



Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Ammonia Acid Gas

Synonyms: Not available.

Product Use: Intermediate.

Manufacturer/Supplier: Husky Lloydminster Upgrader
HWY 16 East
Lloydminster, Sask
S9V 0Z8

Phone Number: 306-825-1764

Emergency Phone: 877-262-2111

Date of Preparation: December 1, 2013

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
 FLAMMABLE GAS, MAY CAUSE FLASH FIRE. MAY BE FATAL IF INHALED. GAS UNDER PRESSURE. MAY CAUSE FROSTBITE. CAUSES BURNS TO EYES AND SKIN. VERY TOXIC BY INHALATION. MAY IRRITATE EYES AND SKIN.

Colour: Colourless.
Physical State: Gas.
Odour: Rotten eggs. Ammonia.

WHMIS	Personal Protection Equipment	TDG (Ground)

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Skin absorption.

Inhalation: Fatal if inhaled. Signs/symptoms may include burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Very high exposure to Ammonia may cause irritation of the nose, throat, and eyes, chemical pneumonitis, acute pulmonary edema, and sudden death (particularly in confined spaces). Exposures to lower concentrations produce irritation of the nose, and respiratory tract, coughing, a risk of chemical bronchitis and after an apparent arrest in the symptoms the victim may have a risk of acute pulmonary edema. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.



Eye: Causes serious eye damage. Signs/symptoms may include cloudy appearance of the cornea, chemical burns, severe pain, tearing, ulcerations, significantly impaired vision or complete loss of vision. Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result. Eye exposure to Ammonia may result in temporary or permanent blindness. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Causes severe skin burns. Signs/symptoms may include localized redness, swelling, itching, intense pain, blistering, ulceration, and tissue destruction. Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

Ingestion: Not a normal route of exposure.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Respiratory system. Lungs. Blood. Cardiovascular system. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	CAS No.	% wt./wt.
Ammonia	7664-41-7	30 - 60
Hydrogen sulfide (H2S)	7783-06-4	30 - 60

Section 4: FIRST AID MEASURES

Inhalation: If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor.

Eye Contact: If in eyes: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.

Skin Contact: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a poison center or doctor. Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Thaw frosted parts with lukewarm water. Do not rub affected area. Remove non-adhering contaminated clothing. Do not remove adherent material or clothing.

Ingestion: Not a normal route of exposure.



General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable gas by OSHA/WHMIS criteria. Flammable; may be ignited by heat, sparks or flames. May form explosive mixtures with air. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may travel to source of ignition and flash back. Some of these materials may react violently with water. Cylinders exposed to fire may vent and release toxic and flammable gas through pressure relief devices. Containers may explode when heated. Ruptured cylinders may rocket. Runoff may create fire or explosion hazard. **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

Fire involving Tanks: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire.

Means of Extinction

Suitable Extinguishing Media: Small Fire: Dry chemical, CO₂, water spray or alcohol-resistant foam.
Large Fire: Water spray, fog or alcohol-resistant foam. Move containers from fire area if you can do it without risk. Damaged cylinders should be handled only by specialists.

Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of sulphur. Oxides of nitrogen. Ammonia.

Protection of Firefighters: TOXIC; may be fatal if inhaled or absorbed through skin. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control may cause pollution. Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces. Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is



possible.

Explosion Data

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.

Sensitivity to Static Discharge: This material is sensitive to static discharge.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks). Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.

Personal Precautions: Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Do not touch or walk through spilled material. Use personal protection recommended in Section 8. Don full-face, positive pressure, self-contained breathing apparatus.

Environmental Precautions: Prevent entry into waterways, sewers, basements or confined areas.

Methods for Containment: Stop leak if you can do it without risk. Do not direct water at spill or source of leak. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. If possible, turn leaking containers so that gas escapes rather than liquid.

Methods for Clean-Up: Isolate area until gas has dispersed.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:

Do not breathe gas. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Pressurized container: Do not pierce or burn, even after use. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area. See Section 8 for information on Personal Protective Equipment.

Storage:

Limit quantity of material in storage. Restrict access to storage area. Post appropriate warning signs. Keep storage area separate from populated work areas. Consider leak detection and alarm systems, as required. Store in a well-ventilated place. Keep container tightly closed. Store locked up. Protect from sunlight. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children. Head spaces in storage containers may contain toxic hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.



Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Component

Ammonia [CAS No. 7664-41-7]

ACGIH: 25 ppm (TWA); 35 ppm (STEL); (1970); For Ammonia

OSHA: 50 ppm (TWA), 35 mg/m³ (TWA);
35 ppm (STEL) [Vacated]; For Ammonia.

Hydrogen sulfide (H₂S) [CAS No. 7783-06-4]

ACGIH: 1 ppm (TWA); 5 ppm (STEL); (2009); For Hydrogen sulfide

OSHA: 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated]

TWA: Time-Weighted Average

STEL: Short-Term Exposure Limit

C: Ceiling

Engineering Controls:

Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:

Wear chemical safety goggles, and full face shield. Ensure that eyewash stations and safety showers are close to the workstation location. Use equipment for eye protection that meets the standards referenced by OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection:

Wear protective gloves. Wear cold insulating gloves. Consult manufacturer specifications for further information.

Skin and Body Protection:

Wear protective clothing. Clothing with full length sleeves and pants should be worn.

Respiratory Protection:

If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator with organic vapor/acid gas cartridge and particulate filter, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.

General Hygiene Considerations:

Handle according to established industrial hygiene and safety practices.

**Section 9: PHYSICAL AND CHEMICAL PROPERTIES**

Appearance:	Transparent.
Colour:	Colourless.
Odour:	Rotten eggs. Ammonia.
Odour Threshold:	0.0047 ppm, (Hydrogen sulphide)
Physical State:	Gas.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	-85.5 °C (-121.9 °F) (Hydrogen sulphide)
Boiling Point:	-60 °C (-76 °F) (Hydrogen sulphide)
Flash Point:	Not available.
Evaporation Rate:	Not available.
Lower Flammability Limit:	4.3 % (Hydrogen sulphide)
Upper Flammability Limit:	46 % (Hydrogen sulphide)
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Specific Gravity:	0.682 (Water = 1) (Ammonia)
Density:	Not available.
Solubility in Water:	Not available.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	260 °C (500 °F) (Hydrogen sulphide)
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Exposure to heat.
Incompatible Materials:	Strong acids. Bases. Strong oxidizers. Metals. Halogens. Fluorine containing compounds. Metal oxides. Metal salts. Sodium hypochlorite (bleach). Mercury. Halides. Nitrates.
Hazardous Decomposition Products:	Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.
Possibility of Hazardous Reactions:	Ammonia reacts with hypochlorite or other halogen sources to form explosive compounds that are sensitive to pressure or increases in temperature. Reaction with



sulfuric acid or other strong mineral acids is exothermic; mixture becomes boiling hot.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD ₅₀ oral	LD ₅₀ dermal	LC ₅₀
Ammonia	7664-41-7	Not available.	7000 mg/kg (rabbit)	2000 ppm (rat); 4H
Hydrogen sulfide (H ₂ S)	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H

Inhalation: Fatal if inhaled. Signs/symptoms may include burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Very high exposure to Ammonia may cause irritation of the nose, throat, and eyes, chemical pneumonitis, acute pulmonary edema, and sudden death (particularly in confined spaces). Exposures to lower concentrations produce irritation of the nose, and respiratory tract, coughing, a risk of chemical bronchitis and after an apparent arrest in the symptoms the victim may have a risk of acute pulmonary edema. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Eye: Causes serious eye damage. Signs/symptoms may include cloudy appearance of the cornea, chemical burns, severe pain, tearing, ulcerations, significantly impaired vision or complete loss of vision. Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result. Eye exposure to Ammonia may result in temporary or permanent blindness. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H₂S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Causes severe skin burns. Signs/symptoms may include localized redness, swelling, itching, intense pain, blistering, ulceration, and tissue destruction. Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

Ingestion: Not a normal route of exposure.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Respiratory system. Lungs. Blood. Cardiovascular system. Nervous system.



Chronic Effects: Prolonged or repeated exposure to Ammonia may cause eye, liver, kidney, or lung damage. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation; damage to cardiovascular system.

Carcinogenicity: This product does not contain any carcinogens or potential carcinogens as listed by ACGIH, IARC, OSHA, or NTP.

Mutagenicity: Not available.

Reproductive Effects: Not available.

Developmental Effects
Teratogenicity: Not available.
Embryotoxicity: Not available.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: **Hydrogen sulphide:**
14.9 ug/L 96 hr. Fathead minnow (*Pimephales promelas*);
9730 ug/L 1.5 hr. Mediterranean mussel (*Mytilus galloprovincialis*)

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT)

Proper Shipping Name: UN3305, COMPRESSED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S. (Ammonia, Hydrogen sulphide), 2.3 (2.1) (8)

Class: 2.3 (2.1) (8)

UN Number: UN3305

Packing Group: Not applicable.

Label Code:





Husky Energy

MATERIAL SAFETY DATA SHEET

Ammonia Acid Gas

Date of Preparation: December 1, 2013

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN3305, COMPRESSED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S. (Ammonia, Hydrogen sulphide), 2.3 (2.1) (8)

Class: 2.3 (2.1) (8)

UN Number: UN3305

Packing Group: Not applicable.

Label Code:



Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)

The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)

The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification: Class A - Compressed Gas.
Class B1 - Flammable Gases.
Class D1A - Very Toxic Material.
Class E - Corrosive Material.

Hazard Symbols:



United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Ammonia	500	100	100	313	Not listed.	10000
Hydrogen sulfide	500	100	100	313s	U135	10000



Husky Energy

MATERIAL SAFETY DATA SHEET

Ammonia Acid Gas

Date of Preparation: December 1, 2013

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Ammonia	7664-41-7	E
Hydrogen sulfide (H ₂ S)	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Ammonia	7664-41-7	SHHS
Hydrogen sulfide (H ₂ S)	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Ammonia	7664-41-7	E
Hydrogen sulfide (H ₂ S)	7783-06-4	E

Note: E = Environmental Hazard

California

California Prop 65: This product does not contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Section 16: OTHER INFORMATION

Disclaimer: The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.

MSDS Expiry Date (Canada): November 30, 2016

Version: 2.0

MSDS Prepared by: Deerfoot Consulting Inc.

Phone: (403) 720-3700