MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: ETHYLENE OXIDE

TRADE NAMES/SYNONYMS:
MTG MSDS 34; OXIRANE; DIHYROOXIRENE; DIMETHYLENE OXIDE; EPOXYETHANE; 1,2-EPOXYETHANE; ETHENE OXIDE; ETO; EO; OXACYCLOPROPANE; OXANE; OXIDOETHANE; ALPHA,BETA-OXIDOETHANE; OXIRAN; RCRA U115; STCC 4906610; UN 1040; C2H4O; MAT09520; RTECS KX2450000

CHEMICAL FAMILY: epoxy

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: ETHYLENE OXIDE
CAS NUMBER: 75-21-8
PERCENTAGE: 99.7

COMPONENT: ACETALDEHYDE
CAS NUMBER: 75-07-0
PERCENTAGE: <0.1

COMPONENT: ACETIC ACID
CAS NUMBER: 64-19-7
PERCENTAGE: <0.1

COMPONENT: WATER
CAS NUMBER: 7732-18-5
PERCENTAGE: <0.1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=4 REACTIVITY=3

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: gas
ODOR: sweet odor
MAJOR HEALTH HAZARDS: harmful if inhaled or swallowed, skin burns, eye burns, respiratory tract irritation, central nervous system depression, allergic reactions, cancer hazard (in humans)
PHYSICAL HAZARDS: May explode when heated. Flammable gas. May cause flash fire.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, lack of sense of smell, tearing, nausea, vomiting, diarrhea, difficulty breathing, irregular heartbeat, headache, drowsiness, symptoms of drunkenness, disorientation, bluish skin color, lung congestion, lung damage, kidney damage, paralysis, reproductive effects, convulsions
LONG TERM EXPOSURE: cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), allergic reactions, blisters
LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), frostbite, tearing
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: irritation (possibly severe), sore throat, nausea, vomiting, diarrhea, stomach pain, chest pain, headache, drowsiness, symptoms of drunkenness, bluish skin color
LONG TERM EXPOSURE: liver damage, cancer

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: Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If

person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage and activated charcoal slurry.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive.

EXTINGUISHING MEDIA: alcohol-resistant foam, carbon dioxide, regular dry chemical, water

Large fires: Use alcohol-resistant foam or flood with fine water spray.

FIRE FIGHTING: Let burn unless leak can be stopped immediately. Move container from fire area if it can be done without risk. Fight large fires from a protected location or safe distance. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck, evacuation radius: 1600 meters (1 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Apply water from a protected location or from a safe distance. Cool containers with water spray until well after the fire is out. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 1600 meters (1 mile). Water may be ineffective.

FLASH POINT: -20 F (-29 C) (CC)
LOWER FLAMMABLE LIMIT: 3%
UPPER FLAMMABLE LIMIT: 100%
AUTOIGNITION: 804 F (429 C)

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:
Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Do not get water inside container. Small spills: Flood with water. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under

CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Protect from physical damage. Store below 30 C. Store outside or in a detached building. Avoid contact with light. Store in a cool, dry place. Use diking sufficient to contain total contents plus 10%. Store with flammable liquids. Keep separated from incompatible substances. Grounding and bonding required. Keep separated from incompatible substances. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355 Part B).

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
ETHYLENE OXIDE:
1 ppm OSHA TWA
5 ppm OSHA excursion limit 15 minute(s)
0.5 ppm OSHA action level
1 ppm ACGIH TWA
0.1 ppm (0.18 mg/m3) NIOSH recommended TWA 10 hour(s) (not to exceed)
5 ppm (9 mg/m3) NIOSH recommended ceiling 10 minute(s)

VENTILATION: Provide local exhaust or process enclosure ventilation system. 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: Wear appropriate chemical resistant clothing. For the liquid: Wear appropriate protective, cold insulating clothing. Wear appropriate chemical resistant clothing.

GLOVES: For the gas: Wear appropriate chemical resistant gloves. For the liquid: Wear insulated gloves. OSHA REGULATED SUBSTANCES: U.S. OSHA 29 CFR 1910.1047.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
OSHA Standard:
Respirator selection should comply with 29 CFR 1910.134, 29 CFR 1910.1047, and the final rule published in the Federal Register on August 24, 2006.
NIOSH Recommendations:
5 ppm

Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern.
End of service life indicator required (ESLI).
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Emergency or planned entry into unknown concentrations or IDLH conditions -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern.
End of service life indicator required (ESLI).
Any appropriate escape-type, self-contained breathing apparatus.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: gas
COLOR: colorless
ODOR: sweet odor
MOLECULAR WEIGHT: 44.06
MOLECULAR FORMULA: (C-H2)2-O
BOILING POINT: 55 F (13 C)
FREEZING POINT: -168 F (-111 C)
VAPOR PRESSURE: 1095 mmHg @ 20 C
VAPOR DENSITY (air=1): 1.5
SPECIFIC GRAVITY (water=1): 0.8824 @ 10 C
WATER SOLUBILITY: soluble
PH: Not applicable
VOLATILITY: 100%
ODOR THRESHOLD: 500 ppm
EVAPORATION RATE: Not applicable
VISCOSITY: 0.0095 cP @ 20 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, acetone, benzene, carbon tetrachloride, organic solvents

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose explosively when heated above 427 C.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may

rupture or explode if exposed to heat.

INCOMPATIBILITIES: acids, combustible materials, bases, metal salts, metal oxides, amines, halo carbons, metals, cyanides, oxidizing materials

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon

POLYMERIZATION: May polymerize violently or explosively. May polymerize when heated. Avoid contact with incompatible materials.

11. TOXICOLOGICAL INFORMATION

ETHYLENE OXIDE:
IRRITATION DATA: 1 percent/7 second(s) skin-human; 18 mg/6 hour(s) eyes-rabbit moderate
TOXICITY DATA: 800 ppm/4 hour(s) inhalation-rat LC50; 72 mg/kg oral-rat LD50
CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Limited Evidence, Animal Sufficient Evidence, Group 1; ACGIH: A2 -Suspected Human Carcinogen
LOCAL EFFECTS:
Irritant: inhalation
Corrosive: skin, eye
ACUTE TOXICITY LEVEL:
Toxic: inhalation, ingestion
TARGET ORGANS: immune system (sensitizer), central nervous system
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: Alcohol may enhance the toxic effects.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 84000 ug/L 96 hour(s) LC50 (Mortality) Fathead minnow (Pimephales promelas)

INVERTEBRATE TOXICITY: 490000 ug/L 48 hour(s) LC50 (Mortality) Brine shrimp (Artemia sp)

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U115. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Ethylene oxide
ID NUMBER: UN1040
HAZARD CLASS OR DIVISION: 2.3
LABELING REQUIREMENTS: 2.3; 2.1
QUANTITY LIMITATIONS:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: Forbidden
ADDITIONAL SHIPPING DESCRIPTION: Toxic-Inhalation Hazard Zone D

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Ethylene oxide
UN NUMBER: UN1040
CLASS: 2.3; 2.1

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
ETHYLENE OXIDE: 10 LBS RQ
Acetaldehyde: 1000 LBS RQ
ACETIC ACID: 5000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B):
ETHYLENE OXIDE: 1000 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C):
ETHYLENE OXIDE: 10 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65):
ETHYLENE OXIDE

OSHA PROCESS SAFETY (29 CFR 1910.119):
ETHYLENE OXIDE: 5000 LBS TQ
Acetaldehyde: 2500 LBS TQ

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
ETHYLENE OXIDE
Cancer (Jul 01, 1987)
Female reproductive toxicity (Feb 27, 1987)
Acetaldehyde
Cancer (Apr 01, 1988)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: ABD1

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

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