

**DAKOTA GASIFICATION COMPANY**

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MATERIAL SAFETY DATA SHEET

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 OUR COMMITMENT TO SUSTAINABILITY

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: Nitrogen (Liquid)

GENERAL USE: Liquid nitrogen has several applications including refrigerating and freezing of perishable foods, cooling of concrete, preservation of biologicals, refrigeration shielding of liquid hydrogen, helium, and neon, as well as many other uses.

PRODUCT DESCRIPTION: Nitrogen is a colorless, odorless, tasteless, and nontoxic gas, which is liquefied at cold temperatures. Nitrogen makes up the major portion of the atmosphere (78% by volume).

MANUFACTURER:

Dakota Gasification Company
 420 County Road 26
 Beulah, North Dakota 58523-9400
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EMERGENCY TELEPHONE NUMBERS:

Dakota Gasification (701) 873-6600
 CHEMTREC (800) 424-9300

2. COMPOSITION / INFORMATION ON INGREDIENTS

<u>INGREDIENTS</u>	<u>WT. %</u>	<u>CAS Registry #</u>
Nitrogen	100	7727-37-9

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200):**EXPOSURE LIMITS 8 hrs. TWA (ppm)**

	<u>OSHA PEL</u>	<u>ACGIH TLV</u>
Nitrogen	Not Established (a simple asphyxiant)	Not Established (a simple asphyxiant)

3. HAZARDS IDENTIFICATION / EMERGENCY OVERVIEW:

Routes of Entry: Inhalation

Effects of Acute Exposure: Nitrogen is nontoxic and largely inert. It can act as a simple asphyxiant by diluting the concentration of oxygen in air below levels necessary to support life. Inhalation of nitrogen in excessive concentrations can result in dizziness, nausea, vomiting, loss of consciousness, and death. Death may result from errors in judgment, confusion, or loss of consciousness, which prevents self-rescue. At low oxygen concentrations, unconsciousness and death may occur in seconds without warning.

Effects of Chronic Exposure: Health impairment from long-term exposure to nitrogen can occur due to lack of oxygen.

Odor character/threshold: Odorless.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Vapors have no serious irritating effect on the eyes. Liquid nitrogen splashed in the eyes may cause severe tissue damage due to freezing.

SKIN CONTACT: Splashes of liquid or sprays of gas, may freeze the skin. Inhalation of vapors is likely. Avoid contact of the skin with liquid nitrogen or its cold boil-off gas.

INHALATION: Inhalation of severe exposure to nitrogen gas will result in rapid, occasionally irregular, breathing; headache; fatigue; mental confusion; nausea and vomiting; giddiness and poor judgement; exhaustion; loss of consciousness; convulsions; death.

4. FIRST AID MEASURES

EYES: Freezing may occur upon contact. Remove the victim from the source of contamination and take him to the nearest eyewash, shower, or other source of clean water. Open the eyelid(s) wide to let the chemical evaporate. Gently rinse the affected eye(s) with clean, cool water for at least 15 minutes. Have the victim lie or sit down and tilt his head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out of the outer corners. The victim may be in great pain and want to keep his eyes closed but you must rinse the chemical out of his eye(s) in order to prevent permanent damage. Ask the victim to look up, down and side to side as you rinse in order to better reach all parts of the eye(s). Seek medical attention.

SKIN: In case of frostbite from exposure to liquid nitrogen, the frostbitten part should be placed in warm water of approximately 105°F. If warm water is

not available, or it is impractical to use, wrap the affected part gently in blankets. Let circulation re-establish itself naturally. Remove any clothing, which may restrict circulation to the frozen area. Do not rub frozen parts, as tissue damage may result. If there has been massive exposure so that the general body temperature is depressed, prompt medical attention is critical. Frozen tissues are painless and appear waxy with a possible yellow color. They will become swollen, painful, and prone to infection when thawed. Alcoholic beverages and smoking decrease blood flow to the frozen tissues and should not be used.

INHALATION: Remove the victim from the contaminated area while protecting yourself from exposure by wearing an air supplied respirator. Have someone contact medical assistance immediately. **If the victim has stopped breathing:** Open his airway, loosen his collar and belt, and administer artificial respiration. Administer oxygen through the bag-valve mask. Check the pulse. If the heart stops, administer CPR. If the heartbeat is very slow, irregular or weak, be prepared to administer CPR. Continue your efforts until help arrives or the victim starts to breathe on his own. Do not leave him alone. Keep the victim warm and quiet. **If the victim is unconscious but breathing:** Lay him on his back. If he is vomiting, turn his head to the side. Clear and open his airway and loosen tight clothing. If available, give him oxygen to breathe. Keep him warm and quiet. Check his pulse periodically and be ready to administer CPR. Do not give an unconscious person anything to drink. **If the victim is conscious but coughing or short of breath:** Lay him down, cover him with a blanket and keep him quiet. Loosen tight clothing. Give him oxygen to breathe until help arrives. Check his pulse periodically. Do not leave him unattended. **If the victim is conscious and not coughing or short of breath:** Lay him down, cover him with a blanket and keep him quiet. Loosen tight clothing. Check his pulse periodically. Do not leave him unattended.

5. FIRE FIGHTING MEASURES

FLASH POINT: Nonflammable gas.

AUTO-IGNITION TEMPERATURE: Does not apply.

UPPER EXPLOSIVE / FIRE LIMITS: Nonflammable gas. Not applicable.

LOWER EXPLOSIVE / FIRE LIMITS: Nonflammable gas. Not applicable.

EXTINGUISHING MEDIA: Nitrogen cannot catch fire. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING: Extinguish fire using agent suitable for surrounding fire. Use water spray to keep fire-exposed

PROCEDURES: containers cool. Do not discharge water sprays into liquid nitrogen. The indiscriminate use of water on surfaces of cryogenic containers or piping can lead to heavy icing and possible blockage of pressure relief devices. Valve stems may be iced over so that they cannot be operated.

6. ACCIDENTAL RELEASE MEASURES

SPILL OR LEAK PROCEDURES: Evacuate spill or leak area, allow concentrated gas to dissipate, use ventilation to dissipate the nitrogen into the atmosphere. Use appropriate personal protective equipment. Avoid contact with skin. Using controlled water spray to accelerate evaporation should be done only if evaporation rate can be controlled.

WASTE DISPOSAL METHOD: Nitrogen may be vented slowly to a well-ventilated outdoor location remote from personnel work areas and building air intakes. Liquid nitrogen may be allowed to evaporate in a well-ventilated outdoor location, which is remote from work areas and building air intakes. Test for sufficient oxygen levels in nearby confined spaces before permitting re-entry.

7. HANDLING AND STORAGE

STORAGE TEMPERATURE: Store in a cool, dry, well-ventilated location. Outside or detached storage is preferred.

SHELF LIFE: Indefinite.

SPECIAL SENSITIVITY: May react vigorously with lithium, titanium, neodymium, zirconium, and many other reactive metals.

HANDLING / STORAGE PRECAUTIONS: Gaseous nitrogen is commonly stored in high-pressure cylinders, tubes, or tube trailers. Liquid nitrogen is commonly stored in cryogenic liquid cylinders or vacuum-insulated storage tanks. All precautions necessary for the handling of any nonflammable gas or cryogenic liquid must be taken. When transferring cryogenic liquids from one container to another, the receiving container should be cooled gradually to prevent thermal shock and to avoid splashing. Cryogenic containers must be made from material suitable for cryogenic temperatures. Some materials become extremely brittle at cryogenic temperatures.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

RECOMMENDED WORK / HYGIENE PROCEDURES: Follow all precautions necessary for working with any nonflammable, nontoxic, compressed gas and any cryogenic liquid.

EYE PROTECTION REQUIREMENTS: Safety goggles should be worn during transfer and normal handling of cryogenic liquids. If severe spraying or splashing may occur, a face shield should also be worn for additional protection. Safety glasses and face shield are recommended if contact with pressurized gas is possible.

HAND PROTECTION REQUIREMENTS: Insulated gloves should always be worn when handling anything that comes in contact with cold liquids and vapor. Gloves should be loose fitting so that they can be removed quickly if liquids are spilled into them.

PROTECTIVE CLOTHING REQUIREMENTS: When working with cryogenic liquids it is recommended that clothing be well fitting, yet easy to remove. When working with cryogenic liquids, it is recommended that trousers be worn outside of boots or work shoes. Trousers are recommended without cuffs.

RESPIRATORY REQUIREMENTS: Positive pressure supplied air or self-contained breathing apparatus.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless.

ODOR: Odorless.

PHYSICAL STATE: Liquid.

VAPOR DENSITY: 0.97 At temperatures which occur just after evaporation from the liquid, the cold saturated vapor is heavier than air and tends to fall.

MELTING POINT: -346°F (-210°C)

BOILING POINT: -320°F (-196°C)

SPECIFIC GRAVITY: 0.81 @ (-195.8°C)(liquid)
(Water=1) 1.0 (gas)

PERCENT VOLATILES: 0

BULK DENSITY: 6.747 lb/gal liquid at boiling point.

SOLUBILITY IN WATER: 0.023 vol/vol at 32°F (slightly soluble in water).

ATOMIC WEIGHT: 28.01

ATOMIC FORMULA: N₂

CHEMICAL FAMILY: Inert Gases

10. STABILITY AND REACTIVITY

INSTABILITY CONDITIONS: May react vigorously with lithium, titanium, neodymium, zirconium, and many other reactive metals.

INCOMPATIBILITIES: May react vigorously with lithium, titanium, neodymium, zirconium, and many other reactive metals.

DECOMPOSITION: Nitrogen is non-flammable.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

ROUTES OF ENTRY: Inhalation.

EFFECTS OF ACUTE EXPOSURE: Nitrogen is a simple asphyxiant. As an inert gas, it has no specific toxicity effect except to exclude oxygen from the lungs. The effect of simple asphyxiant gases is proportional to the extent to which they diminish the amount (partial pressure) of oxygen in the air that is breathed. The oxygen may be diminished to 75% of its normal percentage in air before appreciable symptoms develop. This in turn requires the presence of a simple asphyxiant in a concentration of 33% in the mixture of air and gas. When the simple asphyxiant reaches a concentration of 50%, marked symptoms can be produced. A concentration of 75% is fatal in a matter of minutes.

SYMPTOMS: The first symptoms produced by a simple asphyxiant are rapid respirations and air hunger. Mental alertness is diminished and muscular coordination is impaired. Later judgement becomes faulty and all sensations are depressed. Emotional instability often results and fatigue occurs rapidly. As the asphyxia progresses, there may be nausea and vomiting, prostration and loss of consciousness, and finally convulsions, deep coma and death.

EYE EFFECTS: Extensive tissue damage or burns can result from exposure to

liquid nitrogen or cold nitrogen vapors.

SKIN EFFECTS: Liquid nitrogen is extremely cold and can freeze human skin upon contact. Extensive tissue damage or burns can result from exposure to liquid nitrogen or cold nitrogen vapors.

ACUTE INHALATION EFFECTS: Nitrogen is a simple asphyxiant. See above.

CHRONIC EFFECTS/ CARCINOGENICITY: This agent is not considered a carcinogen by NTP, IARC, or OSHA.

12. ECOLOGICAL INFORMATION

Nitrogen makes up the major portion of the atmosphere, 78% by volume. The extreme cold temperature (-196°C) will freeze organisms on contact, but no long-term ecological effects are anticipated.

13. DISPOSAL CONSIDERATIONS

Allow liquid nitrogen to evaporate in well-ventilated outdoor locations, which are remote from work areas and building air intakes. Vent nitrogen gas slowly in a similar location. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14. TRANSPORTATION INFORMATION

D.O.T. SHIPPING NAME: Nitrogen, Refrigerated liquid

D.O.T. HAZARD CLASS: 2.2

U.N. NUMBER: Liquid - UN 1977

D.O.T. PLACARD: Nonflammable Gas

D.O.T. LABEL CODE: Nonflammable Gas

15. REGULATORY REQUIREMENTS

EPA DETERMINATIONS

CERCLA, 40 CFR 302

The material does not contain hazardous substances which, when released in quantities equal to or exceeding the Reportable Quantity, triggers National Response Center notification requirements.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986, TITLE III - SECTION 302, 304, 311, 313

SECTION 302/304 - Extremely Hazardous Substances (40 CFR 355)

The material does not contain extremely hazardous substances at greater than 1.0% concentration; however, it is possible that this material may contain extremely hazardous substances at a lower concentration so that a large enough spill could warrant an Emergency Release under Section 304.

SECTION 311/312 - MSDS and Chemical Inventory Reporting Requirements (40 CFR 370)

The material should be reported under the following EPA Hazard categories.

4	Immediate (Acute Health Hazard)
	Delayed (Chronic Health Hazard)
	Fire
4	Sudden Release of Pressure
	Reactive

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372)

The material contains no chemicals at a level of 1.0% or greater on the list of toxic chemicals and is not subject to toxic chemical release reporting requirements.

TOXIC SUBSTANCES CONTROL ACT (TSCA) (40 CFR 710)

The chemical ingredients in this material are in the Section 8(b) Chemical Substance Inventory (40 CFR 710) and/or are otherwise in compliance with TSCA.

LIABILITY DISCLAIMER

The information contained in this Material Safety Data Sheet (MSDS) is believed to be correct since it was obtained from sources we believe are reliable. However no representation, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications, hazards connected with the use of the material, or the results to be obtained from the use thereof. User assumes all risks and liability of any use, processing or handling of any material, variations in methods, conditions and equipment used to store, handle, or process the material and hazards connected with the use of the material are solely the responsibility of the user and remain at his sole discretion.

Compliance with all applicable federal, state, and local laws and regulations remains the responsibility of the user, and the user has the responsibility to provide a safe work place to examine all aspects of its operation and to determine if or where precautions, in addition to those described herein, are required.