MATERIAL SAFETY DATA SHEET

PORTA GAS

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: NON-FLAMMABLE GAS MIXTURE Containing One or More of the Following Components in a Nitrogen Balance Gas: Oxygen, 0.0016-23.5%; Propane, 0-1.1%; n-Pentane, 0-0.75%; n-Hexane, 0-0.48%; Carbon Monoxide, 0.0006-1.0%; Hydrogen Sulfide, 0.001-0.025%

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

PRODUCT USE: Calibration of Monitoring and Research Equipment


U.N. NUMBER: UN1650

U.N. DANGEROUS GOODS CLASS: Compressed gases, n.o.s. (*Oxygen, Nitrogen) *for the gas component with the next highest concentration next to Nitrogen.

SUPPLIER/Manufacturer's Name: PortaGAS, Inc.

ADDRESS: 1202 E. Sam Houston Pkwy S., Pasadena, TX 77503

BUSINESS PHONE: +1 713 928 8477

EMERGENCY PHONE: International calls (outside USA): +1 813 246 0585

Australian Poison Information Centre: 13 11 26

Australian Fire Brigade: 000

AUSTRALIAN IMPORTER: Scientific Gas Australia Pty Ltd, 9 Wrights Rd, Drummoyne NSW 2047

BUSINESS PHONE: 1300 880 531

DATE OF PREPARATION: July 2013

DATE OF LAST REVISION: July 2013

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This gas mixture is a colorless gas which has a rotten-egg odor (due to the presence of Hydrogen Sulfide). This odor cannot be relied on as an adequate warning of the presence of this gas mixture, because olfactory fatigue occurs after over-exposure to Hydrogen Sulfide. Hydrogen Sulfide and Carbon Monoxide (another component of this gas mixture) are toxic to humans in relatively low concentrations. Over-exposure to this gas mixture can cause skin or eye irritation, nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. The Propane, n-Pentane, and n-Hexane components can cause anesthetic or peripheral neuropathy effects. Additionally, releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments), individuals in such atmospheres may be asphyxiated.

US DOT SYMBOLS: 

EUROPEAN and (GHS) HAZARD SYMBOLS: Signal Word: Danger

EU LABELING AND CLASSIFICATION: Classification of the substance or mixture according to Regulation (EC) No 1272/2008

Aspiration Hazard Category 1
Acute Toxicity Inhalation Category 3

According to European Directive 67/685/EEC as amended
Harmful by inhalation, pressurized gas

Hazard Statement(s):
H304: May be fatal if swallowed and enters always.
H270: May cause or intensify fire, oxidizer.
H280: Contains gas under pressure, may explode if heated.
H331: Toxic if inhaled.

Precautionary Statement(s):
P281: Avoid breathing gas.
P271: Use only in well-ventilated area.
P261: Use personal protective equipment as required.
P314: Get medical advice/attention if you feel unwell.
P403: Store in a well-ventilated place.

Hazard Symbol(s):
[A] Harmful, [C] Oxidizer

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Risk Phrases: Simple Asphyxiant
R8: Contact with combustible material may cause fire.
R48/20: Harmful: danger of serious damage to health by prolonged exposure through inhalation.
R65: Harmful may cause lung damage if swallowed.
R67: Vapors may cause drowsiness and dizziness.

Safety Phrases:
S9: Keep container in a well ventilated area.
S23: Do not breathe gas.
S38/37: Wear suitable protective clothing and gloves.

HEALTH HAZARDS OR RISKS FROM EXPOSURE:
ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. However, the Hydrogen Sulfide and Carbon Monoxide components of this gas mixture are toxic to humans. Over-exposure to this gas mixture can cause nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. Due to the presence of Hydrogen Sulfide, over-exposures to this gas mixture can also irritate the skin and eyes; severe eye contamination can result in blindness. Inhalation over-exposures to Propane, n-Pentane, and n-Hexane can cause anesthetic effects and motor neuropathy (i.e. pain and tingling in feet and hands).
CHRONIC: Abnormal color perception and pigment changes in the eyes have been reported among persons exposed to 420 -1300 ppm of n-Hexane for five years. Additionally, long-term exposure to low levels of n-Hexane or n-Pentane can affect the nerves in the arms and legs. Effects include numbness or tingling sensation, tiredness, cramps, spasms in legs, difficulty holding objects or walking, loss of appetite and weight loss. Pentane isomers, such as n-Pentane, and Propane can cause sensitization of the heart to epinephrine. Refer to Section 11 (Toxicology Information) for additional information on the components of this gas mixture.

TARGET ORGANS:
ACUTE: Respiratory system, blood system, central nervous system, cardiovascular system.
CHRONIC: Reproductive system, cardiovascular system.

SECTION 3 - COMPOSITION AND INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>HAZARDOUS INGREDIENTS:</th>
<th>CAS #</th>
<th>EINECS#</th>
<th>ICSC #</th>
<th>% Vol</th>
<th>HAZARD CLASSIFICATION; RISK PHRASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Hexane</td>
<td>110-54-3</td>
<td>203-777-6</td>
<td>0279</td>
<td>0 – 0.48%</td>
<td>HAZARD CLASSIFICATION [D] HARMFUL RISK PHRASES: R400</td>
</tr>
<tr>
<td>n-Pentane</td>
<td>109-86-0</td>
<td>203-882-4</td>
<td>0534</td>
<td>0 – 0.75%</td>
<td>HAZARD CLASSIFICATION [G] HARMFUL RISK PHRASES: R67</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>630-08-0</td>
<td>211-128-3</td>
<td>0023</td>
<td>0.0005 – 1.0%</td>
<td>HAZARD CLASSIFICATION [T] Toxic RISK PHRASES: R23, R48/23</td>
</tr>
<tr>
<td>Propane</td>
<td>74-98-6</td>
<td>200-827-9</td>
<td>0319</td>
<td>0 – 0.1%</td>
<td>HAZARD CLASSIFICATION [F] FLAMMABLE RISK PHRASES: R12</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>7783-06-4</td>
<td>231-977-3</td>
<td>0165</td>
<td>0.001 – 0.025%</td>
<td>HAZARD CLASSIFICATION [T] Toxic RISK PHRASES: R26</td>
</tr>
<tr>
<td>Oxygen</td>
<td>7782-44-7</td>
<td>231-856-9</td>
<td>0136</td>
<td>0.0015-23.5%</td>
<td>HAZARD CLASSIFICATION [O] OXIDIZER RISK PHRASES: R8</td>
</tr>
</tbody>
</table>

None of the trace impurities in this product contribute significantly to the hazards associated with the product.
All hazard information pertinent to the product has been provided in this Material Safety Data sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.

Note: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CFR, EU Directives and the Japanese Industrial Standard JIS Z 7250: 2000.

SECTION 4 - FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn. No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary.

Take a copy of the label and the MSDS to physician or other health professional with victim(s).

SKIN EXPOSURE: If irritation of the skin develops after exposure to this gas mixture, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist.

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MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this gas mixture. Carbon Monoxide, a component of this gas mixture, can aggravate some diseases of the cardiovascular system, such as coronary artery disease and angina pectoris. Because of the presence of Hydrogen Sulfide, n-Hexane or n-Pentane in this gas mixture, central nervous system conditions, eye disorders, or skin problems may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure. Hyperbaric oxygen is the most efficient antidote to Carbon Monoxide poisoning, the optimum range being 2-2.5 atm. A special mask, or, preferably, a compression chamber to utilize oxygen at these pressures is required. Avoid administering stimulant drugs. Be observant for initial signs of pulmonary edema in the event of severe inhalation over-exposures.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Applicable
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (In air by volume, %): Lower (LEL): Not applicable. Upper (UEL): Not applicable.
FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.
UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.
Explosion Sensitivity to Static Discharge: Not Sensitive.
SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

NFPA RATING SYSTEM

HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

<table>
<thead>
<tr>
<th>HEALTH HAZARD (BLUE)</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAMMABILITY HAZARD (RED)</td>
<td>0</td>
</tr>
<tr>
<td>PHYSICAL HAZARD (YELLOW)</td>
<td>0</td>
</tr>
</tbody>
</table>

PROTECTIVE EQUIPMENT

For Routine Industrial Use and Handling Applications

EYES RESPIRATORY HANDS BODY
See Sect 8 See Sect 8

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of over-exposure to Hydrogen Sulfide and Carbon Monoxide, the toxic components of this gas mixture, and other safety hazards related to the remaining components of this gas mixture, than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel. For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for Hydrogen Sulfide, Carbon Monoxide, and Oxygen. Hydrogen Sulfide and Carbon Monoxide level must be below exposure level listed in Section 2 (Composition and Information on Ingredients) and Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter the area. If leaking incidentally from the cylinder, contact your supplier.

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing a gas mixture with Hydrogen Sulfide or Carbon Monoxide. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Eye wash stations/safety showers should be near areas where this gas mixture is used or stored. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All work practices should minimize releases of Hydrogen Sulfide and Carbon Monoxide-containing gas mixtures.

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STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C, 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable.

WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS:

WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>ACGIH TWA</th>
<th>OSHA TWA</th>
<th>SWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Hexane</td>
<td>110-54-3</td>
<td>50 ppm (TWA)</td>
<td>500 ppm</td>
<td>20 ppm</td>
</tr>
<tr>
<td>n-Pentane</td>
<td>109-88-0</td>
<td>600 ppm</td>
<td>1000 ppm</td>
<td>600 ppm</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>630-08-0</td>
<td>25 ppm</td>
<td>50 ppm</td>
<td>30 ppm</td>
</tr>
<tr>
<td>Propane</td>
<td>74-98-6</td>
<td>250 ppm</td>
<td>1000 ppm</td>
<td>Not Listed</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>7783-06-4</td>
<td>10 ppm</td>
<td>10 ppm</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Oxygen</td>
<td>7782-44-7</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
</tr>
</tbody>
</table>

There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If the gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Oxygen, Hydrogen Sulfide, and Carbon Monoxide.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if Carbon Monoxide levels exceed the exposure levels given in Section 2 (Composition and Information on Ingredients) or if oxygen levels are below 19.5%, or if either level is unknown during emergency response to a release of this gas mixture. If respiratory protection is required for emergency response to this gas mixture, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: No special protection is needed under normal circumstances of use. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee’s feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.138.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, the main component of this gas mixture:

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/cu ft (1.153 kg/m³)
BOILING POINT: -185.8°C (-320.4°F)
FREEZING/MELTING POINT (at 10 psig): -210°C (345.8°F)
SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.0066
pH: Not applicable.
SOLUBILITY IN WATER vol/vol at 32°F (0°C) and 1 atm: 0.023
MOLECULAR WEIGHT: 28.01
EVAPORATION RATE (nBuAc = 1): Not applicable.
EXPANSION RATIO: Not applicable.
ODOR THRESHOLD: Not applicable. Odorless.
SPECIFIC VOLUME (ft³/lb): 13.8
VAPOR PRESSURE @ 70°F (21.1°C) (psig): Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
APPEARANCE, ODOR AND COLOR: This product is a colorless gas with a rotten-egg like odor. There are no unusual warning properties associated with a release of this product.

WARNING PROPERTIES:

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SECTION 10 - STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Propane, n-Hexane, and n-Pentane include carbon oxides. The decomposition products of Hydrogen Sulfide include water and sulfur oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Components of this gas mixture (Hydrogen Sulfide, Propane, n-Pentane, n-Hexane) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Carbon Monoxide is mildly corrosive to nickel and iron (especially at high temperatures and pressures). Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture in 1% concentration or greater.

CARBON MONOXIDE: TCLo (inhalation, mouse) = 65 ppm/24 hours (7-18 weeks); reprod. effects TCLo (inhalation, mouse) = 8 ppm/1 hour (female 8D post); teratogenic effects TCLo (inhalation, human) = 600 mg/m3/10 minutes; LC50 (inhalation, man) = 4000 ppm/30 minutes; TCLo (inhalation, man) = 650 ppm/45 minutes; central nervous system and blood system effects.

n-PENTANE: LD50 (intravenous, mouse) = 446 mg/kg; LC50 (inhalation, rat) = 364 g/m3/4 hours; TCLo (inhalation, mouse) = 325 g/m3/2 hours.

n-HEXANE: Eye, rabbit = 10 mg/ml; mild TCLo (inhalation, rat) = 10,000 ppm/7 hr. TCLo (inhalation, rat) = 5000 ppm/20 hours; teratogenic effects LD50 (oral, rat) = 28710 mg/kg; LDL0 (intraperitoneal, rat) = 9100 mg/kg; LC50 (inhalation, mouse) = 120,000 mg/kg; LC50 (oral, rat) = 28710 mg/kg; ACUTE INHALATION (mouse): 30,000 ppm, narcosis within 30 to 80 minutes; 35,000-40,000 ppm, convulsions and death. DERMAL (rabbit): 2 to 5 ml/kg for 4 hours resulted in restlessness and discoordination; death occurred at 3 ml/kg.

HYDROGEN SULFIDE: LC50 (inhalation, human) = 800 ppm/30 minutes; LDL0 (inhalation, man) = 5.7 mg/kg; central nervous system, pulmonary effects LC50 (inhalation, human) = 800 ppm/5 minutes; LC50 (inhalation, rat) = 444 ppm; LC50 (inhalation, mouse) = 673 ppm/1 hour; LC50 (inhalation, mammal) = 800 ppm/5 minutes.

PROPAINE: Skin Contact (Rabbit): Several formulations containing an isobutane-propane mixture have been tested for skin irritation effects. All formulations contained less than 1% propane. All of the formulations containing propane caused only mild irritation.

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

OXYGEN: The toxicity data for Oxygen are related to exposures in a hyperbaric environment and are not likely to occur in industrial exposure situations.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST; NTP; CAL/OSHA, and IARC, therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANT OF PRODUCT: The Hydrogen Sulfide component of this gas mixture, is irritating to the eyes, and may be irritating to the skin.

SENSITIZATION OF PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensitizers. Pentane isomers (i.e. n-Pentane) can cause cardiac sensitization to epinephrine.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture on the human reproductive system. Mutagenicity: No mutagenicity effects have been described for the components of this gas mixture. Embryotoxicity: This gas mixture contains components that may cause embryotoxic effects in humans; however, due to the small total amount of the components, embryotoxic effects are not expected to occur. Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans due to the small cylinder size and small total amount of all components. The Carbon Monoxide component of this gas mixture which exists up to 1%, can cause teratogenic effects in humans. Severe exposure to Carbon Monoxide during pregnancy has caused adverse effects and the death of the fetus. In general, maternal symptoms are an indicator of the potential risk to the fetus since Carbon Monoxide is toxic to the mother before it is toxic to the fetus. Reproductive Toxicity: The components of this gas mixture are not expected to cause adverse reproductive effects in humans.

BIological EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) have been determined for the Carbon Monoxide and Hexane components, as follows:
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<table>
<thead>
<tr>
<th>CHEMICAL DETERMINANT</th>
<th>SAMPLING TIME</th>
<th>BEI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARBON MONOXIDE</td>
<td>End of shift</td>
<td>3.5% hemoglobin</td>
</tr>
<tr>
<td>· Carboxyhemoglobin in blood</td>
<td>End of shift</td>
<td>20 ppm</td>
</tr>
<tr>
<td>· Carbon monoxide in end-exhaled air</td>
<td>End of shift</td>
<td></td>
</tr>
<tr>
<td>n-HEXANE</td>
<td>End of shift</td>
<td>5 mg/g creatinine</td>
</tr>
<tr>
<td>· n-Hexane in end-exhaled air</td>
<td>End of shift</td>
<td></td>
</tr>
<tr>
<td>Notice of intended Change:</td>
<td>End of shift</td>
<td>0.4 mg/L</td>
</tr>
<tr>
<td>· 2,5-Hexanedione in urine</td>
<td>(currently is “End of Shift”)</td>
<td></td>
</tr>
</tbody>
</table>

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log $K_w = -0.65$

PENTANE: Log $K_w = 3.39$. Water Solubility = 38.5 mg/L. LOG BCF (n-pentane) calculated, 1.90 and 2.35, respectively.

Photolysis, hydrolysis, and biocenconcentration are not anticipated to be important fate processes. Biodegradation and soil adsorption are anticipated to be more important processes for this compound.

n-HEXANE: Log $K_w = 3.00-4.11$. Water Solubility = 9.5 mg/L. Estimated Bioconcentration Factor = 2.24 and 2.89. Bioconcentration in aquatic organisms is low. Hexane is volatile. Rapid volatilization from water and soil is anticipated for this compound. Hexane will float in slick on surface of the water.

HYDROGEN SULFIDE: Water Solubility = 1 g/242 mL at 20°C.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C; 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this gas mixture’s effects on plant and animal life. The Hydrogen Sulfide and Carbon Monoxide components of this gas mixture can be deadly to exposed animal life, producing symptoms similar to those experienced by humans. This gas mixture may also be harmful to plant life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this gas on aquatic life. The presence of more than a trace of Carbon Monoxide is a hazard to fish. The following aquatic toxicity data are available for the Hydrogen Sulfide component of this gas mixture.

- TLm (Asellussp) = 0.111 mg/L/96 hour TLm (Crangonyx sp) = 1.07 mg/L/96 hour TLm (Gammarus) = 0.84 mg/L/96 hour LC 50 (fly irrigation) = 380 mg/m3/960 minutes LC 50 (fly irrigation) = 1500 mg/m3/77 minutes TLm (Lepomis macrochirius, bluegill sunfish) = 0.0478 mg/L/96 hour TLm (Lepomis macrochirius, bluegill sunfish) = 0.0448 mg/L/96 hour at 21-22 °C TLm (Pimephales promelas, fathead minnow) = 0.0071-0.55 mg/L/96 hour TLm (Salvenlis forinalis, brook trout) = 0.0216-0.038 mg/L/96 hour at 8-12.5 °C

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

SECTION 14 - TRANSPORTATION INFORMATION

US DOT: IATA: IMO: ADR:

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.
MATERIAL SAFETY DATA SHEET

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is classified as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen) or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

HAZARD LABEL: Class 2.2 (Non-Flammable Gas)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12

ERAP INDEX: None

Passenger CARRYING SHIP INDEX: None

Passenger CARRYING ROAD VEHICLE OR Passenger CARRYING RAILWAY VEHICLE INDEX: 75

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 126

Note: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is classified as Dangerous Goods, by rules of IATA.

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):
This product is classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS
SARA REPORTING REQUIREMENTS: The components of this gas mixture are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>SARA 302 (40 CFR 355, Appendix A)</th>
<th>SARA 304 (40 CFR Table 302.4)</th>
<th>SARA 313 (40 CFR 372.65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Hexane</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:
Acute Health: No
Chronic Health: No
Fire: No
Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this gas. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Hexane = 5000 lb (2270 kg); Hydrogen Sulfide = 100 lbs (45.4 lb)

OTHER U.S. FEDERAL REGULATIONS: Hydrogen Sulfide, Carbon Monoxide, Propane, n-Pentane and n-Hexane are subject to the reporting requirements of CFR 29 1910.100. Hydrogen Sulfide, Propylene and n-Pentane are subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for each of these gases is 10,000 pounds and so this mixture will not be affected by the regulation. Depending on specific operations involving the use of this gas mixture, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Hydrogen Sulfide is listed in Appendix A of this regulation. The Threshold Quantity for Hydrogen Sulfide under this regulation is 1500 lbs. This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82). Nitrogen, Oxygen and n-Hexane are not listed Regulated Substances, per 40 CFR, Part 98, of the Risk Management for Chemical Releases. Hydrogen Sulfide is listed under this regulation in Table 1 as a Regulated Substance (Toxic Substance), in quantities of 10,000 lbs (4,553 kg) or greater. Carbon Monoxide, propane and n-Pentane are listed under this regulation in Table 3, as Regulated Substances (Flammable), in quantities of 10,000 lbs (4,553 kg) or greater, and so this mixture will not be affected by the regulation.
MATERIAL SAFETY DATA SHEET

U.S. STATE REGULATORY INFORMATION:
The components of this gas mixture are covered under the following specific State regulations:
- California - Permissible Exposure Limits for Chemical Contaminants: Carbon Monoxide, Nitrogen, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
- Kansas - Section 302/313 List: No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): This product does not contain any component above the 0.1% level which is listed as a California Proposition 65 chemical.

CANADIAN REGULATIONS:
- CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL inventory.
- CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.
- CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This gas mixture is categorized as a Controlled Product, Hazard Classes A – Compressed Gases and D2B – Toxic Material, as per the Controlled Product Regulations.

EUROPEAN ECONOMIC COMMUNITY INFORMATION:
- EU LABELING AND CLASSIFICATION: Classification of the substance or mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:
- AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.
- STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:
- JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:
- Listing of the components on individual country Chemical Inventories is as follows:
  - Asia-Pac:
  - Australian Inventory of Chemical Substances (AICS): Listed
  - Korean Existing Chemicals List (ECL): Listed
  - Japanese Existing National Inventory of Chemical Substances (ENCS): Listed
  - Philippines Inventory if Chemicals and Chemical Substances (PICCS): Listed
  - Swiss Giftliste List of Toxic Substances: Listed
  - U.S. TSCA: Listed

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SECTION 16 - OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixture typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures. For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommend recycling for scrap metal content.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

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