - Flammable gases -- Category 1
H280 -- Gases under pressure -- Compressed gas
H332 -- Acute toxicity, Inhalation -- Category 4
H340 -- Germ cell mutagenicity -- Category 1B
H350 -- Carcinogenicity -- Category 1A

2.2. Label elements



DANGER

Extremely flammable gas
Contains gas under pressure. May explode if heated.
Harmful if inhaled
May cause genetic defects
May cause cancer

P201 - Obtain special instructions before use
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
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P410 + P403 - Protect from sunlight. Store in a well-ventilated place

2.3. Other hazards

May contain or release poisonous hydrogen sulfide gas.
May displace oxygen and cause rapid suffocation
Does not meet the criteria for persistent, bioaccumulative and toxic (PBT) or very persistent, very bioaccumulative (vPvB) substances.

SECTION 3: Composition/information on ingredients

3.1. Substances

Chemical Name	CASRN	EINECS	REACH Registration No.	Concentration ¹	Classification ²
Fuel gases, refinery	68308-27-0	269-640-8	01-2119485582-30	100	H220,H280,H332,H340,H350
Hydrogen sulfide	7783-06-4	231-977-3	Not applicable	<1	H220,H330,H400
Benzene	71-43-2	200-753-7	01-2119447106-44	<0.2	H225,H350,H340,H372,H304,H319,H315

¹ All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

² Regulation EC 1272/2008.

SECTION 4: First aid measures

4.1. Description of first aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: First aid is not normally required. However, it is good practise to wash any chemical from the skin.

Inhalation: Immediately move victim away from exposure and into fresh air in a position comfortable for breathing. If respiratory symptoms or other symptoms of exposure develop, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion: This material is a gas under normal atmospheric conditions and ingestion is unlikely.

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

This material contains hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odour may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

Light hydrocarbon gases are simple asphyxiants and can cause anesthetic effects at high concentrations. Symptoms of overexposure, which are reversible if exposure is stopped, can include shortness of breath, drowsiness, headaches, confusion, decreased coordination, visual disturbances and vomiting. Continued exposure can lead to hypoxia (inadequate oxygen), rapid breathing, cyanosis (bluish discoloration of the skin), numbness of the extremities, unconsciousness and death.

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

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. Amyl nitrite inhalers (found in the cyanide antidote kit) can be used for 30 seconds every minute until an I.V. line is established. For adults the dose is 10 mL of a 3% NaNO₂ solution (0.5 gm NaNO₂ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anaemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic

potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Dry chemical or carbon dioxide is recommended. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

5.2. Special hazards arising from the substance or mixture

Unusual Fire & Explosion Hazards: Extremely flammable gas Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe) Vapours may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapour/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulphur may also be formed.

5.3. Special protective actions for fire-fighters

For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8) Isolate the hazard area and deny entry to unnecessary and unprotected personnel Stop spill/release if it can be done safely If this cannot be done, allow fire to burn Move undamaged containers from immediate hazard area if it can be done safely Stay away from ends of container Water spray may be useful in minimizing or dispersing vapours and to protect personnel Cool equipment exposed to fire with water, if it can be done safely

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Extremely flammable. Contains poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H₂S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Beware of accumulation of gas in low areas or contained areas, where explosive concentrations may occur. Prevent from entering drains or any place where accumulation may occur. Ventilate area and allow to evaporate. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorised personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

6.2. Environmental precautions

Stop and contain spill/release if it can be done safely. Water spray may be useful in minimizing or dispersing vapours. If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

6.3. Methods and material for containment and cleaning up

Notify relevant authorities in accordance with all applicable regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and

regulations may influence or limit the choice of appropriate actions to be taken.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. May contain or release dangerous levels of hydrogen sulfide. Avoid breathing gas. Use only outdoors or in a well-ventilated area. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely flammable Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes for specific bonding/grounding requirements). Do not enter confined spaces such as tanks or pits without following proper entry procedures.

The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of incomplete combustion products (e.g. carbon monoxide, oxides of sulphur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

7.2. Conditions for safe storage, including any incompatibilities

This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapour space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H₂S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet Country or Committee standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death.

7.3. Specific end use(s)

Refer to supplemental exposure scenarios if attached.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Chemical Name	Occupational Exposure Limits	
	ACGIH	Ireland
Hydrogen sulfide	TWA: 1 ppm STEL: 5 ppm	TWA: 5 ppm TWA: 7 mg/m ³ STEL: 14 mg/m ³ STEL: 10 ppm
Benzene	TWA: 0.5 ppm STEL: 2.5 ppm Skin	TWA: 1 ppm TWA: 3 mg/m ³ STEL: 3 ppm STEL: 9 mg/m ³ Carcinogen Skin

STEL = Short Term Exposure Limit (15 minutes); TWA = Time Weighted Average (8 hours); --- = No Occupational Exposure Limit

Chemical Name	Biological Limit Values	
	ACGIH	European Union
Benzene	S-Phenylmercapturic acid in urine: 25 µg/g creatinine, end of shift (background) t,t-Muconic acid in urine: 500 µg/g creatinine,	---

	end of shift (background)	
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Relevant DNEL and PNEC:

Worker Derived No-Effect Level (DNEL)

Inhalation: 3.2 mg/m³ (DMEL, as benzene)
Dermal: 234 mg/kgbw/day (DMEL, as benzene)

Consumer Derived No-Effect Level (DNEL)

Inhalation: Not applicable
Dermal: Not applicable
Ingestion: Not applicable

Environmental Predicted No-Effect Concentration (PNEC): No information available

8.2. Exposure controls

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye/face protection is not normally required; however, good industrial hygiene practise suggests the use of eye protection that meets or exceeds EN 166 whenever working with chemicals.

Skin/Hand Protection: The use of skin protection is not normally required; however, good industrial hygiene practise suggests the use of gloves or other appropriate skin protection whenever working with chemicals.

Respiratory Protection: An approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection programme that follows recommendations for the selection, use, care and maintenance of respiratory protective devices in EN 529:2005 should be followed whenever workplace conditions warrant a respirator's use.

Environmental Exposure Controls: Refer to Sections 6, 7, 12 and 13.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Data represent typical values and are not intended to be specifications. N/A = Not Applicable; N/D = Not Determined

Appearance:	Colourless
Physical Form:	Compressed Gas
Odour:	Rotten egg / sulphurous
Odour Threshold:	N/D
pH:	N/A
Melting/Freezing Point:	N/D
Initial Boiling Point/Range:	-161.5 to -0.5 °C
Flash Point:	-104 to -60 °C
Evaporation Rate (nBuAc=1):	>1
Flammability (solid, gas):	Extremely flammable
Upper Explosive Limits (vol % in air):	15
Lower Explosive Limits (vol % in air):	1.8
Vapour Pressure:	N/D
Relative Vapour Density (air=1):	≤ 1
Relative Density (water=1):	0.43 - 0.59 @ 25°C
Solubility (ies):	Solubility in water: slight
Partition Coefficient (n-octanol/water) (Kow):	1.09 - 2.8 @ 20°C
Auto-ignition Temperature:	287 - 537 °C
Decomposition Temperature:	N/D
Viscosity:	N/D
Explosive Properties:	N/D
Oxidising Properties:	N/D

9.2. Other information

Pour Point: N/D

SECTION 10: Stability and reactivity

- 10.1. Reactivity Not chemically reactive.
- 10.2. Chemical stability Stable under normal ambient and anticipated conditions of use.
- 10.3. Possibility of hazardous reactions Hazardous reactions not anticipated.
- 10.4. Conditions to avoid Avoid all possible sources of ignition. Heat will increase pressure in the storage tank.
- 10.5. Incompatible materials Avoid contact with acids, aluminium chloride, chlorine, chlorine dioxide, halogens and oxidizing agents.
- 10.6. Hazardous decomposition products Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Harmful if inhaled	Contains poisonous hydrogen sulfide gas. See section 4 for symptoms and effects.	4500 ppm (gas, estimated) (rat)
Dermal	Skin absorption is not anticipated		Not Applicable
Oral	Ingestion is not anticipated		Not Applicable

Aspiration Hazard: Not applicable

Skin Corrosion/Irritation: Not expected to be irritating.

Serious Eye Damage/Irritation: Not expected to be irritating.

Skin Sensitisation: Skin contact is not anticipated.

Respiratory Sensitisation: No information available on the mixture, however none of the components have been classified for respiratory sensitisation (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Single Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Repeated Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Carcinogenicity: May cause cancer. Based on component information.

Germ Cell Mutagenicity: May cause genetic defects. Based on component information.

Reproductive Toxicity: Not expected to cause reproductive toxicity.

Other Comments: High concentrations may reduce the amount of oxygen available for breathing, especially in confined spaces. Hypoxia (inadequate oxygen) during pregnancy may have adverse effects on the developing foetus.

11.2 Information on Hazardous Components

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukaemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Programme and the US-Occupational Safety and Health Administration.

Target Organ(s): Prolonged or repeated exposures to benzene vapours can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anaemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

SECTION 12: Ecological information

12.1. Toxicity

Petroleum gases will readily evaporate from the surface and would not be expected to have significant adverse effects in the aquatic environment.

12.2. Persistence and degradability

The hydrocarbons in this material are expected to be inherently biodegradable. In practise, hydrocarbon gases are not likely to remain in solution long enough for biodegradation to be a significant loss process. Hydrogen sulfide, if present in refinery gas streams, will be rapidly oxidized in water and insoluble sulfides precipitated from water when metallic radicals are present.

12.3. Bioaccumulative potential

Since the log Kow values measured for refinery gas constituents are below 3, they are not regarded as having the potential to bioaccumulate.

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 photodegradation by reaction with hydroxyl radicals with half-lives ranging from 3.2 days for n-butane to 7 days for propane.

12.5. Results of PBT and vPvB assessment

Not a PBT or vPvB substance.

12.6. Other adverse effects

None anticipated.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

European Waste Code: 16 05 04* gases in pressure containers (including halons) containing dangerous substances

This material, if discarded as produced, would be considered as hazardous waste pursuant to Directive 2008/98/EC on hazardous waste, and subject to the provisions of that Directive unless Article 1(5) of that Directive applies.

This code has been assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste generators/producers are responsible for assessing the actual process used when generating the waste and its contaminants in order to assign the proper waste disposal code.

Disposal must be in accordance with Directive 2008/98/EC and other applicable national or regional provisions, and based upon material characteristics at time of disposal. For incineration of waste, follow Directive 2000/76/EC. For landfill of waste, follow Directive 1999/31/EC. Product is suitable for burning in an enclosed controlled burner for fuel value if >5000 BTU, or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Follow Directive 2000/76/EC.

Empty Containers: Container contents should be completely used and containers emptied prior to discard. Empty drums should be properly sealed and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with applicable regulations.

SECTION 14: Transport information

14.1. UN number	UN1964
14.2. UN proper shipping name	HYDROCARBON GAS MIXTURE, COMPRESSED, N.O.S. (METHANE , ETHANE)
14.3. Transport hazard class(es)	2.1
14.4. Packing group	None
14.5. Environmental hazards	This product does not meet the DOT/UN/IMDG/IMO criteria of a marine pollutant
14.6. Special precautions for user	None
14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable

SECTION 15: Regulatory information

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

EC 1272/2008 - Classification, labelling and packaging of substances and mixtures
EN166:2002 Eye Protection
EN 529:2005 Respiratory Protective devices
BS EN 374-1:2003 Protective gloves against chemicals and micro-organisms
Occupational Exposure Limits, Health and Safety Authority
Directive 2008/98/EC (Waste Framework Directive)
Directive 2000/76/EC on incineration of waste
Directive 1999/31/EC on landfill of waste

Export Rating: NLR (No Licence Required)

15.2. Chemical safety assessment

A chemical safety assessment has not been carried out for the substance/mixture.

SECTION 16: Other information

Issue Date:	09-Sep-2016
Status:	FINAL
Previous Issue Date:	05-Jun-2012
Revised Sections or Basis for Revision:	New SDS
Safety Data Sheet Number:	817647
Language:	BE

List of Relevant Hazard Statements:

H220 - Extremely flammable gas
H280 - Contains gas under pressure; may explode if heated
H332 - Harmful if inhaled
H350 - May cause cancer
H340 - May cause genetic defects
H225 - Highly flammable liquid and vapour
H372 - Causes damage to organs through prolonged or repeated exposure
H304 - May be fatal if swallowed and enters airways
H319 - Causes serious eye irritation
H315 - Causes skin irritation
H330 - Fatal if inhaled
H400 - Very toxic to aquatic life

CLP Classification (EC No 1272/2008)
H220 - Flammable gases -- Category 1
H280 -- Gases under pressure -- Compressed gas
H332 -- Acute toxicity, Inhalation -- Category 4
H340 -- Germ cell mutagenicity -- Category 1B
H350 -- Carcinogenicity -- Category 1A

Regulatory Basis
Based on component information.
Based on component information.
Based on component information.
Based on component information.
Based on component information.

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; ADR = Agreement on Dangerous Goods by Road; BMGV = Biological Monitoring Guidance Value; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA = [US] Environmental Protection Agency; Germany-TRGS = Technical Rules for Dangerous Substances; IARC = International Agency for Research on Cancer; ICAO/IATA = International Civil Aviation Organisation / International Air Transport Association; INSHT = National Institute for Health and Safety at Work; IMDG = International Maritime Dangerous Goods; Ireland-HSA = Ireland's National Health and Safety Authority; LEL = Lower Explosive Limit; MARPOL = Marine Pollution; N/A = Not Applicable; N/D = Not Determined; NTP = [US] National Toxicology Programme; PBT = Persistent, Bioaccumulative and Toxic; RID = Regulations Concerning the International Transport of Dangerous Goods by Rail; STEL = Short Term Exposure Limit; TLV = Threshold Limit Value; TRGS 903 = Technical rules for hazardous substances; TWA = Time Weighted Average; UEL = Upper Explosive Limit; UK-EH40 = United Kingdom EH40/2005 OEL; vPvB = very Persistent, very Bioaccumulative

Disclaimer of Expressed and implied Warranties:

The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorisation is given nor implied to practice any patented invention without a licence.





Refinery Fuel Gas (Category K)

1 Manufacture of substance - Industrial

Section 1 Exposure Scenario	
Other Petroleum Gases	
Title	Manufacture of substance
Use Descriptor	
Sector(s) of use	3, 8, 9
Process category(ies)	1, 2, 3, 4, 8a, 8b, 15
Environmental release category(ies)	1, 4
Processes, tasks, activities covered	
Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently Assumes a good basic standard of occupational hygiene is implemented Assumes a maximum Butadiene content of 1% and a maximum Benzene content of 1%.

Contributing Scenarios / Product Category	Specific Risk Management Measures & Operating Conditions
General measures (carcinogens)	<p>Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance.</p> <p>Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.</p>
General exposures (closed systems)	Handle substance within a closed system
General exposures (closed systems) with sample collection	Handle substance within a closed system
General exposures (closed systems) Use in contained batch processes	Handle substance within a closed system
General exposures (open systems) Batch process with sample collection	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) Avoid carrying out activities involving exposure for more than 1 hour
Process sampling	Handle substance within a closed system Use a sampling system designed to control exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) or Ensure operation is undertaken outdoors

Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
Bulk transfers (open systems)	Handle substance within a closed system Ensure material transfers are under containment or extract ventilation
Bulk transfers (closed systems)	Ensure material transfers are under containment or extract ventilation
Equipment cleaning and maintenance	Drain down system prior to equipment break-in or maintenance Provide extract ventilation to points where emissions occur
Storage	Ensure material transfers are under containment or extract ventilation Store substance within a closed system

Refinery fuel gas exhibits carcinogenic effects and is classified R45 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from these adverse effects consistent with Directive 2004/37/E.

2.2 Control of environmental exposure
Substance is not classified - environmental exposure assessment not required.
Section 3 Exposure Estimation
3.1 Health
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated
3.2 Environment
Qualitative approach used to conclude safe use
Section 4 Guidance to check compliance with the Exposure Scenario
4.1 Health
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels
4.2 Environment
No additional risk management measures required

2 Distribution of substance - Industrial

Section 1 Exposure Scenario	
Other Petroleum Gases	
Title	Distribution of substance
Use Descriptor	
Sector(s) of use	3, 8, 9
Process category(ies)	1, 2, 3, 4, 8a, 8b, 9, 15
Environmental release category(ies)	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7
Processes, tasks, activities covered	
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 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently Assumes a good basic standard of occupational hygiene is implemented Assumes a maximum Butadiene content of 1% and a maximum Benzene content of 1%.

Contributing Scenarios / Product Category	Specific Risk Management Measures & Operating Conditions
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 systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance.

General exposures (closed systems)	Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
General exposures (closed systems) with sample collection	Handle substance within a closed system
General exposures (closed systems) Use in contained batch processes	Handle substance within a closed system Sample via a closed loop or other system to avoid exposure
General exposures (open systems) Batch process with sample collection	Handle substance within a closed system 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
Process sampling	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) Sample via a closed loop or other system to avoid exposure
Laboratory activities	Sample via a closed loop or other system to avoid exposure
Bulk transfers (closed systems)	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.
Drum and small package filling	Handle substance within a closed system Ensure material transfers are under containment or extract ventilation
Equipment cleaning and maintenance	Provide a good standard of controlled ventilation (10 to 15 air changes per hour) Ensure material transfers are under containment or extract ventilation
Storage	Ensure material transfers are under containment or extract ventilation
	Ensure operation is undertaken outdoors

Refinery fuel gas exhibits carcinogenic effects and is classified R45 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from these adverse effects consistent with Directive 2004/37/E.
2.2 Control of environmental exposure
Substance is not classified - environmental exposure assessment not required.
Section 3 Exposure Estimation
3.1 Health
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated
3.2 Environment
Qualitative approach used to conclude safe use
Section 4 Guidance to check compliance with the Exposure Scenario
4.1 Health
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels
4.2 Environment
No additional risk management measures required

3 Use of substance as a Fuel - Industrial

Section 1 Exposure Scenario	
Other Petroleum Gases	
Title	Use as a fuel
Use Descriptor	
Sector(s) of use	3
Process category(ies)	1, 2, 3, 8a, 8b, 16
Environmental release category(ies)	7
Processes, tasks, activities covered	
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 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa at STP

Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently Assumes a good basic standard of occupational hygiene is implemented Assumes a maximum Butadiene content of 1% and a maximum Benzene content of 1%.

Contributing Scenarios / Product Category	Specific Risk Management Measures & Operating Conditions
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 systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
Bulk transfers	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
Drum/batch transfers	Ensure material transfers are under containment or extract ventilation Wear suitable gloves tested to EN374.
General exposures (closed systems)	Handle substance within a closed system Wear suitable gloves tested to EN374.
General exposures (closed systems) Batch process	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)
General exposures (open systems)	Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
General exposures (open systems) (closed systems) Batch process	Handle substance within a predominantly closed system provided with extract ventilation Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Equipment maintenance	Drain down and flush system prior to equipment break-in or maintenance Provide a good standard of controlled ventilation (10 to 15 air changes per hour)
Vessel and container cleaning	Drain down and flush system prior to equipment break-in or maintenance Provide a good standard of controlled ventilation (10 to 15 air changes per hour) Only allow access to authorised persons. Apply vessel entry procedures including use of forced supplied air
Storage	Provide extract ventilation to points where emissions occur Store substance within a closed system

Refinery fuel gas exhibits carcinogenic effects and is classified R45 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from these adverse effects consistent with Directive 2004/37/E.

2.2 Control of environmental exposure

Substance is not classified - environmental exposure assessment not required.

Section 3 Exposure Estimation

3.1 Health

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

3.2 Environment

Qualitative approach used to conclude safe use

Section 4 Guidance to check compliance with the Exposure Scenario

4.1 Health

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels

4.2 Environment

No additional risk management measures required