Material Safety Data Sheet
Methyl Isobutyl Ketone

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Methyl Isobutyl Ketone

OTHER/GENERIC NAMES: MIBK
4-Methyl-2-pentanone

PRODUCT USE: Solvent

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>INGREDIENT NAME</th>
<th>CAS NUMBER</th>
<th>WEIGHT %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl Isobutyl Ketone</td>
<td>108-10-1</td>
<td>100</td>
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</tbody>
</table>

Trace impurities and additional material names not listed above may also appear in Section 15 toward the end of the MSDS. These materials may be listed for local "Right-To-Know" compliance and for other reasons.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Flammable Liquid and Vapor. Harmful if swallowed, inhaled or absorbed through the skin. Causes skin, eye and respiratory tract irritation.

POTENTIAL HEALTH HAZARDS

SKIN: Causes irritation, redness, and itching. If splashed on the skin may cause tingling.

EYES: Irritation, redness, lacrimation (tearing) and itching can result from exposure to vapor. Liquid can cause severe irritation.
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INHALATION: Can cause irritation at all levels of the respiratory tract (nose, throat, lungs), dizziness, disorientation, headache, incoordination, nausea and vomiting. High concentrations may cause central nervous system depression and unconsciousness.

INGESTION: Can cause stomach pain, dizziness, disorientation, headache, nausea and vomiting. Aspiration into the lungs can cause chemical pneumonia and lung damage.

DELAYED EFFECTS: Effects of CNS depression may linger for hours after exposure. Prolonged skin contact can cause dermatitis. Based on animal data, chronic exposure may cause liver and kidney damage.

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

<table>
<thead>
<tr>
<th>INGREDIENT NAME</th>
<th>NTP STATUS</th>
<th>IARC STATUS</th>
<th>OSHA LIST</th>
</tr>
</thead>
<tbody>
<tr>
<td>No ingredients listed in this section.</td>
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</table>

4. FIRST AID MEASURES

SKIN: Remove and isolate contaminated clothing and shoes. Wash with soap and water and flush with water for at least 15 minutes. Get medical attention as needed for irritation or any other symptoms. Launder contaminated clothing and clean shoes before reuse.

EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Get immediate medical attention.

INHALATION: Remove from exposure area to fresh air. Monitor for respiratory distress. If breathing is difficult, give oxygen provided a qualified operator is available. If breathing has stopped, apply artificial respiration. Get immediate medical attention.

INGESTION: Aspiration hazard. If conscious, rinse mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Get immediate medical attention.

ADVICE TO PHYSICIAN: No specific antidote. Treat supportively and symptomatically.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT: 73.4°F (23°C).
FLASH POINT METHOD: TAG Closed Cup.
AUTOIGNITION TEMPERATURE: 860°F (460°C).
UPPER FLAMMABLE LIMIT (volume % in air): 7.5
LOWER FLAMMABLE LIMIT (volume % in air): 1.4
FLAME PROPAGATION RATE (solids): Not Applicable
OSHA FLAMMABILITY CLASS: Class IC Flammable Liquid.

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, foam or water spray.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Vapor may travel a considerable distance to a source of ignition and flash back. Vapor-air mixtures are explosive within the Flammable Limits noted above. Sealed containers may rupture when heated. Sensitive to static discharge.

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:
Wear NIOSH approved self-contained breathing apparatus, and full protective clothing. Water will not be effective in extinguishing a fire. Use water spray to cool fire-exposed containers and to reduce rate of burning, taking care not to spread the fire. Heat will build pressure and rupture closed storage containers.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (Always wear recommended personal protective equipment.)
Eliminate sources of ignition. Isolate the spill area. Use non-sparking tools and equipment. Stop leak in a safe and practical manner. (If leak cannot be stopped easily and safely, advise trained emergency response personnel of the situation.) Contain and recover liquid when possible. Absorb small spills with an inert material and place in an approved chemical waste container. For large spills, dike up with inert material and transfer into same container. Do not allow to enter into drains or waterways.

Spills and releases may have to be reported to Federal and/or local authorities. See Section 15 regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: (Always wear recommended personal protective equipment.)
Use with adequate ventilation. Avoid contact with skin, eyes and clothing. Do not breathe vapors. Flammable liquid and vapors. Keep away from heat, sparks and flame. Electrically ground all handling equipment. Keep container closed when not in use.

STORAGE RECOMMENDATIONS:
Store in an area suitable for flammable liquids (OSHA 29 CFR 1910.106). Store away from ignition sources, temperature extremes, direct sunlight and incompatible substances. Empty containers may contain product residue and/or vapors. Label warnings apply to empty containers that have not been cleaned.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION:
Wear protective gloves, boots and clothing suitable to prevent skin contact. Butyl Rubber and Neoprene are suitable materials of construction. Inspect for signs of degradation after each use. Replace as needed.
EYE PROTECTION:
Wear safety glasses or chemical safety goggles, per OSHA eye and face protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

RESPIRATORY PROTECTION:
Not required for properly ventilated areas. If there is potential for inhalation of vapor or mist, use an appropriate NIOSH approved respirator. Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

The respirator must be selected based on contamination levels and use conditions found in the workplace. Use conditions must not exceed the working limits of the respirator. The respirator must be approved by the National Institute for Occupational Safety and Health (NIOSH) and used in accordance with Occupational Safety and Health Administration (OSHA) 29 CFR 1910.134.

ADDITIONAL RECOMMENDATIONS:
Make emergency eyewash stations and washing facilities available in work area.
Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material.

EXPOSURE GUIDELINES

<table>
<thead>
<tr>
<th>INGREDIENT NAME</th>
<th>ACGIH TLV</th>
<th>OSHA Z-1 PEL</th>
<th>NIOSH</th>
</tr>
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<tbody>
<tr>
<td>Methyl Isobutyl Ketone</td>
<td>50 ppm TW (8-hr exposure limit)</td>
<td>100 ppm</td>
<td>REL: 50 ppm 10 hr day/40 hr week</td>
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<tr>
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<td>75 ppm (15 min STEL)</td>
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<td>STEL: 75 ppm</td>
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<td>IDLH: 500 ppm</td>
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</table>

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS:
None known

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear, colorless
PHYSICAL STATE: Liquid
MOLECULAR WEIGHT: 100.16
CHEMICAL FORMULA: C₆H₁₂O
ODOR: Sharp, mint-like odor.
SPECIFIC GRAVITY (water = 1.0): 0.801 @ 68°F (20°C).
SOLUBILITY IN WATER (weight %): 1.9 @ 68°F (20°C).
pH: Not Applicable.
BOILING POINT: 241.7°F (116.5°C).
FREEZING POINT: -19.2°F (-84°C).
VAPOR PRESSURE: 16mm Hg 68°F (20°C).
VAPOR DENSITY (air = 1.0): 3.5
EVAPORATION RATE: ~ 1.6 COMPARED TO: Butyl Acetate = 1
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% VOLATILES: ~100
FLASH POINT: 73.4°F (23°C).
(Flash point method and additional flammability data are found in Section 5.)

10. STABILITY AND REACTIVITY

NORMALLY STABLE? (CONDITIONS TO AVOID):
Stable at room temperature in closed containers under normal storage and handling conditions.

INCOMPATIBILITIES:
Aldehydes, acids and strong oxidizing agents. Reacts violently with Potassium t-butoxide. May form explosive peroxides in air.

CONDITIONS TO AVOID:
Avoid heat, ignition sources and incompatible materials.

HAZARDOUS DECOMPOSITION PRODUCTS:
Thermal decomposition can produce carbon monoxide and carbon dioxide.

HAZARDOUS POLYMERIZATION:
Not expected to occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:
Oral LD₅₀ (rat): 2,080 mg/kg (20% solution in surfactant); 4,500 mg/kg (neat).
Oral LD₅₀ (mouse): 1,900 mg/kg.
Inhalation (rat): lethal at 4,000 ppm (16,360 mg/m³); not lethal at 2,000 ppm (8,180 mg/m³).
Skin LD₅₀ (rabbit): >20 g/kg.
Skin Irritation (rabbit): Mild, 500 mg/24H
Eye Irritation (rabbit): Moderate, 100 uL/24H.

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:
Subchronic Inhalation Toxicity Study (monkey, dog, and rat): Continuous inhalation exposure to 100 ppm (409 mg/m³) for 90 days produced no significant changes in clinical parameters or hematology. The rat was the only species showing toxic effects; liver and kidney weights increased. Male rats also showed hyaline droplet degeneration of the proximal renal tubules with occasional focal tubular necrosis. Hyaline droplet nephropathy is a well-documented sex/species specific kidney effect caused by hydrocarbon solvent exposures and is not expected to occur in other mammalian species, including humans.
OTHER DATA:

Developmental/Reproduction Toxicity:
In rats and mice, inhalation exposure up to 3,000 ppm during organogenesis was not embryotoxic or teratogenic, but it did cause fetotoxicity consistent with maternal toxicity. Lower levels (1,000 and 300 ppm) were not embryotoxic, fetotoxic, or maternally toxic in either species.

Genotoxicity:
The weight of evidence from results of a battery of genotoxicity tests suggest that methyl isobutyl ketone is unlikely to be genotoxic in mammalian systems.

12. ECOLOGICAL INFORMATION

Acute Aquatic Toxicity:
- 24 hr LC$_{50}$ (goldfish): 460 mg/L.
- 96 hr LC$_{50}$ (fathead minnow): 505 mg/L, flow-through bioassay.
- 96 hr LC$_{50}$ (rainbow trout): 600 mg/L.
- 96-hr EC$_{50}$ (Selenastrum capricornutum-algae): 400 mg/L.
- 48-hr EC$_{10}$, EC$_{50}$ (Scenedesmus subspicatus): 310, 980 mg/L, respectively.
- 24-hr EC$_{0}$, EC$_{50}$, EC$_{100}$ (Daphnia magna): 2,280, 4,280, 5,000 mg/L, respectively.

13. DISPOSAL CONSIDERATIONS

RCRA

Is the unused product a RCRA hazardous waste if discarded? Yes

If yes, the RCRA ID number (USEPA Hazardous Waste Code is): D001, U161.

OTHER DISPOSAL CONSIDERATIONS:
Whatever cannot be saved for recovery or recycling should be handled as a hazardous waste and sent to an approved RCRA waste facility. Dispose of container and unused contents al in accordance with all applicable local, state, and federal regulations.

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.
14. TRANSPORT INFORMATION

Proper DOT Shipping Description: Methyl Isobutyl Ketone, 3, UN 1245, II.

Reportable Quantity (RQ): 5000 lbs (2270 kg).

Label(s) Required: Class 3, Flammable Liquid.


For additional information on shipping regulations affecting this material, contact the information number found in Section 1.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: Listed on TSCA Inventory.

TSCA 8(a) Inventory Update Rule.

SARA TITLE III/CERCLA

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

<table>
<thead>
<tr>
<th>INGREDIENT NAME</th>
<th>SARA/CERCLA RQ (lb)</th>
<th>SARA EHS TPQ (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl Isobutyl Ketone</td>
<td>5000 lbs.</td>
<td>None</td>
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Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: Immediate. Delayed. Fire

SARA 313 TOXIC CHEMICALS:
The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section 2.

<table>
<thead>
<tr>
<th>INGREDIENT NAME</th>
<th>COMMENT</th>
</tr>
</thead>
</table>
| Methyl Isobutyl Ketone| De Minimis concentration is 1.0%.

STATE RIGHT-TO-KNOW

In addition to the ingredients found in Section 2, the following are listed for state right-to-know purposes.

<table>
<thead>
<tr>
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MATERIAL SAFETY DATA SHEET

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ADDITIONAL REGULATORY INFORMATION:
Methyl Isobutyl Ketone is a Drug Enforcement Administration (DEA) Listed Precursor and Essential Chemical (List 2).
21 CFR 1310.04(f).

WHMIS CLASSIFICATION (CANADA):
Class B, Division 2.
This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by the Controlled Products Regulations.

FOREIGN INVENTORY STATUS:
Methyl Isobutyl Ketone is listed on the following inventories:
Australian.
Canadian DSL.
Chinese.
EINECS.
Japanese (ENCS).
Korean.
Philippines (PICCS).

16. OTHER INFORMATION

CURRENT ISSUE DATE: October 23, 2002.

CHANGES TO MSDS FROM PREVIOUS ISSUE DATE ARE DUE TO THE FOLLOWING:
Convert existing MSDS to ANSI 16 Section format.

OTHER INFORMATION:
NFPA Classification
Health: 2
Flammability: 3
Reactivity: 1