Part 1: Chemical Product and Company Identification

SUBSTANCE: CARBON DIOXIDE, LIQUEFIED

TRADE NAMES/SYNONYMS: CARBONIC ACID; STCC 4904509; UN 2187; RTECS FF6400000 CHEMICAL FAMILY: oxides of carbon

COMPANY: PT ANEKA GAS INDUSTRI

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Creation date: 12 December 2005

Part 2: Composition, Information on ingredients

COMPONENT: CARBON DIOXIDE, LIQUEFIED CAS NUMBER: 124-38-9 EC NUMBER (EINECS): 204-696-9 PERCENTAGE: 100

Part 3: Hazards Identifications

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0 EMERGENCY OVERVIEW: PHYSICAL DESCRIPTION: Volatile, odorless, colorless liquefied gas under pressure. MAJOR HEALTH HAZARDS: difficulty breathing PHYSICAL HAZARDS: Containers may rupture or explode if exposed to heat. POTENTIAL HEALTH EFFECTS: INHALATION: SHORT TERM EXPOSURE: ringing in the ears, nausea, irregular heartbeat, headache, drowsiness, dizziness, tingling sensation, visual disturbances, suffocation, convulsions, coma LONG TERM EXPOSURE: no information on significant adverse effects SKIN CONTACT: SHORT TERM EXPOSURE: blisters, frostbite LONG TERM EXPOSURE: no information on significant adverse effects EYE CONTACT: SHORT TERM EXPOSURE: irritation, blurred vision LONG TERM EXPOSURE: no information on significant adverse effects INGESTION: SHORT TERM EXPOSURE: frostbite LONG TERM EXPOSURE: no information is available CARCINOGEN STATUS: OSHA: No NTP: No IARC: No

Part 4: First Aid Measures

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention. SKIN CONTACT: If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention. EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention. INGESTION: If a large amount is swallowed, get medical attention. NOTE TO PHYSICIAN: For inhalation, consider oxygen.

Part 5: Fire Fighting Measures

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard. EXTINGUISHING MEDIA: Use extinguishing agents appropriate for surrounding fire. FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile).

Part 6: Accidental Release Measures

OCCUPATIONAL RELEASE: Do not touch spilled material. Stop leak if possible without personal risk. Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering.

Part 7: Handling and Storage

STORAGE: Store and handle in accordance with all current regulations and standards

Part 8: Exposure Controls, Personal Protection

EXPOSURE LIMITS: CARBON DIOXIDE, LIQUEFIED: CARBON DIOXIDE: 5000 ppm (9000 mg/m3) OSHA TWA 10000 ppm (18000 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993) 30000 ppm (54000 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993) 5000 ppm ACGIH TWA 30000 ppm ACGIH STEL 5000 ppm (9000 mg/m3) NIOSH recommended TWA 10 hour(s) 30000 ppm (54000 mg/m3) NIOSH recommended STEL 9100 mg/m3 (5000 ml/m3) DFG MAK (peak limitation category-IV) 9000 mg/m3 (5000 ml/m3) EC MAK 5000 ppm (9150 mg/m3) UK OES TWA 15000 ppm (27400 mg/m3) UK OES STEL MEASUREMENT METHOD: Gas collection bag; Gas chromatography with thermal conductivity detection; NIOSH IV # 6603 VENTILATION: Based on available information, additional ventilation is not required. Ensure compliance with applicable exposure limits. EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. CLOTHING: For the gas: Protective clothing is not required. For the liquid: Wear appropriate protective, cold insulating clothing. GLOVES: Wear insulated gloves. RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA. 40,000 ppm Any supplied-air respirator. Any self-contained breathing apparatus with a full facepiece. Escape - Any appropriate escape-type, self-contained breathing apparatus. For Unknown Concentrations or

Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece

Part 9: Physical and Chemical Properties

PHYSICAL DESCRIPTION: Volatile, odorless, colorless liquefied gas under pressure. MOLECULAR WEIGHT: 44.01 MOLECULAR FORMULA: C-02 BOILING POINT: -110 F (-79 C) FREEZING POINT: -94 F (-70 C) VAPOR PRESSURE: 569 mmHg @ -82 C VAPOR DENSITY (air=1): 1.5 SPECIFIC GRAVITY (water=1): 1.101 @ -37 C WATER SOLUBILITY: soluble PH: Not applicable VOLATILITY: Not applicable ODOR THRESHOLD: Not available EVAPORATION RATE: Not applicable COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable SOLVENT SOLUBILITY: Soluble: hydrocarbons, organic solvents

Part 10: Stability and Reactivity

REACTIVITY: Stable at normal temperatures and pressure. CONDITIONS TO AVOID: Protect from physical damage and heat. Containers may rupture or explode if exposed to heat. Avoid contact with water or moisture. INCOMPATIBILITIES: combustible materials, oxidizing materials, metal salts, reducing agents, metal carbide, metals, bases CARBON DIOXIDE: ACRYLALDEHYDE: Exothermic polymerization. BARIUM PEROXIDE: Incandescent reaction. CESIUM OXIDE: Ignition. DIETHYL MAGNESIUM: Ignition. ETHYLENEIMINE: Explosive polymerization. HYDRAZINE: Decomposition. METAL ACETYLIDES: Ignition or incandescence. METAL HYDRIDES: Reduction reaction. METALS: Dusts of many metals suspended in carbon dioxide atmospheres are ignitable and explosive; some bulk metals will burn in the gas at elevated temperatures. POTASSIUM: Mixtures of the solids are impact-sensitive. POTASSIUM-SODIUM ALLOY: Mixtures of the solids are impact-sensitive. SODIUM: Mixtures of the solids are impact-sensitive. SODIUM PEROXIDE: Highly exothermic reaction; may be explosive in the presence of metals. POLYMERIZATION: Will not polymerize.

Part 11: Toxicological Information

CARBON DIOXIDE, LIQUEFIED: TOXICITY DATA: 9 pph/5 minute(s) inhalation-human LCLo; 90000 ppm/5 minute(s) inhalation-mammal LCLo; 10000 ppm/24 hour(s)-30 day(s) continuous inhalation-rat TCLo; 27000 ppm/24 hour(s)-30 day(s) continuous inhalation-rabbit TCLo ACUTE TOXICITY LEVEL: Insufficient Data. MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: heart or cardiovascular disorders, respiratory disorders REPRODUCTIVE EFFECTS DATA: 6 pph inhalation-rat TCLo/24 hour(s) 10 day(s) pregnant female continuous; 6 pph inhalation-rat TCLo/24 hour(s) 10 day(s) pregnant female continuous; 55 pph inhalation-mouse TCLo/2 hour(s) 3 day(s) male; 55 pph inhalation-mouse TCLo/4 hour(s) 6 day(s) male; 2 pph inhalation-mouse TCLo/8 hour(s) 10 day(s) pregnant female continuous; 13 pph inhalation-rabbit TCLo/4 hour(s) 9-12 day(s) pregnant female continuous HEALTH EFFECTS: INHALATION: ACUTE EXPOSURE: CARBON DIOXIDE: In the solid or liquid form carbon dioxide is very volatile, readily releasing the gas. At concentrations from 2-10% it may cause acidic taste, dyspnea, headache, vertigo, nausea, labored breathing, weakness, drowsiness, mental confusion, and increase in blood pressure, pulse, and respiratory rate. Exposure to 10% for a few minutes has been reported to cause visual disturbances, tinnitus, tremors, profuse perspiration, restlessness, paresthesias, general feeling of discomfort, loss of consciousness, and coma. Concentrations of 25-30% may cause coma and convulsions within one minute. Tachycardia and arrhythmias are possible. Concentrations of 50% may cause symptoms of hypocalcemia including carpopedal spasms. Excessive carbon dioxide for a time period of not more than 5 minutes was reported to cause effects on vision with constriction of visual fields, enlargement of blind spots, photophobia, loss of convergence and accommodation, and deficient dark adaptation as well as headache, insomnia, and personality changes, largely depression and irritability. Even when there is sufficient oxygen present to prevent simple asphyxiation by carbon dioxide, high concentrations may cause adverse effects by interfering with its normal elimination from the body. Initially, exposure to increased carbon dioxide concentrations results in a compensatory increase in both rate and depth of ventilation. Beyond a certain point, however, this may reverse to hypoventilation resulting in respiratory acidosis. Death from asphyxia may occur if the concentration and duration of exposure are sufficient. Reproductive effects have been reported in animals. CHRONIC EXPOSURE: CARBON DIOXIDE: It has been reported that persons may tolerate 1.5% in inhaled air for prolonged periods without adverse effects, but calcium/ phosphorus metabolism may be affected with serum levels of calcium and urinary phosphorus progressively falling. At 2% concentration, deepened respiration may occur. At 3% impairment of performance has been noted. It has, however, been demonstrated that the development of tolerance may occur during prolonged exposure to low levels. Reproductive effects have been reported in animals. SKIN CONTACT: ACUTE EXPOSURE: CARBON DIOXIDE: No adverse effects have been reported from exposure to the gas. Due to rapid evaporation, the liquid or solid may cause frostbite with redness, tingling and pain or numbness. In more severe cases, the skin may become hard and white and develop blisters. CHRONIC EXPOSURE: CARBON DIOXIDE: No adverse effects are expected from exposure at low levels. EYE CONTACT: ACUTE EXPOSURE: CARBON DIOXIDE: At high concentrations in air, carbon dioxide may cause a stinging sensation of the eyes. 200,000 ppm of the gas may cause irritation. Due to rapid evaporation, the liquid or solid may cause frostbite with redness, pain, and blurred vision. CHRONIC EXPOSURE: CARBON DIOXIDE: No adverse effects are expected from exposure to low levels. INGESTION: ACUTE EXPOSURE: CARBON DIOXIDE: Ingestion of a gas is unlikely. If the liquid or solid is swallowed, frostbite damage to the lips, mouth and mucous membranes may occur. CHRONIC EXPOSURE: CARBON DIOXIDE: No data available.

Part 12: Ecological Information

ECOTOXICITY DATA: FISH TOXICITY: 150000 ug/L 48 day(s) (Mortality) Brown trout (Salmo trutta)

Part 13: Disposal Consideration

Dispose in accordance with all applicable regulations.

Part 14: Transport Information

U.S. DOT 49 CFR 172.101: PROPER SHIPPING NAME: Carbon dioxide, refrigerated liquid ID NUMBER: UN2187 HAZARD CLASS OR DIVISION: 2.2 LABELING REQUIREMENTS: Nonflammable gas PACKAGING AUTHORIZATIONS: EXCEPTIONS: 49 CFR 173.306 NON-BULK PACKAGING: None BULK PACKAGING: 49 CFR 173.314, 315 QUANTITY LIMITATIONS: PASSENGER AIRCRAFT OR RAILCAR: 50 kg CARGO AIRCRAFT ONLY: 500 kg LAND TRANSPORT ADR/RID: SUBSTANCE NAME: Carbon dioxide, deeply-refrigerated/Carbon dioxide, refrigerated liquid UN NUMBER: UN2187 ADR/RID CLASS: 2 ITEM NUMBER: 7(a)/3A WARNING SIGN/LABEL: 2/2; 13 HAZARD ID NUMBER: 22 AIR TRANSPORT IATA/ICAO: PROPER SHIPPING NAME: Carbon dioxide, refrigerated liquid UN/ID NUMBER: UN2187 IATA/ICAO CLASS: 2.2 LABEL: Nonflammable gas MARITIME TRANSPORT IMDG: CORRECT TECHNICAL NAME: Carbon dioxide, refrigerated liquid UN/ID NUMBER: UN2187 IMDG CLASS: 2(2.2) EmS No.: 2-12 MFAG Table No.: 615 IMDG CODE PAGE: 2111