1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

<table>
<thead>
<tr>
<th>Material Name</th>
<th>Methyl Ethyl Ketone (MEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses</td>
<td>Use as a solvent only in industrial manufacturing processes.</td>
</tr>
</tbody>
</table>
| Supplier            | TOP Solvent (Vietnam) Limited Liability Company  
                        Go Dau Industrial Park, Long Thanh, Dong Nai Province  
                        Viet Nam |
| Telephone           | +84 8 3827 9030 ~ 34 |
| Fax                 | +84 8 3827 9035 |
| Emergency Telephone | +84 8 3827 9030 ~ 34 [working hours] or  
                        +66 38 683 090 ext.103 [out of working hours] |
| Emergency Fax Number| +66 38 683 165 [out of working hours] |

2. HAZARDS IDENTIFICATION

GHS Classification:
- FLAMMABLE LIQUIDS, Category 2
- ACUTE TOXICITY - ORAL, Category 5
- ACUTE TOXICITY - INHALATION, Category 5
- SKIN CORROSION/IRRITATION, Category 3
- SERIOUS EYE DAMAGE/IRRITATION, Category 2B
- SPECIFIC TARGET ORGAN SYSTEMIC TOXICITY (SINGLE EXPOSURE), Category 3, Respiratory tract irritation, Narcotic effects.
- ASPIRATION HAZARD, Category 2

GHS Label Elements:
- Symbol(s):
  - Flammable liquid
  - Inhaling hazard
  - Eye irritation

Signal Words:
- Danger

GHS Hazard Statements:
- PHYSICAL HAZARDS:
  - Highly flammable liquid and vapour.
- HEALTH HAZARDS:
  - May be harmful if swallowed.
  - May be harmful if inhaled.
  - Causes eye irritation.
  - Causes skin irritation.
  - May cause respiratory irritation.
  - May cause drowsiness or dizziness.
- ENVIRONMENTAL HAZARDS:
  - Not classified as an environmental hazard under GHS criteria.

GHS Precautionary:
- PREVENTION:
Methyl Ethyl Ketone (MEK)

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Statements
Keep away from heat/sparks/open flames/hot surfaces.
No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands thoroughly after handling.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Use only outdoors or in a well-ventilated area.

RESPONSE:
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
Call a POISON CENTER or doctor/physician if you feel unwell.
IF IN EYES: Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical advice/attention.
If skin irritation occurs: Get medical advice/attention.

STORAGE:
Store in a well-ventilated place. Keep container tightly closed. Keep cool.
Store locked up.

DISPOSAL:
Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.

Other Hazards which do not result in Classification: Vapours are heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger. Exposure may enhance the toxicity of other materials. Repeated exposure may cause skin dryness or cracking.

Aggravated Medical Condition: Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Skin. Eyes.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms: Ethyl methyl ketone, 2-Butanone, Butanone, MEK
INDEX No.: 606-002-00-3
Methyl Ethyl Ketone (MEK)

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Identification No. : 201-159-0

<table>
<thead>
<tr>
<th>Hazardous Components</th>
<th>CAS</th>
<th>Identification No.</th>
<th>Conc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl ethyl ketone</td>
<td>78-93-3</td>
<td>2011590</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Inhalation : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.

Skin Contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available.

Eye Contact : Immediately flush eyes with large amounts of water for at least 15 minutes while holding eyelids open. Transport to the nearest medical facility for additional treatment.

Ingestion : If swallowed, do not induce vomiting; transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration.

Most Important Symptoms/Effects, Acute & Delayed : Eye irritation signs and symptoms may include a burning sensation and a temporary redness of the eye. Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death.

Immediate medical attention, special treatment : Causes central nervous system depression. Call a doctor or poison control center for guidance.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Specific hazards arising from Chemicals : Carbon monoxide may be evolved if incomplete combustion occurs. The vapour is heavier than air, spreads along the ground and distant ignition is possible.

Suitable Extinguishing Media : Alcohol-resistant foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only. Do not discharge extinguishing waters into the aquatic environment.

Unsuitable Extinguishing Media : Do not use water in a jet.

Protective Equipment & : Wear full protective clothing and self-contained breathing
6. ACCIDENTAL RELEASE MEASURES

Observe all relevant local and international regulations.

**Personal Precautions, Protective Equipment and Emergency Procedures**

Avoid contact with spilled or released material. Immediately remove all contaminated clothing. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.

**Environmental Precautions**

Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Monitor area with combustible gas indicator.

**Methods and Material for Containment and Clean Up**

For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

**Additional Advice**

See Chapter 13 for information on disposal. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Vapour may form an explosive mixture with air.

7. HANDLING AND STORAGE

**General Precautions**

Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Precautions for Safe Handling: Avoid contact with the skin. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 10 m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Handling Temperature: Ambient.

Conditions for Safe Storage: Keep away from aerosols, flammables, oxidizing agents, corrosives and from products harmful or toxic to man or to the environment. Must be stored in a well-ventilated area, away from sunlight, ignition sources and other sources of heat. Storage Temperature: Ambient.

Product Transfer: Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling.

Recommended Materials: For container paints, use epoxy paint, zinc silicate paint. For containers, or container linings use mild steel, stainless steel.

Unsuitable Materials: Aluminium, Plastics, Natural, neoprene or nitrile rubbers.

Container Advice: Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.

Expiry Date: The shelf life of product is dependent on many variables, including container material of construction, storage temperature, atmospheric breathing, etc. Because of the effect of these variables, it is difficult to make a firm prediction of shelf life. Provided the safety and handling recommendations are followed, the product has shelf life of 18 months at least when stored below 40°C (104°F) in drums and 6 months when stored in bulk. The product potentially become yellowish color if storage for long time > 6 months. This does not necessarily mean that after this period their fitness for purpose has expired, but merely that it is advised to seek professional advice after this longer storage time.

Other Advice: Ensure that all local regulations regarding handling and storage facilities are followed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Material</th>
<th>Source</th>
<th>Type</th>
<th>ppm</th>
<th>mg/m3</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl ethyl ketone</td>
<td>ACGIH</td>
<td>TWA</td>
<td>200 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACGIH</td>
<td>STEL</td>
<td>300 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VN OEL</td>
<td>TWA</td>
<td>150 mg/m3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VN OEL</td>
<td>STEL</td>
<td>300 mg/m3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Information: Wash hands before eating, drinking, smoking and using the...
Biological Exposure Index (BEI) - See reference for full details

No biological limit allocated.

Appropriate Engineering Controls: The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Eye washes and showers for emergency use.

Individual Protection Measures: Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection: If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN141. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus.

Hand Protection: Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable chemical protection: Long term protection: Butyl rubber. Polyvinyl alcohol. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

Eye Protection: Chemical splash goggles (chemical monogoggles).

Protective Clothing: Use protective clothing which is chemical resistant to this material. Safety shoes and boots should also be chemical resistant.

Thermal Hazards: Not applicable.

Monitoring Methods: Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Examples of sources of recommended air monitoring methods are given below or contact supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of
analytical Methods
http://www.cdc.gov/niosh/nmam/nmamenu.html Occupational
Safety and Health Administration (OSHA), USA: Sampling and
(HSE), UK: Methods for the Determination of Hazardous
Substances http://www.hsl.gov.uk/search.htm

Environmental Exposure Controls:
Local guidelines on emission limits for volatile substances must
be observed for the discharge of exhaust air containing vapour.

9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**: Clear. Liquid.
**Odour**: Characteristic
**Odour threshold**: Data not available
**pH**: Not applicable.
**Initial Boiling Point and Boiling Range**: 70 - 80.5 °C / 158 - 176.9 °F
**Melting / freezing point**: -86 °C / -123 °F
**Flash point**: -4 °C / 25 °F (Abel)
**Upper / lower Flammability or Explosion limits**: 1.8 - 11.5 %(V)
**Auto-ignition temperature**: 515 °C / 959 °F (ASTM E-659)
**Vapour pressure**: 9,500 Pa at 20 °C / 68 °F
**Relative Density**: 0.804 - 0.806 at 20 °C / 68 °F
**Density**: Data not available
**Water solubility**: 250 g/l at 20 °C / 68 °F Miscible.
**Solubility in other solvents**: Alcohol(s) Completely miscible.
**n-octanol/water partition coefficient (log Pow)**: 0.3
**Dynamic viscosity**: 0.42 mPa.s at 20 °C / 68 °F
**Kinematic viscosity**: Data not available
**Vapour density (air=1)**: 2.4 at 20 °C / 68 °F
**Volatile organic carbon content**: Typical 66.6 % (EC/1999/13)
**Evaporation rate (nBuAc=1)**: 3.7 (ASTM D 3539, nBuAc=1)
**Decomposition Temperature**: Note:, Stable under normal conditions of use., Reacts with
**Flammability**: Yes, in certain circumstances product can ignite due to static
electricity.

10. STABILITY AND REACTIVITY

**Chemical Stability**: Stable under normal conditions of use. Reacts with strong
oxidising agents.
**Possibility of Hazardous Reactions**: Data not available
**Conditions to Avoid**: Avoid heat, sparks, open flames and other ignition sources.
**Incompatible Materials**: Strong oxidising agents.
Hazardous Decomposition Products: Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

Sensitivity to Static Discharge: Yes, in certain circumstances product can ignite due to static electricity.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment: Information given is based on product testing.
Likely Routes of Exposure: Inhalation is the primary route of exposure although absorption may occur through skin contact or following accidental ingestion.
Acute Oral Toxicity: May be harmful if swallowed. LD50 > 2000 - <= 5000 mg/kg, Rat
Acute Dermal Toxicity: Expected to be of low toxicity: LD50 > 5000 mg/kg, Rabbit
Acute Inhalation Toxicity: May be harmful if inhaled. High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.

Skin Corrosion/Irritation: Expected to be slightly irritating.
Serious Eye Damage/Irritation: Irritating to eyes.
Respiratory Irritation: Inhalation of vapours or mists may cause irritation to the respiratory system.
Respiratory or Skin Sensitisation: Not a skin sensitiser.
Repeated Dose Toxicity: Low systemic toxicity on repeated exposure.
Aspiration Hazard: Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
Germ Cell Mutagenicity: Not mutagenic.
Carcinogenicity: Not expected to be carcinogenic.
Reproductive and Developmental Toxicity: Causes slight foetotoxicity. Effects were seen at high doses only. Not expected to impair fertility.
Additional Information: Exposure may enhance the toxicity of other materials.

12. ECOLOGICAL INFORMATION

Basis for Assessment: Ecotoxicological data are based on product testing.
Methyl Ethyl Ketone (MEK)

Version 1A
Effective Date 01-May-09

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Acute Toxicity

Fish: Low toxicity: LC/EC/IC50 > 1000 mg/l
Aquatic Invertebrates: Low toxicity: LC/EC/IC50 > 100 mg/l
Algae: Low toxicity: LC/EC/IC50 > 1000 mg/l
Microorganisms: Low toxicity: LC/EC/IC50 > 1000 mg/l

Mobility: If product enters soil, it will be highly mobile and may contaminate groundwater. Dissolves in water.

Persistence/degradability: Readily biodegradable meeting the 10 day window criterion. Oxidises rapidly by photo-chemical reactions in air.

Bioaccumulative Potential: Does not have the potential to bioaccumulate significantly.

13. DISPOSAL CONSIDERATIONS

Material Disposal: Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or water.

Container Disposal: Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard. Do not, puncture, cut, or weld uncleaned drums. Send to drum recoverer or metal reclaimer.

Local Legislation: Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

14. TRANSPORT INFORMATION

Land (as per ADR classification): Regulated
Class: 3
Packing group: II
Hazard identification no.: 33
UN No.: 1193
Danger label (primary risk): 3
Proper shipping name: METHYL ETHYL KETONE

IMDG
Identification number: UN 1193
Proper shipping name: METHYL ETHYL KETONE
Class / Division: 3
Packing group: II
Marine pollutant: No
IATA (Country variations may apply)
UN No. : 1193
Proper shipping name : Methyl ethyl ketone
Class / Division : 3
Packing group : II

Additional Information : This product may be transported under nitrogen blanketing. Nitrogen is an odourless and invisible gas. Exposure to nitrogen may cause asphyxiation or death. Personnel must observe strict safety precautions when involved with a confined space entry.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

AICS : y
DSL : y
INV (CN) : y
ENCS (JP) : y (2)-542
ISHL (JP) : y (2)-542
TSCA : y
EINECS : y 201-159-0
KECI (KR) : y 97-1-81
KECI (KR) : y KE-24094
PICCS (PH) : y


MSDS Version Number : 1A
Methyl Ethyl Ketone (MEK)

Material Safety Data Sheet

MSDS Effective Date : 01-May-09

MSDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.


Uses and Restrictions : Use as a solvent only in industrial manufacturing processes.

MSDS Distribution : The information in this document should be made available to all who may handle the product.

Disclaimer : This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.