Material Safety Data Sheet

1. Product and company identification

Product name	HYDROGEN RICH, SOUR REFINERY GAS This material can contain hydrogen sulfide (H2S), a very toxic and extremely flammable gas.
MSDS #	RS023
Code	RS023
Product use	Intermediate.
Synonyms	DHDS Hot Flash Drum Release Gas, Absorber Feed, Coker Off Gas, 1st Stage Recycle Gas, Stabilizer Off Gas, Chocker Off Gas.
Supplier	BP Products North America Inc. 150 West Warrenville Road Naperville, Illinois 60563-8460 USA
EMERGENCY HEALTH INFORMATION:	1 (800) 447-8735 Outside the US: +1 703-527-3887 (CHEMTREC)
EMERGENCY SPILL INFORMATION:	1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT INFORMATION	1 (866) 4 BP - MSDS (866-427-6737 Toll Free - North America) email: bpcares@bp.com

2. Hazards identification

Physical state	Gas.
Color	Colorless.
Emergency overview	DANGER ! EXTREMELY FLAMMABLE GAS. MAY CAUSE FLASH FIRE. CONTENTS UNDER PRESSURE. VAPOR MAY CONTAIN HYDROGEN SULFIDE (H2S) GAS WHICH CAN BE HARMFUL OR FATAL IF INHALED. INHALATION OF VAPOR/AEROSOL CONCENTRATIONS ABOVE THE RECOMMENDED EXPOSURE LIMITS CAUSES HEADACHES, DIZZINESS, DROWSINESS, AND NAUSEA, AND MAY LEAD TO UNCONSCIOUSNESS OR DEATH. AT VERY HIGH CONCENTRATIONS, CAN DISPLACE THE NORMAL AIR AND CAUSE SUFFOCATION FROM LACK OF OXYGEN. CAUSES SEVERE EYE IRRITATION. MAY CAUSE SKIN IRRITATION. MAY CAUSE RESPIRATORY TRACT IRRITATION. CONTAINS N-HEXANE WHICH MAY CAUSE PERIPHERAL NERVE DAMAGE. Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode. Do not puncture or incinerate container. Do not breathe gas. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	Dermal contact. Eye contact. Inhalation.
Potential health effects	
Eyes	Causes severe eye irritation. Will cause serious damage to the eyes. Contact with rapidly expanding gas may cause burns or frostbite.

Skin	May cause skin irritation. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	May be fatal if inhaled. May cause respiratory irritation. Inhalation causes headaches, dizziness, drowsiness and nausea and may lead to unconsciousness. At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen. This material can contain hydrogen sulfide (H2S), a very toxic and extremely flammable gas. Contains n-hexane which may cause peripheral nerve damage. See toxicological information (section 11)
Ingestion	Not applicable (gas).

See toxicological information (section 11)

3. Composition/information on ingredients

Ingredient name	CAS #	%
Gases (petroleum), refinery	68783-07-3	100
Contains:		
Hydrogen	1333-74-0	40 - 95
Methane	74-82-8	1 - 20
Ethane	74-84-0	0 - 10
Propane	74-98-6	0 - 10
Hydrogen Sulfide	7783-06-4	0.01 - 8
Propylene	115-07-1	0 - 5
Ethylene	74-85-1	0 - 5
Butane	106-97-8	0 - 2
isobutane	75-28-5	0 - 2
pentane	109-66-0	0 - 2
isopentane	78-78-4	0 - 2
Hexane, other isomers	None assigned.	0 - 2
n-Hexane	110-54-3	0 - 1

4. First aid measures

Eye contact	Contact with liquid: Immediately flush with plenty of tepid water (105-115 F; 41-46 C). DO NOT USE HOT WATER. Get immediate medical attention.
Skin contact	Contact with liquid: Immediately flush with plenty of tepid water (105-115 F; 41-46 C). DO NOT USE HOT WATER. Get immediate medical attention.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	As this product is a gas, refer to the inhalation section.

5. Fire-fighting measures

Flammability of the product	Flammable
Auto-ignition temperature	260°C (500°F) (Estimated. Based on NFPA Hydrogen Sulfide)
Flash point	Closed cup: -188.15°C (-306.7°F) (Estimated. Based on Methane)
Explosion limits	Lower: 2.1% (Estimated. Based on NFPA Propane) Upper: 75% (Estimated. Based on NFPA Hydrogen)
Fire/explosion hazards	Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
Unusual fire/explosion hazards	Extremely explosive in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and shocks and mechanical impacts.

Extinguishing media

Suitable	If involved in fire, shut off flow immediately if it can be done without risk. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. In case of fire, use water fog, foam, dry chemicals, or carbon dioxide. If gas has ignited, do not attempt to extinguish but stop gas flow and allow to burn out. Use water spray to cool heat-exposed containers, and to protect surrounding areas and personnel effecting shut-off. Withdraw from area and allow the fire to burn. Cool containers with water jet in order to prevent pressure build-up, auto-ignition or explosion.
Not suitable	Do not use water jet.
Fire-fighting procedures	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. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Hazardous combustion products	Decomposition products may include the following materials: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.)
Protective clothing (fire)	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Special remarks on fire hazards	OSHA / NFPA Class 1 A Flammable gas

6. Accidental release measures

Environmental precautions	Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
Personal protection in case of a large spill	Chemical splash goggles. Chemical-resistant protective suit. Boots. Chemical-resistant gloves. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Suggested protective clothing might not be adequate. Consult a specialist before handling this product. CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator.
Methods for cleaning up	
Large spill	Immediately contact emergency personnel. Stop leak if without risk. Eliminate all ignition sources. Keep unnecessary personnel away. This material can contain hydrogen sulfide (H2S), a very toxic and extremely flammable gas.
Small spill	Immediately contact emergency personnel. Stop leak if without risk.

7. Handling and storage

Handling	Put on appropriate personal protective equipment (see section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. High pressure gas.
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). Keep container tightly closed and sealed until ready for use. Empty containers may contain harmful, flammable/combustible or explosive residue or vapors. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards.
Other information	Hydrogen sulfide (H2S) gas and mercaptans may accumulate in storage tanks and bulk transport compartments containing this material. Exposures exceeding PELs may occur when material is exposed to air or when disconnecting loading arms, gauging and sampling. Vapor concentrations of hydrogen sulfide above 50 ppm, or prolonged exposure at lower levels, may saturate human odor perception so that the smell of the gas (rotten egg odor) may not be apparent. Exposure to concentrations of hydrogen sulfide vapor above 500 ppm may cause rapid death. DO NOT DEPEND ON THE SENSE OF SMELL TO DETECT HYDROGEN SULFIDE! (See Section 8, Personal Protection). Water which has been in contact with a sour crude oil may contain entrained hydrogen sulfide and mercaptans. This wastewater can present health and safety hazards if the hydrogen sulfide gas is rapidly released from solution or if high concentrations accumulate in enclosed spaces in storage

tanks.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Methane	**ACGIH TLV (United States, 1/2007).** TWA: 1000 ppm 8 hour(s).
Ethane	**ACGIH TLV (United States, 1/2007).** TWA: 1000 ppm 8 hour(s).
Propane	**ACGIH TLV (United States, 1/2007).** TWA: 1000 ppm 8 hour(s). **NIOSH REL (United States, 12/2001).** TWA: 1800 mg/m³ 10 hour(s). TWA: 1000 ppm 10 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 1800 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s).
Hydrogen Sulfide	**ACGIH TLV (United States, 1/2007).** STEL: 21 mg/m³ 15 minute(s). STEL: 15 ppm 15 minute(s). TWA: 14 mg/m³ 8 hour(s). TWA: 10 ppm 8 hour(s). **NIOSH REL (United States, 12/2001).** CEIL: 15 mg/m³ 10 minute(s). CEIL: 10 ppm 10 minute(s). **OSHA PEL Z2 (United States, 11/2006).** AMP: 50 ppm 10 minute(s). CEIL: 20 ppm
Propylene	**ACGIH TLV (United States, 1/2007).** TWA: 500 ppm 8 hour(s).
Ethylene	**ACGIH TLV (United States, 1/2007).** TWA: 200 ppm 8 hour(s).
Butane	**ACGIH TLV (United States, 1/2007).** TWA: 1000 ppm 8 hour(s). **NIOSH REL (United States, 12/2001).** TWA: 1900 mg/m³ 10 hour(s). TWA: 800 ppm 10 hour(s).
isobutane	**ACGIH TLV (United States, 1/2007).** TWA: 1000 ppm 8 hour(s). **NIOSH REL (United States, 12/2001).** TWA: 1900 mg/m³ 10 hour(s). TWA: 800 ppm 10 hour(s).
Pentane	**ACGIH TLV (United States, 1/2007).** TWA: 600 ppm 8 hour(s). **NIOSH REL (United States, 12/2001).** CEIL: 1800 mg/m³ 15 minute(s). CEIL: 610 ppm 15 minute(s). TWA: 350 mg/m³ 10 hour(s). TWA: 120 ppm 10 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 2950 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s).
Isopentane	**ACGIH TLV (United States, 1/2007).** TWA: 600 ppm 8 hour(s).
Hexane, other isomers	**ACGIH TLV (United States).** TWA: 500 ppm 8 hour(s). STEL: 1000 ppm 15 minute(s).
n-Hexane	**OSHA (United States).** TWA: 1800 mg/m³ 8 hour(s). **ACGIH TLV (United States, 1/2007). Skin** TWA: 50 ppm 8 hour(s). **NIOSH REL (United States, 12/2001).** TWA: 180 mg/m³ 10 hour(s). TWA: 50 ppm 10 hour(s).

OSHA PEL (United States, 11/2006).
TWA: 1800 mg/m³ 8 hour(s).
TWA: 500 ppm 8 hour(s).

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Some states may enforce more stringent exposure limits.

Control Measures
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.

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. In accordance with good industrial hygiene and safety work practices, airborne exposures should be controlled to the lowest extent practicable.

Personal protection

Eyes
Do not get in eyes. Chemical splash goggles.

Skin and body
Avoid contact with skin and clothing. Wear suitable protective clothing.

Respiratory
The gas can cause asphyxiation without warning by replacing the oxygen in the air. Use adequate ventilation. Do not breathe gas. Air-filtering respirators, also called air-purifying respirators, will not be adequate under conditions of oxygen deficiency (i.e. low oxygen concentration), and would not be considered suitable where airborne concentrations of chemicals with a significant hazard are present. In these cases air-supplied breathing apparatus will be required. Air supplied respiratory protection should be worn whenever it is required for the worker's face to be within 3 feet of an open hatch. If operating conditions cause high vapor concentrations or the TLV is exceeded, use NIOSH-certified, supplied-air respirator. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator.

Hands
Wear gloves that cannot be penetrated by chemicals or oil.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or S.O.P. for special handling instructions.

9. Physical and chemical properties

Physical state
Gas.

Color
Colorless.

Odor
Rotten eggs.

Flash point
Closed cup: -188.15°C (-306.7°F) (Estimated. Based on Methane)

Explosion limits
Lower: 2.1% (Estimated. Based on NFPA Propane)
Upper: 75% (Estimated. Based on NFPA Hydrogen)

Auto-ignition temperature
260°C (500°F) (Estimated. Based on NFPA Hydrogen Sulfide)

Boiling point / Range
-252.78°C (-423°F)

Melting point / Range
-255.34°C (-427.6°F)

Vapor density
0.2 to 0.4 [Air = 1] Note: Vapor Specific gravity

Solubility
Partially soluble in water

10. Stability and reactivity

Stability and reactivity	The product is stable.
Conditions to avoid	Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame).
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) and Hydrogen Sulfide (H2S).
Hazardous polymerization	Will not occur.

11. Toxicological information

Classification

Product/ingredient name	IARC	NTP	OSHA
Ethylene	3	-	-
Propylene	3	-	-

IARC :
3 - Not classifiable as a human carcinogen.

Other information

This material is an asphyxiant. Asphyxiants may reduce the oxygen concentration in the air to dangerous levels. Symptoms of lack of oxygen include increased depth and frequency of breathing, air hunger, dizziness, headache, nausea or loss of consciousness.

High vapor concentrations can cause headaches, dizziness, drowsiness and nausea and may lead to unconsciousness.Exposure to vapor at high concentrations may have the following effects: heart beat irregularity (arrhythmia).

Hydrogen sulfide (H2S) gas may accumulate in storage tanks of bulk transport compartments containing this material. Contact with eyes causes painful conjunctivitis, sensitivity to light, tearing and clouding of vision. Inhalation of low concentrations causes a runny nose with a loss of sense of smell, labored breathing and shortness of breath. Direct contact with skin causes pain and redness. Other symptoms of exposure include profuse salivation, nausea, vomiting, diarrhea, giddiness, headache, dizziness, confusion, rapid breathing, rapid heart rate, sweating, weakness, sudden collapse, unconsciousness and death due to respiratory paralysis.Cardiac neurological effects have also been reported. Prolonged breathing (greater than one hour) of concentrations of H2S around 50 ppm can produce eye and respiratory tract irritation. Levels of 250 to 600 ppm will result in fluid in the lungs, and concentrations around 1,000 ppm will cause unconsciousness and death in a short period of time. Since the sense of smell rapidly becomes insensitive to this toxic, colorless gas, odor cannot be relied upon as an indicator of concentrations of the gas. Always exercise caution when working around closed containers.

This product contains n-hexane. Overexposure to n-hexane may cause progressive and potentially irreversible damage to the peripheral nervous system, particularly in the arms and legs. Animal studies have also shown that n-hexane overexposure may cause testicular injury. However, animal studies conducted with commercial hexane, containing 53% n-hexane, showed neither peripheral nervous system damage nor testicular injury at inhalation exposures up to 9000 ppm.

Potential chronic health effects

Carcinogenicity

No component of this product at levels greater than 0.1% is identified as a carcinogen by ACGIH or the International Agency for Research on Cancer (IARC). No component of this product present at levels greater than 0.1% is identified as a carcinogen by the U.S. National Toxicology Program (NTP) or the U.S. Occupational Safety and Health Act (OSHA).

Medical conditions aggravated by over-exposure

Pre-existing respiratory disorders may be aggravated by over-exposure to this product.

12. Ecological information

No testing has been performed by the manufacturer.

13. Disposal considerations

Waste information

The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. 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. Do not puncture or incinerate container. Empty pressure vessels should be returned to the supplier.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	---	Proper classification to be determined at the time of shipment	----	-	-
TDG Classification	---	Proper classification to be determined at the time of shipment	----	-	-
IMDG Classification	---	Proper classification to be determined at the time of shipment	----	-	-
IATA/ICAO Classification	---	Proper classification to be determined at the time of shipment	----	-	-

15. Regulatory information

U.S. Federal regulations

United States inventory (TSCA 8b): All components are listed or exempted.

TSCA 12(b) one-time export: Pentane

TSCA 12(b) annual export notification: n-Hexane

SARA 302/304/311/312 extremely hazardous substances: Hydrogen Sulfide
SARA 302/304 emergency planning and notification: Hydrogen Sulfide
SARA 302/304/311/312 hazardous chemicals: Hydrogen; Methane; Ethane; Propane; Butane; isobutane; Pentane; Isopentane; n-Hexane; Propylene; Ethylene; Hydrogen Sulfide
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: HYDROGEN RICH, SOUR REFINERY GAS: Fire hazard, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard

SARA 313

Form R - Reporting requirements

Product name	CAS number	Concentration
Hydrogen Sulfide	7783-06-4	0.01 - 8
Propylene	115-07-1	0 - 5
Ethylene	74-85-1	0 - 5
n-Hexane	110-54-3	0 - 1

Notice to reader

NOTICE : This Material Safety Data Sheet is based upon data considered to be accurate at the time of its preparation. Despite our efforts, it may not be up to date or applicable to the circumstances of any particular case. We are not responsible for any damage or injury resulting from abnormal use, from any failure to follow appropriate practices or from hazards inherent in the nature of the product.