Safety Data Sheet

1. PRODUCT IDENTIFICATION

Name: Methyl Ethyl Ketone
Synonyms: MEK, 2-Butanone, methyl acetone, ethyl methyl ketone
CAS#: 78-93-3
Europe EC#: 201-159-0
Product Uses: solvent in paints & coatings

2. HAZARDS

Quick Guide: highly flammable liquid, heavy vapour travels, distant ignition and flashback are possible; irritating to eyes, central nervous depressant

Canada – WHMIS
Key: B 2, D 2B
   B 2 – Flash Point <38°C, B 3 – Flash Point >38°C & <93°C
   D 1 – Immediately Toxic, D 2 – Chronic Toxicity
   C – Oxidising Substance, E – Corrosive, F – Reactive Substance

U.S.A. – HMIS
Key: Health – 2, Fire – 3, Reactivity – 0
   0= minimal, 1=slight, 2=moderate, 3=serious, 4=severe

3. COMPOSITION

<table>
<thead>
<tr>
<th>%</th>
<th>TWAEV / TLV mg/m³</th>
<th>LD₅₀ (mg/kg) ORAL</th>
<th>LD₅₀ (mg/kg) SKIN</th>
<th>LC₅₀ ppm INHALATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>200 / 590</td>
<td>1740</td>
<td>6480</td>
<td>10,200</td>
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</tbody>
</table>

2-Butanone

4. FIRST AID

SKIN: Wash with plenty of water. Remove contaminated clothing and do not reuse until thoroughly laundered.
EYES: Wash eyes with plenty of water, holding eyelids open. Seek medical assistance promptly if there is irritation.
INHALATION: Remove from contaminated area promptly. CAUTION: Rescuer must not endanger himself! If breathing stops, administer artificial respiration and seek medical aid promptly.
INGESTION: Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim’s head below hips to prevent inhalation of vomited material. Seek medical help promptly.

5. FIRE FIGHTING & FLAMMABILITY

Flash Point: -9°C / 16°F (closed cup)
Autoignition Temperature: 404°C / 759°F – also 505°C / 940°F
Flammable Limits: 1.4% – 11.5%
Combustion Products: carbon monoxide, nitrogen oxides, smoke, part oxidised hydrocarbon fragments
Fire Fighting Precautions: foam, dry chemical, water fog or spray to cool & dilute, product floats on water – water jet spreads flames; fire fighters must wear SCBA
Static Charge Accumulation: cannot accumulate a static charge on agitation or pumping

Please ensure that this MSDS is given to, and explained to people using this product.
6. ACCIDENTAL RELEASE MEASURES

| Serious Fire Potential: blanket spill with foam as a precaution against accidental ignition. Take extreme care to avoid sparks – do not operate (turn on OR off) electrical appliances near spill, unless explosion proof. |

Leak Precaution: dyke to control spillage and prevent environmental contamination

Handling Spill: ventilate contaminated area; recover free liquid with suitable pumps; absorb residue on an inert sorbent, sweep & pick up using plastic or aluminium shovel, & store in closed containers for recycling or disposal

7. HANDLING & STORAGE

Store in a cool, dry environment, away from sources of ignition, heat and substances named in Part 7 (above). Always use non-sparking bronze or aluminium hand tools. All electrical and mechanical equipment (including lighting, switchgear and forklift trucks) used with or around this product must be explosion-proof.

Although this product cannot retain a static charge on agitation or transfer from one container to another, its flash point is low & it is prudent to ground or electrically bond the source container receiving container and transfer pump before transferring contents. Avoid splashing by ensuring that the product nozzle is below the surface in the receiving container.

Empty containers may contain a flammable / explosive vapour. Always ensure that containers, whether empty or full, or part full, are tightly sealed unless in use.

Avoid breathing product vapour. Use with adequate ventilation. If dealing with a spill, and ventilation is impossible or impractical, wear a suitable respirator with organic vapour cartridge.

Never cut, drill, weld or grind on or near this container. Avoid contact with skin and wash work clothes frequently. An eye bath and safety shower must be available near the workplace.

8. EXPOSURE CONTROL & PERSONAL PROTECTION

| Ontario TWAEV | 200ppm / 590mg/m³ |
| Ontario STEV | 300ppm / 885mg/m³ |
| ACGIH TLV | 200ppm / 590mg/m³ |
| OSHA PEL | 200ppm / 590mg/m³ |

Ventilation: mechanical ventilation may be required to control airborne titre to regulated limits; respirators with organic vapour cartridges should be available for escape purposes should ventilation or containment fail (store respirators in airtight containers [eg: “Tupperware” to maintain “freshness”])

Hands: “Barrier” or “Silver Shield” gloves – other types may also protect; consult supplier for suitability

Eyes: safety glasses with side shields – always protect the eyes

Clothing: wear impermeable (above) apron, boots, & long sleeves if there is any danger of splashing,

9. PHYSICAL PROPERTIES

| Odour & Appearance | clear, colourless liquid with sharp, sweetish acetone-like odour |
| Odour Threshold | 5-55ppm – geometric mean is 16ppm |
| Vapour Pressure | 78mmHg / 10.3kPa (20°C / 68°F) |
| Evaporation Rate (Butyl Acetate = 1) | 2.6 |
| Vapour Density (air = 1) | 2.5 |
| Boiling Range | 80°C / 175°F |
| Freezing Point | -87°C / -144°F |
| Specific Gravity | 0.806 (20/20°C) |
| Water Solubility | 275 grams per litre (20°C / 68°F) |
| Also soluble in | most organic solvents |
| Viscosity | 0.43centipoise (20°C / 68°F) |
| pH | none – (does not liberate hydrogen ions when dissolved) |
| Conversion Factor | 1ppm = 2.94g/m³ |
| Molecular Weight | 72grams per mole |

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10. REACTIVITY

Dangerously Reactive With: strong oxidising agents, halogens and strong alkalies
Also Reactive With: strong acids; forms shock sensitive peroxides with mixtures of H₂O₂ & HNO₃
Stability: stable; will not polymerize
Decomposes in Presence of: not known
Decomposition Products: none apart from Hazardous Combustion Products
Sensitive to Mechanical Impact: no

11. TOXICITY

Effects, Acute Exposure:
- Skin Contact: aggressively drying – “whitens” skin (by removing oils); may irritate
- Skin Absorption: yes; but no toxic effects likely by this route
- Eye Contact: liquid may be severely irritating; vapour irritating above 200ppm
- Inhalation: upper respiratory irritation at 200ppm, but no neurological symptoms after 4 hours at this level; dizziness, drowsiness, intoxication, nausea at higher airborne titres
- Ingestion: headache, dizziness, drowsiness, nausea, intoxication – not a route of industrial exposure

Effects, Chronic Exposure:
- General: prolonged exposure may cause dermatitis
- Sensitising: not a sensitisser in humans (only one reported case) or animals
- Carcinogen/Tumorigen: not considered a tumorigen or a carcinogen in humans or animals
- Reproductive Effect: no known effect in humans; fetotoxic in rodents only at doses producing maternal symptoms
- Mutagen: no known effect on humans or animals
- Synergistic With: not known
- LD₅₀ (oral): 3000 & 3140mg/kg (mouse), 1740, 2350, 2740 & 2600-5400mg/kg (rat)
- LD₅₀ (skin): 6480 & 8050mg/kg (rabbit)
- LC₅₀ (inhalation): 11,500ppm (rat), 10,880 & 30,200ppm (mouse), 10,200ppm (guinea pig)

12. ECOLOGICAL INFORMATION

Bioaccumulation: not a bioaccumulator; biological ½-life is 4-5 hours
Biodegradation: biodegrades readily & rapidly in the presence of oxygen; 89% in 20 days, anaerobic 89% in 21 days
Abiotic Degradation: reacts with atmospheric hydroxyl radicals; estimated ½-life in air 14 days; 4 days (direct photolysis)
Mobility in soil, water: water soluble; moves readily in soil and water

Aquatic Toxicity:
- LC₅₀ (Fish, 96hr): 3220mg/litre (Pimephales promelas), 5600mg/litre (Gambusia affinis), 4467mg/litre (Lepomis macrochirus),
- EC₅₀ (Crustacea, 48hr): 5090mg/litre (Daphnia magna)
- EC₃ (Algae): 1200mg/litre (Microcystis aeruginosa), 4300mg/litre (Scenedesmus quadricauda)
- EC₅₀ (Bacteria): 5100mg/litre (Photobacterium phosphoreum),
- EC₃ (Bacteria): 1150mg/litre (Pseudomonas putida)

13. DISPOSAL

Waste Disposal: do not flush to sewer, recycle solvent if possible, may be incinerated in approved facility
Containers:
- Drums should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use.
- Pails must be vented and thoroughly dried prior to crushing and recycling.
- IBCs (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years.
- Never cut, drill, weld or grind on or near this container, even if empty

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Product Name: Methyl Ethyl Ketone

14. TRANSPORT CLASSIFICATION

Canada TDG PIN UN-1193
AND Shipping Name methyl ethyl ketone
U.S.A. 49 CFR Class 3
Packing Group II
Marine Pollutant not a marine pollutant ERAP Required NO

EMERGENCY INFORMATION

Canada Call CANUTEC (collect) (613) 996-6666
U.S.A. Call CHEMTREC (800) 424-9300

15. REGULATIONS

Canada DSL on inventory
U.S.A. TSCA on inventory
Europe EINECS on inventory

Europe Risk Phrases R: 11, 36, 66, 67 – Highly flammable. Irritating to the eyes. Repeated exposure may cause skin dryness or cracking. Vapours may cause drowsiness and dizziness.

Europe Safety Phrases S: 9, 16 - Keep container in a well-ventilated place. Keep away from sources of ignition - No smoking.

Immediately Dangerous to Life or Health: 3000 ppm

Acceptable Daily Intakes: ... An Acceptable Daily Intake (ADI), defined as the amount of a chemical to which humans can be exposed on a daily basis over an extended period of time (usually a lifetime) without suffering a deleterious effect, for methyl ethyl ketone is 3.2 mg/day for oral exposure. ...

Allowable Tolerances: Residues of methyl ethyl ketone are exempted from the requirement of a tolerance when used as a surfactant in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

OSHA Standards: Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 200 ppm (590 mg/cu m). Vacated 1989 OSHA PEL TWA 200 ppm (590 mg/cu m); STEL 300 ppm (885 mg/cu m) is still enforced in some states.

NIOSH Recommendations: Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 200 ppm (590 mg/cu m). Recommended Exposure Limit: 15 Min Short-Term Exposure Limit: 300 ppm (885 mg/cu m).

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 200 ppm; 15 min Short Term Exposure Limit (STEL): 300 ppm. Biological Exposure Index (BEI): Determinant: methyl ethyl ketone in urine; Sampling Time: end of shift; BEI: 2 mg/L.

Atmospheric Standards: This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Methyl ethyl ketone is produced, as an intermediate or final product, by process units covered under this subpart. Listed as a hazardous air pollutant generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Methyl ethyl ketone is included on this list.

Federal Drinking Water Guidelines: EPA 4,000 ug/L
State Drinking Water Guidelines: Arizona 170 ug/L, Florida 4,200 ug/L, Massachusetts 4,000 ug/L, Maine 3,600 ug/L, Minnesota 4,000 ug/L, New Hampshire 4,000 ug/L, New Jersey 270 ug/L, Wisconsin 460 ug/L

CERCLA Reportable Quantities: Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 5000 lb or 2270 kg. The toll free number of the NRC is (800) 424-8802. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b).

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15. REGULATIONS, cont’d

**TSCA Requirements:** Pursuant to section 8(d) of TSCA, EPA promulgated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies. Methyl ethyl ketone is included on this list. Effective date 10/4/1982, Sunset date 10/4/1992.

**RCRA Requirements:** As stipulated in 40 CFR 261.33, when 2-butanone, as a commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate, becomes a waste, it must be managed according to Federal and/or State hazardous waste regulations. Also defined as a hazardous waste is any residue, contaminated soil, water, or other debris resulting from the cleanup of a spill, into water or on dry land, of this waste. Generators of small quantities of this waste may qualify for partial exclusion from hazardous waste regulations (40 CFR 261.5). When methyl ethyl ketone is a spent solvent, it is classified as a hazardous waste from a nonspecific source (F005), as stated in 40 CFR 261.31, and must be managed according to State and/or Federal hazardous waste regulations. A solid waste containing methyl ethyl ketone may or may not become characterized as a hazardous waste when subjected to the Toxicity Characteristic Leaching Procedure listed in 40 CFR 261.24, and if so characterized, must be managed as a hazardous waste.

**FIFRA Requirements:** Residues of methyl ethyl ketone are exempted from the requirement of a tolerance when used as a surfactant in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

**FDA Requirements:** Methyl ethyl ketone is an indirect food additive for use only as a component of adhesives. Methyl ethyl ketone is a food additive permitted for direct addition to food for human consumption as a synthetic flavoring substance and adjuvant in accordance with the following conditions: a) they are used in the minimum quantity required to produce their intended effect, and otherwise in accordance with all the principles of good manufacturing practice, and 2) they consist of one or more of the following, used alone or in combination with flavoring substances and adjuvants generally recognized as safe in food, prior-sanctioned for such use, or regulated by an appropriate section in this part.

16. OTHER INFORMATION

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Data from RTECS, HSDB (Haz. Substance Data Base), Cheminfo (CCOHS), IUCLID Datasheets (ESIS – European Chem. Substance Info. System), & others.

Preparation Date: December 2003  Revision Date: September 2006, September 2009, September 2012

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