SAFETY DATA SHEET

Prepared to U.S. OSHA 29 CFR 1910.1200(g) and the UN Global Harmonization Standard (Revision 7)

Section 1 – IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 - TRADE NAME/IDENTIFICATION OF THE MIXTURE: K100G+

1.2 - SYNONYMS:	None
1.3 - CHEMICAL NAME/FAMILY:	Primary Alcohol/Aliphatic Glycol/Secondary Amine/Alkenoic Acid Mixture
1.4 - RELEVANT USES of the SUBSTANCE:	Diesel Fuel Treatment
1.5 - USES ADVISED AGAINST:	Other than Relevant Use
1.6 - COMPANY/UNDERTAKING IDENTIFICATION:	
1.6.1 - U.S. SUPPLIER/MANUFACTURER'S NAME:	**KINETIC FUEL TECHNOLOGY, INC.**
1.6.2 - ADDRESS:	1205 Balmer Road; Youngstown, NY 14174
1.6.3 - BUSINESS PHONE/GENERAL SDS INFORMATION:	1-716-745-1461 (Monday thru Friday 8 a.m. to 5 p.m., EST)
1.6.4 - EMERGENCY PHONE (U.S./Canada/Puerto Rico):	United States/Canada/Puerto Rico: 1-800/424-9300 (Chemtrec) [24-hrs]
1.6.5 - EMERGENCY PHONE (OUTSIDE U.S.):	International: 01-703-527-3887 (Chemtrec) [24-hours]
1.6.6 - WEBSITE:	www.k100fueltreatment.com

Section 2 - HAZARD IDENTIFICATION

2.1 - GLOBAL HARMONIZATION LABELING AND CLASSIFICATION: Classified in accordance with Global Harmonization Standard under U.S. OSHA Hazard Communication Standard.

2.1.2 - Classification: Flammable Liquid Category 3, Acute Oral Toxicity Cat. 4, Acute Dermal Toxicity Category 4, Acute Inhalation Toxicity Cat. 4, Skin Irritation Category 2, Eye Damage Category 1B, Specific Target Organ Toxicity (Inhalation-Irritation) Single Exposure Category 3, Specific Target Organ Toxicity (Inhalation-Narcotic Effect) Single Exposure Category 3, Specific Target Organ Toxicity (Ingestion-Eye) Single Exposure Category 1

2.1.3 - Signal Word: Danger

2.1.4 - Hazard Statements: H226: Flammable liquid and vapor. H302 + H312 + H332: Harmful if swallowed, in contact with skin or if inhaled. H315: Causes skin irritation. H318: Causes serious eye damage. H335: May cause respiratory irritation. H370: Causes damage to organs (optic nerve) if ingested.

2.1.5 - Precautionary Statements:

2.1.5.1 - Prevention: P210: Keep away from heat/sparks/open flames/hot surfaces. — No smoking. P233: Keep container tightly closed. P240: Ground/bond container and receiving equipment. P241: Use explosion-proof electrical/ventilating/lighting/equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P260: Do not breathe gas/mist/vapors/spray. P264: Wash thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area. P280: Wear protective gloves/protective clothing/eye protection/face protection.

2.1.5.2 - Response: P370 + P378: In case of fire: Use materials appropriate for surrounding fire for extinction. Do not use halons. P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P301 + P312: If swallowed, Call a POISON CENTER or doctor/physician if you feel unwell. P330: Rinse mouth. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P332 + P313: If skin irritation occurs, get medical attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P304 + P340: If inhaled, remove victim to fresh air and keep at rest in a position comfortable for breathing. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. P310: Immediately call a POISON CENTER or doctor. P321: Specific treatment (remove from exposure and treat symptoms).

2.1.5.3 - Storage: P403 + P233 + P235: Store in a well-ventilated place. Keep container tightly closed. Keep cool. P405: Store locked up.

2.1.5.4 - Disposal: P501: Dispose of contents/containers in accordance with all local, regional, national and international regulations.

2.1.6 - Hazard Symbols/Pictograms: GHS02, GHS05, GHS07, GHS08

2.2 - EMERGENCY OVERVIEW:

2.2.1 - Product Description: This product is clear yellow, combustible liquid with a mild ether or sweet odor.

2.2.2 - Health Hazards: This product may be harmful by inhalation, ingestion or by skin absorption. Inhalation and ingestion can cause central nervous system effects. Eye contact may cause severe irritation. Skin contact, especially if prolonged, may cause dermatitis. Ingestion may result in aspiration and damage to the lungs. Due to the presence of Primary Alkyl Alcohol, severe vision effects, including increased sensitivity to light, blurred vision, and blindness may develop following an 8 to 24-hour symptom-free period if ingested. Vapor may produce temporary blurring of vision with a general bluish or grayish haze and the appearance of halos around lights. Components are suspect reproductive toxins.

2.2.3 - Flammability Hazards: This product is combustible. When involved in a fire, this material may decompose and produce irritating vapors and toxic compounds (including carbon oxides, nitrogen oxides, ammonia, peroxides and formaldehyde).

Section 2 - HAZARD IDENTIFICATION (Continued)

2.2 - EMERGENCY OVERVIEW (continued):

2.2.4 - Reactivity Hazards: This product is not reactive.

2.2.5 - Environmental Hazards: This product may cause harm if released to the environment.

2.2.6 - Emergency Considerations: Emergency responders should wear appropriate protection, including fire protective equipment for situation to which they respond.

Section 3 - COMPOSITION and INFORMATION ON INGREDIENTS

3.1 - COMPONENT NAMES, CAS NUMBERS, PERCENTAGES and GLOBAL HARMONIZATION CLASSIFICATION

Chemical Name	CAS #	% w/w	LABEL ELEMENTS GHS Classification under U.S. OSHA Hazard Communication Standard Hazard Statement Codes
Ethylene Glycol Monobutyl Ether	111-76-2	30-45%	HARMONISED CLASSIFICATION - ANNEX VI OF REGULATION (EC) NO 1272/2008 (CLP REGULATION) Classification: Acute Oral Toxicity Cat. 4, Acute Dermal Toxicity Cat. 4, Acute Inhalation Cat. 4, Eye Irritation Cat. 2, Skin Irritation Cat. 2 Hazard Statement Codes: H302 + H312 + H332, H319, H315
n-Butyl Alcohol	71-36-3	30-40%	HARMONISED CLASSIFICATION - ANNEX VI OF REGULATION (EC) NO 1272/2008 (CLP REGULATION) Classification: Flammable Liquid Cat. 3, Acute Oral Toxicity Cat. 4, Eye Damage Cat. 1, Skin Irritation Cat. 2, Specific Target Organ Toxicity (Inhalation-Irritation) Single Exposure Cat. 3, Specific Target Organ Toxicity (Inhalation-Narcotic Effect) Single Exposure Cat. 3 Hazard Statement Codes: H226, H302, H318, H315, H335, H336
Primary Alkyl Alcohol	Proprietary	15-20%	HARMONISED CLASSIFICATION - ANNEX VI OF REGULATION (EC) NO 1272/2008 (CLP REGULATION) Classification: Flammable Liquid Cat. 2, Acute Oral Toxicity Cat. 3, Acute Dermal Toxicity Cat. 3, Acute Inhalation Toxicity Cat. 3, Specific Target Organ Toxicity (Ingestion-Optic Nerve) Single Exposure Cat. 1 Hazard Statement Codes: H225, H301 + H311 + H331, H370
Cyclic Secondary Amine	Proprietary	5-10%	HARMONISED CLASSIFICATION - ANNEX VI OF REGULATION (EC) NO 1272/2008 (CLP REGULATION) Classification: Skin Irritation Cat. 2, Eye Irritation Cat. 2A, Specific Target Organ Toxicity (Inhalation-Respiratory Irritation) Single Exposure Cat. 3 Hazard Statement Codes: H315, H319, H335 EU ECHA Properties of Concern: Suspected carcinogen: equivocal carcinogenicity data according to ISSCAN. Suspected skin sensitizer: CAESAR skin sensitization model in VEGA (Q)SAR platform predicts that the chemical is Sensitizer (good reliability).
Alkenoic Acid	Proprietary	3-7%	HARMONISED CLASSIFICATION - ANNEX VI OF REGULATION (EC) NO 1272/2008 (CLP REGULATION) Classification: Flammable Liquid Cat. 3, Acute Oral Toxicity Cat. 4, Acute Dermal Toxicity Cat. 4, Acute Inhalation Toxicity Cat. 4, Skin Corrosion Cat. 1B Hazard Statement Codes: H226, H302 + H312 + H332, H314

See Section 16 for full text of classification.

Section 4 - FIRST-AID MEASURES

4.1 - PROTECTION OF FIRST AID RESPONDERS: Rescuers should be taken for medical attention if necessary. Remove or cover gross contamination to avoid exposure to rescuers.

4.2 - DESCRIPTION OF FIRST AID MEASURES: Persons developing hypersensitivity reactions should receive medical attention. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Take a copy of label and SDS to physician or health professional with the contaminated individual.

4.2.1 - Skin Exposure: Wash gently and thoroughly with water for 20 minutes or until chemical is removed. While under running water, remove contaminated clothing, shoes and leather goods. Seek medical attention if adverse effect persists after decontamination.

4.2.2 - Eye Exposure: If this product contaminates the eyes, rinse eyes under gently running water. Use sufficient force to open eyelids and then "roll" eyes while flushing. Minimum flushing is for 20 minutes. The contaminated individual must seek medical attention if any adverse effect continues after rinsing.

4.2.3 - Inhalation: If vapors of this product are inhaled, causing irritation, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if adverse effect continues after removal to fresh air.

4.2.4 - Ingestion: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow. Lean victim forward to avoid aspiration into the lungs if vomiting occurs naturally. If victim is convulsing, maintain an open airway and obtain immediate medical attention. If heart or breathing has stopped, trained persons should administer cardiopulmonary resuscitation (CPR) until medical personnel arrive.

4.3 - MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory or skin conditions may be aggravated by repeated exposure to this product.

4.4 - IMPORTANT SYMPTOMS AND EFFECTS: See Sections 2 (Hazard Identification) and 11 (Toxicological Information).

4.5 - IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED: Treat symptoms and eliminate exposure.

Section 5 - FIRE-FIGHTING MEASURES

5.1 - FLASH POINT (Cleveland open cup): 40.5°C (105°F)

5.2. - AUTOIGNITION TEMPERATURE: Not established.

5.3 - FLAMMABLE LIMITS (in air by volume, %): LEL: 1.1% UEL: 10.6%

5.4 - FIRE EXTINGUISHING MEDIA: In the event of a fire, use suppression media for surrounding materials (e.g., water spray, dry chemical, carbon dioxide, foam, any “ABC” class extinguisher).

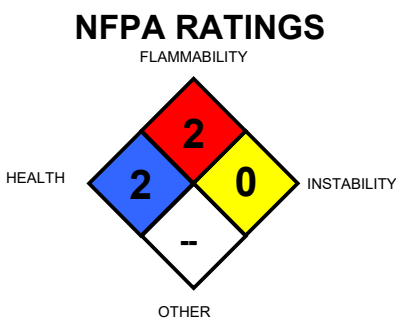
5.5 - UNSUITABLE FIRE EXTINGUISHING MEDIA: Halons.

Section 5 - FIRE-FIGHTING MEASURES (Continued)

5.6 - SPECIAL HAZARDS ARISING FROM THE SUBSTANCE: This product is combustible. When involved in a fire, this product may decompose and produce irritating vapors and toxic compounds (including carbon oxides). Vapors can travel a long distance to an ignition source and flash back.

5.6.1 - Explosion Sensitivity to Mechanical Impact: Not sensitive.

5.6.2 - Explosion Sensitivity to Static Discharge: Vapors from this product may be ignited by static energy.



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

5.7 - SPECIAL PROTECTIVE ACTIONS FOR FIRE-FIGHTERS: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. In cause fire involving large volume of product, water may be ineffective to completely extinguish fire; however, water can be used to extinguish the fire when a number of hose streams are applied by experienced firefighters to sweep the flames off the surface of the burning liquid. Water can also be applied as a fine spray to absorb the heat of the fire and to cool exposed containers and materials and can be used to extinguish the fire when hose streams are applied by experienced firefighters trained in fighting all types of combustible liquid fires. Water spray can be used to dilute spills to raise the flash point and to flush spills away from ignition sources. Solid streams of water may be ineffective and spread material. If this liquid is involved in a fire, fire runoff water should be contained to prevent possible environmental damage. If necessary, decontaminate fire-response equipment with soap and water solution.

Section 6 - ACCIDENTAL RELEASE MEASURES

6.1 - PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. Eliminate any possible sources of ignition and provide maximum explosion-proof ventilation. Use only non-sparking tools and equipment during the response. Call CHEMTREC (1-800-424-9300) for emergency assistance. The atmosphere must at least 19.5 percent Oxygen before non-emergency personnel can be allowed in the area without Self-Contained Breathing Apparatus and fire protection.

6.2 - PERSONAL PROTECTIVE EQUIPMENT: Proper protective equipment should be used. Use only non-sparking tools and equipment.

6.2.1 - Small Spills: Wear rubber gloves, splash goggles, and appropriate body protection.

6.2.2 - Large Spills: Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit. Minimum level of personal protective equipment for releases in which the level of oxygen is less than 19.5% or is unknown must be **Level B: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus.**

6.3 - METHODS FOR CLEAN-UP AND CONTAINMENT:

6.3.1 - Small Spills: Carefully absorb spill using polypads or other non-reactive absorbent. Place spilled material in appropriate container for disposal, sealing tightly. Remove all residue before decontamination of spill area.

6.3.2 - Large Spills: Access to the spill area should be restricted. For large spills, dike or otherwise contain spill and absorb spill with polypads or other non-reactive absorbent material. Monitor area for combustible vapor levels.

6.3.3 - All Spills: Place all spill residue in a double plastic bag or other containment and seal. Decontaminate the area thoroughly. Do not mix with wastes from other materials. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations). For spills on water, contain, minimize dispersion and collect. Dispose of recovered material and report spill per regulatory requirements.

6.4 - ENVIRONMENTAL PRECAUTIONS: Avoid release to the environment. Run-off water may be contaminated by other materials and should be contained to prevent possible environmental damage.

6.5 - REFERENCE TO OTHER SECTIONS: See information in Section 8 (Exposure Controls – Personal Protection) and Section 13 (Disposal Considerations) for additional information.

Section 7 - HANDLING and USE

7.1 - PRECAUTIONS FOR SAFE HANDLING: All employees who handle this material should be trained to handle it safely. Minimize all exposure to this substance. As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing this product. Keep away from heat, sparks, and other sources of ignition. Use non-sparking tools. Bond and ground containers during transfers of material. Containers of this product must be properly labeled.

7.2 - CONDITIONS FOR SAFE STORAGE: Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity).

Section 7 - HANDLING and USE (Continued)

7.2 - CONDITIONS FOR SAFE STORAGE (continued): Containers should be separated from oxidizing materials by a minimum distance of 20 ft. or by a barrier of non-combustible material at least 5 ft. high having a fire-resistance rating of at least 0.5 hours. Storage areas should be made of fire-resistant materials. **Local Fire Departments should be notified of the storage of this product on site. Storage and processing areas of this product should be identified with a NFPA 704 placard (diamond) large enough to be seen from a distance.** Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Have appropriate extinguishing equipment in the storage area (such as sprinkler systems or portable fire extinguishers). Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged. Refer to NFPA 30, *Flammable and Combustible Liquids Code*, for additional information on storage.

7.3 - SPECIFIC END USE(S): This product is a gasoline fuel additive. Follow all industry standards for use of this product.

7.4 - 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 this product in areas where adequate ventilation is provided. Decontaminate equipment thoroughly, before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

Section 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

8.1 - EXPOSURE LIMITS/CONTROL PARAMETERS:

8.1.1 - Ventilation and Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits provided in this section, if applicable. Use a non-sparking, grounded, explosion-proof ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside, taking necessary precautions for environmental protection. Ensure eyewash/safety shower stations are available near where this product is used.

8.1.2 - Occupational/Workplace Exposure Limits/Guidelines:

8.1.2.1 - n-Butyl Alcohol:
ACGIH TLV TWA: 20 ppm
ACGIH TLV STEL: Not Applicable
OSHA PEL TWA: 100 ppm
OSHA PEL STEL: Vacated 1989 PEL: 50 ppm (ceiling)
NIOSH REL TWA: Not Applicable
NIOSH REL STEL: 50 ppm, Skin (ceiling)
NIOSH IDLH: 1400 ppm (based on 10% of the LEL)
DFG MAK TWA: 100 ppm
DFG MAK PEAK: 1•MAK 15 min. average value, 1-hr interval, 4 per shift
DFG MAK Pregnancy Risk Classification: C
Carcinogen Status: EPA-D

8.1.2.2 - Ethylene Glycol Monobutyl Alcohol:
ACGIH TLV TWA: 20 ppm
ACGIH TLV STEL: Not Applicable
OSHA PEL TWA: 50 ppm (skin); Vacated 1989 PEL: 20 ppm
OSHA PEL STEL: Vacated 1989 PEL: 300 ppm
NIOSH REL TWA: 5 (skin)
NIOSH REL STEL: Not Applicable
NIOSH IDLH: 700 ppm
DFG MAK TWA: 10 ppm (sum of the concentrations of EGBE and it's acetate in air) [skin]
DFG MAK PEAK: 2•MAK 15 min. average value, 1-hr interval, 4 per shift
DFG MAK Pregnancy Risk Classification: C
Carcinogen Status: EPA-NL, IARC-3, TLV-A3

8.1.2.2 - Proprietary Primary Alkyl Alcohol:
ACGIH TLV TWA: 200 ppm (skin)
ACGIH TLV STEL: 250 ppm (skin)
OSHA PEL TWA: 200 ppm
OSHA PEL STEL: Vacated 1989 PEL: 250 ppm
NIOSH REL TWA: 200 (skin)
NIOSH REL STEL: 250 (skin)
NIOSH IDLH: 6000 ppm
DFG MAK TWA: 100 ppm (skin)
DFG MAK PEAK: 2•MAK 15 min. average value, 1-hr interval, 4 per shift
DFG MAK Pregnancy Risk Classification: C

8.1.2.3 - Proprietary Alkenoic Acid:
ACGIH TLV TWA: 20 ppm (skin)
ACGIH TLV STEL: Not Applicable
OSHA PEL TWA: 20 ppm (skin)
OSHA PEL STEL: Vacated 1989 PEL: 30 ppm
NIOSH REL TWA: 20 (skin)
NIOSH REL STEL: 30 (skin)
NIOSH IDLH: 1400 ppm (based on 10% of the LEL)
DFG MAK TWA: 10 ppm (skin)
DFG MAK PEAK: 2•MAK 15 min. average value, 1-hr interval, 4 per shift
DFG MAK Pregnancy Risk Classification: C
Carcinogen Status: IARC-3, TLV-A4

8.1.2.4 - Proprietary Cyclic Secondary Amine:
Carcinogen Status: MAK.0-3

See Section 16 for Definitions of Terms Used.

8.1.3 - ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, ACGIH Biological Exposure Indices (BEIs) have been determined for some components of this product, as follows:

8.1.3.1 - Ethylene Glycol Monobutyl Ether: Butoxyacetic Acid (BAA) in Urine; Sampling Time: End of Shift; Biological Exposure Indices: 200 mg/g creatine

8.1.3.2 - Primary Alkyl Alcohol: Methanol in Urine; Sampling Time: End of Shift; Biological Exposure Indices: 15 mg/L

8.2 - PROTECTIVE EQUIPMENT: *The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132, including* U.S. Federal OSHA Respiratory Protection (29 CFR 1910.134), OSHA Eye Protection 29 CFR 1910.133, OSHA Hard Protection 29 CFR 1910.138, OSHA Foot Protection 29 CFR 1910.136 and OSHA Body Protection 29 CFR1910.132). Please reference applicable regulations and standards for relevant details.

8.2.1 - Respiratory Protection: Maintain airborne contaminant concentrations below exposure limits listed in this section, if applicable. If respiratory protection is needed, use only protection authorized in applicable regulations. Oxygen levels below 19.5% are considered IDLH by U.S. OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

Section 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

8.2 - PROTECTIVE EQUIPMENT (continued):

8.2.1 - Respiratory Protection (continued): For additional information, the following U.S. NIOSH recommendations for respiratory protection for the n-Butyl Alcohol, Primary Alkyl Alcohol and Ethylene Glycol Monobutyl Ether components, are provided below to assist in respiratory protection equipment.

8.2.1.1 - n-BUTYL ALCOHOL

CONCENTRATION	RESPIRATORY PROTECTION
Up to 1250 ppm:	Any Supplied-Air Respirator (SAR) operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge(s).
Up to 1400 ppm:	Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s), or any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any PAPR with a tight-fitting facepiece and organic vapor cartridge(s), or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR with a full facepiece.
Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions:	Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and 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- or back-mounted organic vapor canister, or any appropriate escape-type, SCBA.

8.2.1.2 - ETHYLENE GLYCOL MONOBUTYL ETHER

CONCENTRATION	RESPIRATORY PROTECTION
Up to 50 ppm:	Any Chemical Cartridge Respirator with organic vapor cartridge(s), or any Supplied-Air Respirator (SAR).
Up to 125 ppm:	Any SAR operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge.
Up to 250 ppm:	Any Chemical Cartridge Respirator with a full facepiece and organic vapor cartridge(s), or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any PAPR with a tight-fitting facepiece and organic vapor cartridge(s), or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR with a full facepiece.
Up to 700 ppm:	Any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Emergency or Planned Entry Into Unknown Concentrations or IDLH Conditions:	Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.
Escape:	Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any appropriate escape-type, SCBA.

8.2.1.3 - PRIMARY ALKYL ALCOHOL

CONCENTRATION	RESPIRATORY PROTECTION
Up to 2000 ppm:	Any Supplied-Air Respirator (SAR).
Up to 5000 ppm:	Any SAR operated in a continuous-flow mode.
Up to 6000 ppm:	Any SAR that has a tight-fitting facepiece and is operated in a continuous-flow mode, or any Self-Contained Breathing Apparatus SCBA with a full facepiece, or any SAR with a full facepiece.
Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions:	Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.
Escape:	Any appropriate escape-type, SCBA.

8.2.2 - Eye Protection: Splash goggles or safety glasses. If necessary, refer to appropriate regulations.

8.2.3 - Hand Protection: Wear gloves appropriate for use with glycol ethers and alcohols. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this SDS. If necessary, refer to appropriate regulations.

8.2.4 - Body Protection: If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment). 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 under appropriate regulations.

Section 9 - PHYSICAL and CHEMICAL PROPERTIES

FORM: *Liquid.*
COLOR: Yellowish.
MOLECULAR FORMULA: Mixture.
MOLECULAR WEIGHT: Mixture.
ODOR: Mild, sweet, ether-like.
ODOR THRESHOLD: For Alkenoic Acid: 0.011 ppm
BOILING POINT: 123°C (253.5°F)
FREEZING/MELTING POINT: Not established.
EVAPORATION RATE (nBuAc = 1): 0.41
SOLUBILITY IN WATER: 100%
VAPOR PRESSURE (air = 1): 4.0
VAPOR DENSITY: 2.71
SPECIFIC GRAVITY @20°C (water = 1): 0.85
pH: Not established.
COEFFICIENT WATER/OIL DISTRIBUTION: Not available for product.
HOW TO DETECT THIS SUBSTANCE (identification properties): The appearance and odor of this product can be a distinguishing characteristic to identify it in event of accidental release.

Section 10 - STABILITY and REACTIVITY

10.1 - CHEMICAL STABILITY: This product is stable and is not reactive.

10.2 - DECOMPOSITION PRODUCTS:

10.2.1 - Combustion: Irritating fumes and toxic gases (e.g., carbon oxides, nitrogen oxides, ammonia, hydrogen cyanide, peroxides and formaldehyde).

10.2.2 - Hydrolysis: None.

Section 10 - STABILITY and REACTIVITY (Continued)

10.3 - MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This material may be incompatible with strong oxidizing agents (e.g. bromine, chlorine, chromium trioxide, nitric acid, perchlorates or sodium hypochlorite), hydrogen peroxide, metals (e.g. powdered aluminum or magnesium), carbon tetrachloride and metals (e.g. aluminum, magnesium or zinc), alkali metals (e.g. sodium or potassium), acetyl bromide, dichloromethane, perchloric acid or metal perchlorates (e.g. barium perchlorate or lead perchlorate), potassium tert-butoxide, alkylaluminum solutions, beryllium hydride, cyanuric chloride, isocyanates or phosphorus (iii) oxide (tetraphosphorus hexaoxide), diethyl zinc, mineral acids (e.g. sulfuric acid), organic acids, acid anhydrides, acid chlorides or sodium hydroxide and chloroform, cellulose nitrate, nitromethane, nitrites, nitrous acid, nitrogen oxides, aluminum, halogens (e.g. bromine or chlorine), lithium aluminum hydride, isocyanates (e.g. toluene diisocyanate, hexamethylene diisocyanate or methyl isocyanate).

10.4 - POSSIBILITY OF HAZARDOUS REACTIONS/POLYMERIZATION: Will not occur.

10.5 - CONDITIONS TO AVOID: Avoid heat, light, and contact with incompatible chemicals.

Section 11 - TOXICOLOGICAL INFORMATION

11.1 - SYMPTOMS OF EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational exposure are expected to be by inhalation, skin and eye contact. The symptoms of exposure to this product are as follows:

11.1.2 - Inhalation: Inhalation of mists, sprays, fumes or vapors from this product may cause central nervous system effects, including incoordination, dizziness, drowsiness, headache, nausea and vomiting. In addition, inhalation of high concentration may cause corrosive effects such as a burning sensation, sore throat, runny nose, coughing, wheezing, shortness of breath and difficulty breathing. In severe cases, potentially fatal lung injury (pulmonary edema) may result. The symptoms of pulmonary edema, such as chest pain and shortness of breath, may be delayed up to 24 hours after exposure. Due to the high level of Ethylene Glycol Monobutyl Ether, short-term exposure by inhalation may cause adverse blood system effects (red blood cell fragility, hemoglobinuria) at low concentrations, based on animal tests.

11.1.3 - Contact with Skin or Eyes: Contact with the liquid and the eyes will cause severe irritation. Vapor contact will cause irritation, including stinging, redness and tearing. Vapor contact may also produce temporary blurring of vision with a general bluish or grayish haze and the appearance of halos around lights. Prolonged eye contact may cause damage to tissue. Skin contact may be irritating. Prolonged skin contact may cause defatting of the skin and dermatitis and may cause severe irritation, burns, blistering and permanent scarring.

11.1.4 - Skin Absorption: Components of this product can be absorbed through the skin and may cause harmful effect if a large area of skin is involved or contact is prolonged. Symptoms may include adverse central nervous system effects described under 'Inhalation' and 'Ingestion' and adverse blood system effects.

11.1.5 - Ingestion: Ingestion is not a significant route of occupational exposure. Ingestion of this product can cause adverse central nervous system effects, with symptoms such as dizziness, incoordination, drowsiness, headache, nausea and vomiting. Due to the presence of the Primary Alkyl Alcohol, severe vision effects, including increased sensitivity to light, blurred vision, and blindness may develop following an 8 to 24-hour symptom-free period if ingested. Due to the high level of Ethylene Glycol Monobutyl Ether, ingestion may cause adverse blood system effects (red blood cell fragility, hemoglobinuria) at low concentrations, based on animal tests. Ingestion of products containing glycol ethers may cause harm to kidneys. Aspiration into the lungs is a potential hazard after ingestion.

11.1.6 - Injection: Though not anticipated to be a significant route of exposure for this product, injection (via punctures or lacerations by contaminated objects) may cause redness at the site of injection.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	2*
FLAMMABILITY HAZARD	(RED)	2
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

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

11.2 - IRRITANCY OF PRODUCT: This product may mildly to moderately irritate contaminated tissue.

11.3 - SENSITIZATION OF PRODUCT: No component of this product is known to cause human skin or respiratory sensitization. The Cyclic Secondary Amine component has been shown to cause skin sensitization in a laboratory animal assay in animals. The EU ECHA database lists Cyclic Secondary Amine as a Suspected skin sensitizer: CAESAR skin sensitization model in VEGA (Q)SAR platform predicts that the chemical is Sensitizer (good reliability).

11.4 - HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Exposure to this product may cause the following health effects:

11.4.1 - Acute: This product may be harmful by inhalation, ingestion or if absorbed via intact skin. Ingestion may be fatal or cause significant eye effects or blindness. Inhalation of high concentration may be fatal or may cause adverse blood effects. Eye contact may cause severe irritation. Skin contact may be irritating.

11.4.2 - Chronic: Prolonged or chronic skin contact may cause dermatitis. Long-term occupational exposure (inhalation and dermal) to ethylene glycol ethers, including Ethylene Glycol Monobutyl Ether, may be associated with increased oxalic acid loads, which can alter kidney function and may result in kidney stones.

11.5 - TARGET ORGANS:

11.5.1 - Acute: Skin, eyes, respiratory system, central nervous system, blood, blood-forming system.

11.5.2 - Chronic: *Skin, kidneys.*

Section 11 - TOXICOLOGICAL INFORMATION (Continued)

11.6 - TOXICITY DATA: The following toxicity data are available for components of 1% concentration or greater. Due to the large amount of data for components, only available human data, LD50 (Oral-Rat or Mouse), LD50 (Skin-Rabbit or Rat), LC50 (Inhalation-Rat or Mouse), mutation data and irritation data are provided in this SDS. Contact Kinetic Fuel Technology for information on other data available.

11.6.1 - n-BUTYL ALCOHOL:
Standard Draize Test (Eye-Human) 50 ppm
Standard Draize Test (Eye-Human) 990 ppm/1 hour
Standard Draize Test (Skin-Human) 20 µL/20 minutes
TCLo (Inhalation-Human) 25 ppm: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Sense Organs and Special Senses (Eye): conjunctive irritation; Lungs, Thorax, or Respiration: other changes
TDLo (Eye-Human) 72.5 mg/m^3: Sense Organs and Special Senses (Eye): conjunctive irritation
LDLo (Oral-Human) 428 mg/kg
Standard Draize Test (Skin-Rabbit) 20 mg/24 hours: Moderate
Standard Draize Test (Eye-Rabbit) 2 mg/24 hours: Severe
Standard Draize Test (Eye-Rabbit) 1.62 mg: Severe
Standard Draize Test (Eye-Rabbit) 0.005 mL: Severe
LD_{50} (Oral-Rat) 790 mg/kg: Liver: fatty liver degeneration; Kidney/Ureter/Bladder: other changes; Blood: other changes
LD_{50} (Oral-Rat) 4.36 gm/kg: Gastrointestinal: gastritis; Liver: other changes; Blood: hemorrhage
LD_{50} (Oral-Rat) 0.79 gm/kg
LD_{50} (Oral-Mouse) 100 mg/kg
LD_{50} (Skin-Rabbit) 3400 mg/kg

11.6.2 - ETHYLENE GLYCOL MONOBUTYL ETHER:
Open Irritation Test (Skin-Rabbit) 500 mg: Mild
Standard Draize Test (Eye-Rabbit) 100 mg: Severe
Standard Draize Test (Eye-Rabbit) 100 mg/24 hours: Moderate
LDLo (Oral-Human) 143 mg/kg
TDLo (Oral-Woman) 600 mg/kg: Behavioral: coma; Lungs, Thorax, or Respiration: dyspnea; Nutritional and Gross Metabolic: metabolic acidosis
TDLo (Oral-Woman) 7813 µL/kg: Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Nutritional and Gross Metabolic: metabolic acidosis
TCLo (Inhalation-Human) 195 ppm/8 hours: Gastrointestinal: nausea or vomiting
TCLo (Inhalation-Human) 100 ppm: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Sense Organs and Special Senses (Eye): effect, not otherwise specified; Lungs, Thorax, or Respiration: other changes
TCLo (Inhalation-Human) 1500 mg/m^3: Sense Organs and Special Senses (Eye): conjunctive irritation; Liver: other changes; Kidney/Ureter/Bladder: other changes
LC_{50} (Inhalation-Rat) 450 ppm/4 hours: Behavioral: ataxia; Nutritional and Gross Metabolic: weight loss or decreased weight gain
LC_{50} (Inhalation-Rat) 2900 mg/m^3/7 hours: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
LC_{50} (Inhalation-Mouse) 3380 mg/m^3/7 hours: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
LC_{50} (Inhalation-Mouse) 700 ppm/7 hours: Behavioral: analgesia; Lungs, Thorax, or Respiration: dyspnea; Kidney/Ureter/Bladder: hematuria
LD_{50} (Oral-Rat) 470 mg/kg
LD_{50} (Oral-Rat) 917 mg/kg: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
LD_{50} (Oral-Mouse) 1230 mg/kg: Behavioral: altered sleep time (including change in righting reflex), somnolence (general depressed activity); Skin and Appendages: hair
LD_{50} (Oral-Mouse) 1167 mg/kg: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
LD_{50} (Skin-Rabbit) 220 mg/kg
Mutation in Microorganisms (Bacteria-*Salmonella typhimurium*) 19 µmol/plate

11.6.3 - PRIMARY ALKYL ALCOHOL:
TDLo (Oral-Man) 3571 µL/kg: Sense Organs and Special Senses (Eye): visual field changes; Lungs, Thorax, or Respiration: dyspnea; Blood: other changes
TDLo (Oral-Man) 9450 µL/kg: Sense Organs and Special Senses (Eye): mydriasis (pupillary dilation); Behavioral: general anesthetic; Nutritional and Gross Metabolic: body temperature decrease
TDLo (Oral-Man) 3429 mg/kg: Sense Organs and Special Senses (Eye): visual field changes
TDLo (Oral-Woman) 4 gm/kg: Sense Organs and Special Senses (Eye): visual field changes; Lungs, Thorax, or Respiration: dyspnea; Gastrointestinal: nausea or vomiting

11.6.3 - PRIMARY ALKYL ALCOHOL (continued):
LDLo (Oral-Man) 6422 mg/kg: Brain and Coverings: changes in circulation (hemorrhage, thrombosis, etc.); Lungs, Thorax, or Respiration: dyspnea; Gastrointestinal: nausea or vomiting
LDLo (Oral-Woman) 10 mL/kg: Lungs, Thorax, or Respiration: respiratory depression; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects; Gastrointestinal: changes in structure or function of endocrine pancreas
LDLo (Oral-Human) 428 mg/kg: Behavioral: headache; Lungs, Thorax, or Respiration: other changes
LDLo (Oral-Human) 143 mg/kg: Sense Organs and Special Senses (Eye): optic nerve neuropathy; Lungs, Thorax, or Respiration: dyspnea; Gastrointestinal: nausea or vomiting
LDLo (Unreported-Man) 868 mg/kg
TCLo (Inhalation-Human) 86,000 mg/m^3: Sense Organs and Special Senses (Eye): lachrymation; Lungs, Thorax, or Respiration: cough, other changes
TCLo (Inhalation-Human) 300 ppm: Sense Organs and Special Senses (Eye): visual field changes; Behavioral: headache; Lungs, Thorax, or Respiration: other changes
Standard Draize Test (Skin-Rabbit) 20 mg/24 hours: Moderate
Standard Draize Test (Eye-Rabbit) 40 mg: Moderate
Standard Draize Test (Eye-Rabbit) 100 mg/24 hours: Moderate
LD_{50} (Oral-Rat) 5600 mg/kg
LD_{50} (Oral-Mouse) 7300 mg/kg
LD_{50} (Skin-Rabbit) 15,800 mg/kg
LC_{50} (Inhalation-Rat) 64000 ppm/4 hours
LC_{50} (Inhalation-Rabbit) 81000 mg/m3/14 hours
DNA Inhibition (Human Lymphocyte) 300 mmol/L
DNA Repair (Bacteria-*Escherichia coli*) 20 mg/well
Mutation in Microorganisms (Yeast-*Saccharomyces cerevisiae*) 12 pph
Mutation in Microorganisms (Mouse Lymphocyte) 7900 mg/L
Sex Chromosome Loss and Non-Disjunction (Mold-*Aspergillus nidulans*) 56,000 ppm
Cytogenetic Analysis (Parenteral-Grasshopper) 3000 ppm
Cytogenetic Analysis (Oral-Mouse) 1 gm/kg
Cytogenetic Analysis (Intraperitoneal-Mouse) 75 mg/kg
DNA Damage (Oral-Rat) 10 µmol/kg
Morphological Transformation (Mouse-Fibroblast) 0.01 mg/L/21 days

11.6.4 - ALKENOIC ACID:
Open Irritation Test (Skin-Rabbit) 500 mg: Moderate
Standard Draize Test (Eye-Rabbit) 2 mg: Severe
LC_{50} (Inhalation-Rat) 8000 ppm/8 hours
LC_{50} (Inhalation-Mouse) 1320 mg/m^3/2 hours: Sense Organs and Special Senses (Eye): lachrymation; Behavioral: ataxia; Lungs, Thorax, or Respiration: cyanosis
LC_{50} (Inhalation-Mouse) 12,000 mg/m^3: Behavioral: alteration of classical conditioning
LC_{50} (Inhalation-Mouse) 1.35 gm/m^3
LD_{50} (Oral-Rat) 1738 mg/kg: Kidney/Ureter/Bladder: changes in blood vessels or in circulation of kidney
LD_{50} (Oral-Mouse) 525 mg/kg: Behavioral: sleep, somnolence (general depressed activity)
LD_{50} (Oral-Mouse) 1200 mg/kg
Morphological Transformation (Mouse-Fibroblast) 125 mg/L
Morphological Transformation (Mouse Lymphocyte) 1 µL/L
Mutation in Mammalian Somatic Cells (Mouse Lymphocyte) 1 gm/L
Sister Chromatid Exchange (Hamster Ovary) 160 mg/L
Cytogenetic Analysis (Inhalation-Rat) 0.07 mg/L/122 days-intermittent

11.6.5 - CYCLIC SECONDARY AMINE:
Standard Draize Test (Skin-Human) 15 mg/3 days-intermittent: Moderate
Standard Draize Test (Eye-Rabbit) 100 mg: Mild
Open Irritation Test (Skin-Rabbit) 500 mg: Mild
LD_{50} (Oral-Rat) 25,000 mg/kg
LD_{50} (Oral-Mouse) 28,000 mg/kg
Cytogenetic Analysis (Yeast-*Saccharomyces cerevisiae*) 100 mg/L
Cytogenetic Analysis (Hamster Fibroblast) 2500 µg/L
Unscheduled DNA Synthesis (Rectal-Mouse) 35 mg/kg

11.7 - CARCINOGENIC POTENTIAL: Components of this product are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

11.7.1 - n-BUTYL ALCOHOL: EPA-D (Not Classifiable a to Human Carcinogenicity)
11.7.2 - ETHYLENE GLYCOL MONOBUTYL ETHER: ACGIH TLV-A3 (Confirmed Animal Carcinogen); EPA-NL (Not Likely to Be Carcinogenic to Humans); IARC-3 (Not Classifiable as to Carcinogenicity to Humans)
11.7.3 - ALKENOIC ACID: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Not Classifiable as to Carcinogenicity to Humans)
11.7.4 - CYCLIC SECONDARY AMINE: MAK-3 (Substances Which Cause Concern that They Could be Carcinogenic for Man but Cannot Be Assessed Conclusively Because of Lack of Data. The classification in Category 3 is provisional. The EU ECHA database lists Cyclic Secondary Amine as a Suspected carcinogen: equivocal carcinogenicity data according to ISSCAN.

The remaining components of this product are not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, or ACGIH and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

Section 11 - TOXICOLOGICAL INFORMATION (Continued)

11.8 - REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on animal or human reproductive systems.

11.8.1 - Mutagenicity: The components of this product are not reported to cause mutagenic effects in humans. There is insufficient information available to conclude that the Primary Alkyl Alcohol component is mutagenic. A positive result was obtained in a limited oral study in mice, however other oral and inhalation studies in live rats and mice have given negative results. Mostly negative results have been obtained in cultured mammalian cells, bacteria and fruit flies (Drosophila).

11.8.2 - Embryotoxicity: The components of this product are not reported to cause embryotoxic effects in humans. The Primary Alkyl Alcohol component has produced fetotoxicity in rats and teratogenicity in mice exposed by inhalation to high concentrations that did not produce significant maternal toxicity. The n-Butyl Alcohol component has caused embryotoxic and teratogenic effects in animal tests, but only with maternal toxicity.

11.8.3 - Teratogenicity: The components of this product are not reported to cause teratogenic effects in humans. The Ethylene Glycol Monobutyl Ether has caused teratogenic effects, but only with maternal toxicity.

11.8.4 - Reproductive Toxicity: The components of this product are not reported to cause reproductive effects in humans.

Section 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

***12.1 - MOBILITY*:** This product has not been tested for mobility in soil. The following information is available for some components.

12.1.1 - n-BUTYL ALCOHOL: The Koc of n-Butyl Alcohol is estimated as 72, using a log Kow of 0.88 and a regression-derived equation. According to a classification scheme, this estimated Koc value suggests that n-Butyl Alcohol is expected to have high mobility in soil.

12.1.2 - ETHYLENE GLYCOL MONOBUTYL ETHER: The Koc of 2-Butoxyethanol is estimated as 67, using a log Kow of 0.83 and a regression-derived equation. According to a classification scheme, this estimated Koc value suggests that 2-Butoxyethanol is expected to have high mobility in soil.

12.1.3 - PRIMARY ALKYL ALCOHOL: Using a structure estimation method based on molecular connectivity indices, the Koc for Primary Alkyl Alcohol can be estimated to be 1. According to a classification scheme, this estimated Koc value suggests that Primary Alkyl Alcohol is expected to have very high mobility in soil.

12.2 - PERSISTENCE AND BIODEGRADABILITY: This product has not been tested for persistence or biodegradability. The following information is available for some components.

12.2.1 - n-BUTYL ALCOHOL: If released to air, a vapor pressure of 7 mm Hg at 25° C indicates n-Butyl Alcohol will exist solely as a vapor in the ambient atmosphere. Vapor-phase n-Butyl Alcohol will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 46 hours. If released to soil, n-Butyl Alcohol is expected to have high mobility based upon an estimated Koc of 72. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 8.8X10-6 atm-cu m/mole. n-Butyl Alcohol may volatilize from dry soil surfaces based upon its vapor pressure. The biodegradation half-life of n-Butyl Alcohol in a sub-surface soil was approximately 7 days. If released into water, n-Butyl Alcohol is not expected to adsorb to suspended solids and sediment in water based upon the estimated Koc. Volatilization from water surfaces is expected to be an important environmental fate process based upon this compound's Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 2 and 29 days, respectively. In a river die-away test, n-Butyl Alcohol achieved 33% of its theoretical BOD in 5 days, suggesting biodegradation will be an important fate process in water. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions.

12.2.2 - ETHYLENE GLYCOL MONOBUTYL ETHER: If released to air, a vapor pressure of 0.88 mm Hg at 25°C indicates 2-Butoxyethanol will exist solely as a vapor in the ambient atmosphere. Vapor-phase 2-Butoxyethanol will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 16 hours. If released to soil, 2-Butoxyethanol is expected to have high mobility based upon an estimated Koc of 67. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 1.60X10-6 atm-cu m/mole. If released into water, 2-Butoxyethanol is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. 2-Butoxyethanol reached 91% of its theoretical BOD in 14 days using an activated sludge inoculum. Therefore, this compound has the potential to biodegrade rapidly in water. Based upon this compound's estimated Henry's Law constant it is concluded that the volatilization of 2-Butoxyethanol from water surfaces may be an important fate process. The estimated volatilization half-lives for a model river and model lake are 25 and 185 days, respectively. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions.

12.2.3 - PRIMARY ALKYL ALCOHOL: If released to the atmosphere, a vapor pressure of 127 mm Hg at 25°C indicates that Primary Alkyl Alcohol will exist solely in the vapor phase. Vapor phase Primary Alkyl Alcohol is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 17 days. If released to soil, Primary Alkyl Alcohol is expected to have very high mobility based upon an estimated Koc of 1. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 4.55X10-6 atm-cu m/mole. Primary Alkyl Alcohol may also volatilize from dry soils based upon it vapor pressure. Biodegradation of Primary Alkyl Alcohol in soils is expected to occur rapidly based on half-lives in a sandy silt loam from Texas and a sandy loam from Mississippi of 1 and 3.2 days, respectively. If released into water, Primary Alkyl Alcohol is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is expected to be an important fate process based upon this compound's Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 3 and 35 days, respectively. Biodegradation is expected to occur in natural waters since Primary Alkyl Alcohol is degraded quickly in soils and was biodegraded rapidly in various aqueous screening tests using sewage seed or activated sludge. BCF values of less than 10, measured in fish suggests bioconcentration in aquatic organisms is low. Hydrolysis of Primary Alkyl Alcohol and photolysis in sunlit surface waters are not expected since Primary Alkyl Alcohol lacks functional groups that are susceptible to hydrolysis or photolysis under environmental conditions.

12.3 - BIO-ACCUMULATION POTENTIAL: This product has not been tested for bio-accumulation potential. The following information is available for some components.

12.3.1 - n-BUTYL ALCOHOL: An estimated BCF of 3 was calculated for n-Butyl Alcohol, using a log Kow of 0.88 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low. Octanol/Water Partition Coefficient: Log Kow = 0.88

12.3.2 - ETHYLENE GLYCOL MONOBUTYL ETHER: An estimated BCF of 3 was calculated for 2-Butoxyethanol, using an estimated log Kow of 0.83 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low.

12.3.3 - PRIMARY ALKYL ALCOHOL: Fish (golden ide) exposed to 0.05 mg/L of Primary Alkyl Alcohol for three days in an aquatic tank had measured BCF values of less than 10. Based on a classification scheme, this BCF value suggests that bioconcentration in aquatic organisms is low.

12.4 - ECOTOXICITY: This product has not been tested for toxicity to aquatic or terrestrial organisms; however, all release to terrestrial, atmospheric and aquatic environments should be avoided. Release of this product to an aquatic environment may be harmful to aquatic plant and animal life in contaminated bodies of water, especially in large quantities. The following aquatic toxicity data are available for some components. Only select data are presented in this SDS. Contact Kinetic Fuel Technologies for information on other data available.

***12.4.1 - n*-BUTYL ALCOHOL:**
LC_{50}, S (fathead minnow) 96 hours = 1,910 mg/L
LC_{50} (*Alburnus alburnus*) 96 hours = 2,300 mg/L
LC_{50} (*Nitocra spinipes*) 96 hours = 2,100 mg/L

12.4.2 - ETHYLENE GLYCOL MONOBUTYL ETHER:
LC_{50} (*Menidia beryllina* Inland silverside) 96 hours = 1250 mg/L; static
LC_{50} (*Crangon crangon* brown shrimp) 96 hours = 775 mg/L (range: 550-950 mg/L)
LC_{50} (*Lepomis macrochirus* Bluegill) 96 hours = 1,490 mg/L; static
LC_{50} (*Pimephales promelas* Fathead minnow) 96 hours = 2137 mg/L
LC_{50} (*Oncorhynchus mykiss* Rainbow trout) 96 hours = > 1000 mg/L

12.4.2 - ETHYLENE GLYCOL MONOBUTYL ETHER (continued):
LC_{50} (*Cyprinodon variegatus* Sheepshead minnow) 96 hours = 116 mg/L
LC_{50} (*Artemia salina* Brine shrimp) 24 hours = 1000 mg/L

12.4.3 - PRIMARY ALKYL ALCOHOL:
EC_{50} (*Daphnia magna* Water flea; immobilization) 24 hours = > 10,000 mg/L
LC_{50} (*Artemia salina* Brine shrimp, 24 hr old) 24 hours = 1578.84 mg/L
LC_{50} (*Pimephales promelas* fathead minnows, 30 day old 0.12 g) 96 hours = 28,100 mg/L
LC_{50} (*Oncorhynchus mykiss* Rainbow trout, 0.8 g) 96 hours = 19,000 mg/L
LC_{50} (*Lepomis macrochirus* Bluegill) 96 hours = 15,400 mg/L; flow-through
LC_{50} (*Crangon crangon* Brown shrimp, adult) 96 hours = 1340 mg/L

Section 12 - ECOLOGICAL INFORMATION (Continued)

12.4 - ECOTOXICITY (continued):

12.4.3 - ALKENOIC ACID:
LC_{50} (bluegill) 96 hours = 350 mg/L
LC_{50} (daphnia) 24 hours = 100 mg/L
EC_{50} (Daphnia magna) 24 hours = 119 mg/L (immobilization)

12.4.4 - YCLIC SECONDARY AMINE:
LC_{50} (*Pimephales promelas* Fathead minnow, juvenile 4-8 wks., length 1.1-3.1 cm) 96 hours = 205,000 µg/L

12.5 - OTHER ADVERSE EFFECTS: No component of this product is known to have ozone depletion potential.

12.6 - ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Section 13 - DISPOSAL CONSIDERATIONS

13.1 - WASTE TREATMENT/DISPOSAL METHODS: It is the responsibility of the generator to determine at the time of disposal whether the product meets the criteria of a hazardous waste per regulations of the area in which the waste is generated and/or disposed of. Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Shipment of wastes must be done with appropriately permitted and registered transporters.

13.2 - DISPOSAL CONTAINERS: Waste materials must be placed in and shipped in appropriate 5-gallon or 55-gallon poly or metal waste pails or drums. Permeable cardboard containers are not appropriate and should not be used. Ensure that any required marking or labeling of the containers be done to all applicable regulations.

13.3 - PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials.

13.4 - PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations. This product, if unaltered by handling, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

13.5 - U.S. EPA WASTE NUMBER: Wastes of this product should be tested to determine if they meet the criteria for D001 Waste Characteristic-Ignitability.

Section 14 - TRANSPORTATION INFORMATION

14.1 - U.S. DEPARTMENT OF TRANSPORTATION SHIPPING REGULATIONS: This product is classified as Dangerous Goods, per regulations of the DOT.

14.1.1 - UN Identification Number: UN 1993
14.1.2 - Proper Shipping Name: Flammable liquid, n.o.s. (n-Butyl alcohol, Primary Alkyl Alcohol)
14.1.3 - Hazard Class Number and Description: 3 (Flammable)
14.1.4 - Packing Group: PG III
14.1.5 - DOT Label(s) Required: Class 3 (Flammable)
14.1.6 - Emergency Response Guidebook Number (2016): 128
14.1.7 - Marine Pollutant: This compound is not specifically listed as a Marine Pollutant and does not meet the criteria of a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).
14.1.8 - CERCLA RQ: 5000 lb (2270 kg)

14.2 - INTERNATIONAL AIR TRANSPORT ASSOCIATION/ICAO (IATA/ICAO): This material is classified as dangerous goods, per the International Air Transport Association.

14.2.1 - UN Identification Number: UN 1993
14.2.2 - Proper Shipping Name/Description: Flammable liquid, n.o.s. (n-Butyl alcohol, Primary Alkyl Alcohol)
14.2.3 - Hazard Class or Division: 3 (Flammable)
14.2.4 - Hazard Label(s) Required: Class 3 (Flammable)
14.2.5 - Packing Group: III
14.2.6 - Excepted Quantities: E1
14.2.7 - Passenger and Cargo Aircraft Packing Instruction: 355
14.2.8 - Passenger and Cargo Aircraft Packing Maximum Net Quantity per Pkg.: 60 L
14.2.9 - Passenger and Cargo Aircraft Packing Limited Quantity Packing Instruction: Y344
14.2.10 - Passenger and Cargo Aircraft Packing Limited Quantity Maximum Net Quantity per Pkg.: 10 L
14.2.11 - Cargo Aircraft Only Packing Instruction: 366
14.2.12 - Cargo Aircraft Only Maximum Net Quantity per Pkg.: 60 L
14.2.13 - Special Provisions: A3
14.2.14 - ERG Code: 3L

14.3 - TRANSPORT IN BULK ACCORDING TO THE IBC CODE: See the information under the individual jurisdiction listings for IBC information.

14.4 - ENVIRONMENTAL HAZARDS: This product does not meet the criteria of environmentally hazardous according to the criteria of the UN Model Regulations (as reflected in the IMDG Code, ADR, RID, and ADN); and is not specifically listed in Annex III under MARPOL 73/78.

Section 15 - REGULATORY INFORMATION

15.1 - UNITED STATES REGULATIONS:

15.1.1 - U.S. SARA 302 (40 CFR 355, Appendix A) Reporting Requirements: Not applicable to any component.

15.1.2 - U.S. SARA 304 (40 CFR 304, Table 302.4) Reporting Requirements: Not applicable to any component.

15.1.3 - U.S. SARA 313 (40 CFR 372.65) Reporting Requirements: n-Butyl Alcohol: Yes; Ethylene Glycol Monobutyl Ether: Yes/N230; Primary Alkyl Alcohol: Yes

15.1.4 - U.S. SARA Threshold Planning Quantity (TPQ): There are no specific Threshold Planning Quantities for any component of this product. The default Federal SDS submission and inventory requirement filing threshold of 10,000

15.1.5 - U.S. SARA Hazard Categories (Section 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: No; FIRE: Yes; REACTIVE: No; SUDDEN RELEASE: No

15.1.6 - U.S. CERCLA Reportable Quantities (RQ): n-Butyl Alcohol = 5000 lb (2270 kg); Primary Alkyl Alcohol = 5000 lb (2270 kg); the Ethylene Glycol Monobutyl Ether component has not been assigned a specific CERCLA RQ, but is a CERCLA Hazardous Substance, as a glycol ether.

15.1.6 - U.S. TSCA Inventory Status: The components of this product are on the TSCA Inventory.

15.1.7 - California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): No component is on the California Proposition 65 lists.

Section 16 - OTHER INFORMATION

16.1 - GLOBAL HARMONIZATION LABELING AND CLASSIFICATION- COMPONENT CLASSIFICATION: The following information is classification details of components.

16.1.1 - n-Butyl Alcohol: This is a published, Harmonized classification.

Classification: Flammable Liquid Category 3, Acute Oral Toxicity Category 4, Eye Damage Category 1, Skin Irritation Category. 2, Specific Target Organ Toxicity (Inhalation-Irritation) Single Exposure Category 3, Specific Target Organ Toxicity (Inhalation-Narcotic Effect) Single Exposure Category 3

Hazard Statements: H226: Flammable liquid and vapor. H302: Harmful if swallowed. H318: Causes serious eye damage. H315: Causes skin irritation. H335: May cause respiratory irritation. H336: May cause drowsiness or dizziness.

16.1.2 - Ethylene Glycol Monobutyl Ether: This is a published, Harmonized classification.

Classification: Acute Oral Toxicity Category 4, Acute Dermal Toxicity Category 4, Acute Inhalation Category 4, Eye Irritation Category 2, Skin Irritation Category 2

Hazard Statements: H302 + H312 + H332: Harmful if swallowed, in contact with skin or if inhaled. H319: Causes serious eye irritation. H315: Causes skin irritation.

16.1.3. - Primary Alkyl Alcohol: This is a published, Harmonized classification.

Classification: Flammable Liquid Category 2, Acute Oral Toxicity Category 3, Acute Dermal Toxicity Category 3, Acute Inhalation Toxicity Category 3, Specific Target Organ Toxicity (Ingestion-Eye) Single Exposure Category 1

Hazard Statements: H225: Highly flammable liquid and vapor. H301 + H311 + H331: Toxic if swallowed, in contact with skin or if inhaled. H370: Causes damage to organs.

16.1.4 - Alkenoic Acid: This is a published, Harmonized classification.

Classification: Flammable Liquid Category 3, Acute Oral Toxicity Category 4, Acute Dermal Toxicity Category 4, Acute Inhalation Toxicity Category 4, Skin Corrosion Category 1B

Hazard Statements: H226: Flammable liquid and vapor. H302 + H312 + H332: Harmful if swallowed, in contact with skin or if inhaled. H314: Causes severe skin burns and eye damage.

16.1.5 - Cyclic Secondary Amine: This is a published, Harmonized classification.

Classification: Skin Irritation Category 2, Eye Irritation Category 2A, Specific Target Organ Toxicity (Inhalation-Respiratory Irritation) Single Exposure

Hazard Statements: H315: Causes skin irritation. H315: Causes skin irritation. H335: May cause respiratory irritation.

Additional EU ECHA Properties of Concern: Suspected carcinogen: equivocal carcinogenicity data according to ISSCAN. Suspected skin sensitizer: CAESAR skin sensitization model in VEGA (Q)SAR platform predicts that the chemical is Sensitizer (good reliability).

16.2 - REVISIONS DETAILS: October 2019: Up-date of entire SDS for current compliance with the Global Harmonization Standard under U.S. OSHA 1910.120.

16.3 - REFERENCES AND DATA SOURCES: Contact the supplier for information.

16.4 - METHODS OF EVALUATING INFORMATION FOR THE PURPOSE OF CLASSIFICATION: Bridging principles were used to classify this product.

16.5 - PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc. • PO Box 1961, Hilo, HI 96721 • 800-441-3365 • 808-969-4846

16.6- DATE OF PRINTING: November 1, 2019

16.7 - DEFINITION OF TERMS.

A large number of abbreviations and acronyms appear on an SDS. Some of these, which are commonly used, include the following.

CAS #: This is the Chemical Abstract Service Number that uniquely identifies each constituent.

16.7.1. - EXPOSURE LIMITS IN AIR:

16.7.1.1- CEILING LEVEL: The concentration that shall not be exceeded during any part of the working exposure.

16.7.1.2 - DFG MAK Germ Cell Mutagen Categories: 1: Germ cell mutagens that have been shown to increase the mutant frequency in the progeny of exposed humans. **2:** Germ cell mutagens that have been shown to increase the mutant frequency in the progeny of exposed mammals. **3A:** Substances that have been shown to induce genetic damage in germ cells of human of animals, or which produce mutagenic effects in somatic cells of mammals *in vivo* and have been shown to reach the germ cells in an active form. **3B:** Substances that are suspected of being germ cell mutagens because of their genotoxic effects in mammalian somatic cell *in vivo*; in exceptional cases, substances for which there are no *in vivo* data, but that are clearly mutagenic in vitro and structurally related to known in vivo mutagens. **4:** Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible.

16.7.1 - EXPOSURE LIMITS IN AIR (continued):

16.7.1.3 - DFG MAK Germ Cell Mutagen Categories (continued): 5: Germ cell mutagens, the potency of which is considered to be so low, that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

16.7.1.4 - DFG MAK Pregnancy Risk Group Classification: Group A: A risk of damage to the developing embryo or fetus has been unequivocally demonstrated. Exposure of pregnant women can lead to damage of the developing organism, even when MAK and BAT (Biological Tolerance Value for Working Materials) values are observed. **Group B:** Currently available information indicates a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed, even when MAK and BAT values are observed. **Group C:** There is no reason to fear a risk of damage to the developing embryo or fetus when MAK and BAT values are observed. **Group D:** Classification in one of the groups A–C is not yet possible because, although the data available may indicate a trend, they are not sufficient for final evaluation.

17.7.1.5 - IDLH: Immediately Dangerous to Life and Health. This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

16.7.1.6 - LOQ: Limit of Quantitation.

16.7.1.7 - MAK: Federal Republic of Germany Maximum Concentration Values in the workplace.

16.7.1.8 - NE: Not Established. When no exposure guidelines are established, an entry of NE is made for reference.

16.7.1.9 - NIC: Notice of Intended Change.

16.7.1.10- NIOSH CEILING: The exposure that shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, the ceiling shall be assumed as a 15-minute TWA exposure (unless otherwise specified) that shall not be exceeded at any time during a workday.

16.7.1.11 - NIOSH RELs: NIOSH's Recommended Exposure Limits.

16.7.1.12 - PEL: OSHA's Permissible Exposure Limits. This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL" is placed next to the PEL that was vacated by Court Order.

16.7.1-13 - SKIN: Used when a there is a danger of cutaneous absorption.

16.7.1. 14 - STEL: Short Term Exposure Limit, usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA.

16.7.1.15 - TLV: Threshold Limit Value. An airborne concentration of a substance that represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour.

16.7.1.16 - TWA: Time Weighted Average exposure concentration for a conventional 8-hr (TLV, PEL) or up to a 10-hr (REL) workday and a 40-hr workweek.

16.7.1.17 - WEEL: Workplace Environmental Exposure Limits from the AIHA.

16.7.2 - HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS: This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards.

16.7.2.1 - HEALTH HAZARD: 0 Minimal Hazard: No significant health risk, irritation of skin or eyes not anticipated. *Skin Irritation*: Essentially non-irritating. Mechanical irritation may occur. PII or Draize = 0. *Eye Irritation*: Essentially non-irritating, minimal effects clearing in < 24 hours. Mechanical irritation may occur. Draize = 0. *Oral Toxicity LD_{50} Rat*: > 5000 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 2000 mg/kg. *Inhalation Toxicity 4-hrs LC_{50} Rat*: > 20 mg/L. **1** Slight Hazard: Minor reversible injury may occur; may irritate the stomach if swallowed; may defat the skin and exacerbate existing dermatitis. *Skin Irritation*: Slightly or mildly irritating. PII or Draize > 0 < 5. *Eye Irritation*: Slightly to mildly irritating, but reversible within 7 days. Draize > 0 ≤ 25. *Oral Toxicity LD_{50} Rat*: > 500–5000 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 1000–2000 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: > 2–20 mg/L. **2** *Moderate Hazard*: Temporary or transitory injury may occur; prolonged exposure may affect the CNS. *Skin Irritation*: Moderately irritating; primary irritant; sensitizer. PII or Draize ≥ 5, with no destruction of dermal tissue. *Eye Irritation*: Moderately to severely irritating; reversible corneal opacity; corneal involvement or irritation clearing in 8–21 days. Draize = 26–100, with reversible effects. *Oral Toxicity LD_{50} Rat*: > 50–500 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 200–1000 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: > 0.5–2 mg/L. **3** Serious Hazard: Major injury likely unless prompt action is taken, and medical treatment is given; high level of toxicity; corrosive. *Skin Irritation*: Severely irritating and/or corrosive; may cause destruction of dermal tissue, skin burns, and dermal necrosis. PII or Draize > 5–8, with destruction of tissue. *Eye Irritation*: Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. *Oral Toxicity LD_{50} Rat*: > 1–50 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 20–200 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: > 0.05–0.5 mg/L. **4** Severe Hazard: Life-threatening; major or permanent damage may result from single or repeated exposure; extremely toxic; irreversible injury may result from brief contact. *Skin Irritation*: Not appropriate. Do not rate as a 4, based on skin irritation alone. *Eye Irritation*: Not appropriate. Do not rate as a 4, based on eye irritation alone. *Oral Toxicity LD_{50} Rat*: ≤ 1 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: ≤ 20 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: ≤ 0.05 mg/L.

16.7.2.2 - FLAMMABILITY HAZARD: 0 Minimal Hazard: Materials that will not burn in air when exposure to a temperature of 815.5°C (1500°F) for a period of 5 minutes. **1** Slight Hazard: Materials that must be pre-heated before ignition can occur. Material requires considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur. This usually includes the following: Materials that will burn in air when exposed to a temperature of 815.5°C (1500°F) for a period of 5 minutes or less; Liquids, solids and semisolids having a flash point at or above 93.3°C (200°F) (i.e. OSHA Class IIIB); and Most ordinary combustible materials (e.g. wood, paper, etc.).

16.7.2 - HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

16.7.2.2 - FLAMMABILITY HAZARD (continued): 2 Moderate Hazard: Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres with air. This usually includes the following: Liquids having a flash-point at or above 37.8°C (100°F); Solid materials in the form of course dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp); and Solids and semisolids (e.g. viscous and slow flowing as asphalt) that readily give off flammable vapors. **3** Serious Hazard: Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions. This usually includes the following: Liquids having a flash point below 22.8°C (73°F) and having a boiling point at or above 38°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (100°F) (i.e. OSHA Class IB and IC); Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air (e.g., dusts of combustible solids, mists or droplets of flammable liquids); and Materials that burn extremely rapidly, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). **4** Severe Hazard: Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and that will burn readily. This usually includes the following: Flammable gases; Flammable cryogenic materials; Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e. OSHA Class IA); and Materials that ignite spontaneously when exposed to air at a temperature of 54.4°C (130°F) or below (pyrophoric).

16.7.2.3 - PHYSICAL HAZARD: 0 *Water Reactivity*: Materials that do not react with water. *Organic Peroxides*: Materials that are normally stable, even under fire conditions and will not react with water. *Explosives*: Substances that are Non-Explosive. *Compressed Gases*: No Rating. *Pyrophorics*: No Rating. *Oxidizers*: No 0 rating. *Unstable Reactives*: Substances that will not polymerize, decompose, condense, or self-react.). **1** *Water Reactivity*: Materials that change or decompose upon exposure to moisture. *Organic Peroxides*: Materials that are normally stable but can become unstable at high temperatures and pressures. These materials may react with water but will not release energy violently. *Explosives*: Division 1.5 & 1.6 explosives. Substances that are very insensitive explosives or that do not have a mass explosion hazard. *Compressed Gases*: Pressure below OSHA definition. *Pyrophorics*: No Rating. *Oxidizers*: Packaging Group III oxidizers; Solids: any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%)/cellulose mixture and the criteria for Packing Group I and II are not met. *Unstable Reactives*: Substances that may decompose condense, or self-react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosion hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors. Substances that readily undergo hazardous polymerization in the absence of inhibitors. **2** *Water Reactivity*: Materials that may react violently with water. *Organic Peroxides*: Materials that, in themselves, are normally unstable and will readily undergo violent chemical change but will not detonate. These materials may also react violently with water. *Explosives*: Division 1.4 explosives. Explosive substances where the explosive effects are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package. *Compressed Gases*: Pressurized and meet OSHA definition but < 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics*: No Rating. *Oxidizers*: Packing Group II oxidizers. Solids: any material that, either in concentration tested, exhibits a mean burning time of less than or equal to the mean burning time of a 2:3 potassium bromate/cellulose mixture and the criteria for Packing Group I are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise of a 1:1 aqueous sodium chlorate solution (40%)/cellulose mixture and the criteria for Packing Group I are not met. *Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential (or low risk) for significant heat generation or explosion. Substances that readily form peroxides upon exposure to air or oxygen at room temperature. **3** *Water Reactivity*: Materials that may form explosive reactions with water. *Organic Peroxides*: Materials that are capable of detonation or explosive reaction but require a strong initiating source or must be heated under confinement before initiation; or materials that react explosively with water. *Explosives*: Division 1.3 explosives. Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. *Compressed Gases*: Pressure ≥ 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics*: No Rating. *Oxidizers*: Packing Group I oxidizers. Solids: any material that, in either concentration tested, exhibits a mean burning time less than the mean burning time of a 3:2 potassium bromate/cellulose mixture. Liquids: any material that spontaneously ignites when mixed with cellulose in a 1:1 ratio, or which exhibits a mean pressure rise time less than the pressure rise time of a 1:1 perchloric acid (50%)/cellulose mixture. *Unstable Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a moderate potential (or moderate risk) to cause significant heat generation or explosion. **4** *Water Reactivity*: Materials that react explosively with water without requiring heat or confinement. *Organic Peroxides*: Materials that are readily capable of detonation or explosive decomposition at normal temperature and pressures. *Explosives*: Division 1.1 & 1.2 explosives. Explosive substances that have a mass explosion hazard or have a projection hazard. A mass explosion is one that affects almost the entire load instantaneously.

Section 16 - OTHER INFORMATION (Continued)

16.7.2 - HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

16.7.2.3 - PHYSICAL HAZARD (continued): 4 (continued): *Compressed Gases*: No Rating. *Pyrophorics*: Add to the definition of Flammability 4. *Oxidizers*: No 4 rating. *Unstable Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a high potential (or high risk) to cause significant heat generation or explosion.

16.7.3 - NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

16.7.3.1 - HEALTH HAZARD: 0 Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials. Gases and vapors with an LC_{50} for acute inhalation toxicity greater than 10,000 ppm. Dusts and mists with an LC_{50} for acute inhalation toxicity greater than 200 mg/L. Materials with an LD_{50} for acute dermal toxicity greater than 2000 mg/kg. Materials with an LD_{50} for acute oral toxicity greater than 2000 mg/kg. Materials essentially non-irritating to the respiratory tract, eyes, and skin. **1** Materials that, under emergency conditions, can cause significant irritation. Gases and vapors with an LC_{50} for acute inhalation toxicity greater than 5,000 ppm but less than or equal to 10,000 ppm. Dusts and mists with an LC_{50} for acute inhalation toxicity greater than 10 mg/L but less than or equal to 200 mg/L. Materials with an LD_{50} for acute dermal toxicity greater than 1000 mg/kg but less than or equal to 2000 mg/kg. Materials that slightly to moderately irritate the respiratory tract, eyes and skin. Materials with an LD_{50} for acute oral toxicity greater than 500 mg/kg but less than or equal to 2000 mg/kg. **2** Materials that, under emergency conditions, can cause temporary incapacitation or residual injury. Gases with an LC_{50} for acute inhalation toxicity greater than 3,000 ppm but less than or equal to 5,000 ppm. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC_{50} for acute inhalation toxicity, if its LC_{50} is less than or equal to 5000 ppm and that does not meet the criteria for either degree of hazard 3 or degree of hazard 4. Dusts and mists with an LC_{50} for acute inhalation toxicity greater than 2 mg/L but less than or equal to 10 mg/L. Materials with an LD_{50} for acute dermal toxicity greater than 200 mg/kg but less than or equal to 1000 mg/kg. Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that cause severe tissue damage, depending on duration of exposure. Materials that are respiratory irritants. Materials that cause severe, but reversible irritation to the eyes or are lachrymators. Materials that are primary skin irritants or sensitizers. Materials whose LD_{50} for acute oral toxicity is greater than 50 mg/kg but less than or equal to 500 mg/kg. **3** Materials that, under emergency conditions, can cause serious or permanent injury. Gases with an LC_{50} for acute inhalation toxicity greater than 1,000 ppm but less than or equal to 3,000 ppm. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater its LC_{50} for acute inhalation toxicity, if its LC_{50} is less than or equal to 3000 ppm and that does not meet the criteria for degree of hazard 4. Dusts and mists with an LC_{50} for acute inhalation toxicity greater than 0.5 mg/L but less than or equal to 2 mg/L. Materials with an LD_{50} for acute dermal toxicity greater than 40 mg/kg but less than or equal to 200 mg/kg. Materials that are corrosive to the respiratory tract. Materials that are corrosive to the eyes or cause irreversible corneal opacity. Materials corrosive to the skin. Cryogenic gases that cause frostbite and irreversible tissue damage. Compressed liquefied gases with boiling points below -55°C (-66.5°F) that cause frostbite and irreversible tissue damage. Materials with an LD_{50} for acute oral toxicity greater than 5 mg/kg but less than or equal to 50 mg/kg. **4** Materials that, under emergency conditions, can be lethal. Gases with an LC_{50} for acute inhalation toxicity less than or equal to 1,000 ppm. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than ten times its LC_{50} for acute inhalation toxicity, if its LC_{50} is less than or equal to 1000 ppm. Dusts and mists whose LC_{50} for acute inhalation toxicity is less than or equal to 0.5 mg/L. Materials whose LD_{50} for acute dermal toxicity is less than or equal to 40 mg/kg. Materials whose LD_{50} for acute oral toxicity is less than or equal to 5 mg/kg.

16.7.3.2 - FLAMMABILITY HAZARD: 0 Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand. Materials that will not burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in according with Annex D of NFPA 704. **1** Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur: Materials that will burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in according with Annex D of NFPA 704. Liquids, solids, and semisolids having a flash point at or above 93.4°C (200°F) (i.e. Class IIIB liquids). Liquids with a flash point greater than 35°C (95°F) that do not sustain combustion when tested using the *Method of Testing for Sustained Combustibility*, per 49 CFR 173, Appendix H or the UN *Recommendations on the Transport of Dangerous Goods, Model Regulations* (current edition) and the related *Manual of Tests and Criteria* (current edition). Liquids with a flash point greater than 35°C (95°F) in a water-miscible solution or dispersion with a water non-combustible liquid/solid content of more than 85% by weight. Liquids that have no fire point when tested by ASTM D 92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup*, up to the boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change. Combustible pellets with a representative diameter of greater than 2 mm (10 mesh). Most ordinary combustible materials. Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **2** Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air. Liquids having a flash point at or above 37.8°C (100°F) and below 93.4°C (200°F) (i.e. Class II and Class IIIA liquids.) Solid materials in the form of powders or coarse dusts of representative diameter between 420 microns (40 mesh) and 2 mm (10 mesh) that burn rapidly but that generally do not form explosive mixtures with air. Solid materials in fibrous or shredded form that burn rapidly and create flash fire hazards, such as cotton, sisal, and hemp. Solids and semisolids that readily give off flammable vapors. Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **3** Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions.

16.7.3 - NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

16.7.3.2 - FLAMMABILITY HAZARD (continued): 3 (continued): Liquids having a flash point below 22.8°C (73°F) and having a boiling point at or above 37.8°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (100°F) (i.e. Class IB and IC liquids). Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air. Flammable or combustible dusts with representative diameter less than 420 microns (40 mesh). Materials that burn with extreme rapidity, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.**4** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily. Flammable gases. Flammable cryogenic materials. Any liquid or gaseous materials that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e. Class IA liquids). Materials that ignite when exposed to air, Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

16.7.3.3- INSTABILITY HAZARD: 0 Materials that in themselves are normally stable, even under fire conditions. Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) below 0.01 W/mL. Materials that do not exhibit an exotherm at temperatures less than or equal to 500°C (932°F) when tested by differential scanning calorimetry. **1** Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures. Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 0.01 W/mL and below 10 W/mL. **2** Materials that readily undergo violent chemical change at elevated temperatures and pressures. Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 10 W/mL and below 100W/mL. **3** Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation. Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 100 W/mL and below 1000 W/mL. Materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures. **4** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures. Materials that are sensitive to localized thermal or mechanical shock at normal temperatures and pressures. Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) of 1000 W/mL or greater.

16.7.4 - FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point: Minimum temperature at which a liquid gives off sufficient vapor to form an ignitable mixture with air near the surface of the liquid or within the test vessel used. Autoignition Temperature: Minimum temperature of a solid, liquid, or gas required to initiate or cause self-sustained combustion in air with no other source of ignition. LEL: Lowest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame. UEL: Highest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame.

16.7.5 - TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. LD_{50}: Lethal Dose (solids & liquids) that kills 50% of the exposed animals. LC_{50}: Lethal Concentration (gases) that kills 50% of the exposed animals. ppm: Concentration expressed in parts of material per million parts of air or water. mg/m^3: Concentration expressed in weight of substance per volume of air. mg/kg: Quantity of material, by weight, administered to a test subject, based on their body weight in kg. TDLo: Lowest dose to cause a symptom. TCLo: Lowest concentration to cause a symptom. TDo, LDLo, and LDo, or TC, TCo, LCLo, and LCo: Lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** IARC: International Agency for Research on Cancer. NTP: National Toxicology Program. RTECS: Registry of Toxic Effects of Chemical Substances. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information:** BEI: ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

16.7.6 - REPRODUCTIVE TOXICITY INFORMATION:

A mutagen is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryo toxin is a chemical that causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance that interferes in any way with the reproductive process.

16.7.7 - ECOLOGICAL INFORMATION:

EC: Effect concentration in water. BCF: Bioconcentration Factor, which is used to determine if a substance will concentrate in life forms that consume contaminated plant or animal matter. TLm: Median threshold limit. log K_{OW} or log K_{OC}: Coefficient of Oil/Water Distribution is used to assess a substance's behavior in the environment.

16.7.8 - REGULATORY INFORMATION:

EPA: U.S. Environmental Protection Agency. ACGIH: American Conference of Governmental Industrial Hygienists, a professional association that establishes exposure limits. OSHA: U.S. Occupational Safety and Health Administration. NIOSH: National Institute of Occupational Safety and Health, which is the research arm of OSHA. DOT: U.S. Department of Transportation. SARA: Superfund Amendments and Reauthorization Act. TSCA: U.S. Toxic Substance Control Act. CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act. Marine Pollutant status according to the DOT; CERCLA or Superfund; and various state regulations. This section also includes information on the precautionary warnings that appear on the material's package lab