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

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Methanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Uses</td>
<td>Industrial solvent, Bio-diesel production</td>
</tr>
<tr>
<td>Manufacturer/Supplier</td>
<td>TOP Solvent Company Limited</td>
</tr>
<tr>
<td></td>
<td>555/1 Energy Complex Building A, 11th Floor</td>
</tr>
<tr>
<td></td>
<td>Viphavadi Rangsit Road Chatuchak, Bangkok 10900</td>
</tr>
<tr>
<td></td>
<td>Thailand</td>
</tr>
<tr>
<td>Telephone</td>
<td>+66 2 299 0003 or +66 2 797 2993</td>
</tr>
<tr>
<td>Fax</td>
<td>+66 2 797 2983</td>
</tr>
<tr>
<td>Emergency Telephone</td>
<td>+66 2 299 0003 [working hours] or</td>
</tr>
<tr>
<td>Number</td>
<td>+66 38 683090 ext.103 [out of working hours]</td>
</tr>
<tr>
<td>Other Information</td>
<td>TOPSol is a trademark owned by TOP Solvent Company Limited</td>
</tr>
</tbody>
</table>

2. HAZARDS IDENTIFICATION

GHS Classification:
- FLAMMABLE LIQUIDS, Category 2
- Acute toxicity (Oral), Category 3
- Acute toxicity (Dermal), Category 3
- Acute toxicity (Inhalation), Category 3
- Specific target organ toxicity - single exposure
  Category 1 (central nervous system, visual organ)

GHS label elements

<table>
<thead>
<tr>
<th>Symbol(s)</th>
<th>Signal words</th>
<th>GHS Hazard Statements</th>
</tr>
</thead>
</table>
| ![Flammable Liquid](image) ![Toxic](image) ![Health Hazard](image) | Danger | H225 - Highly flammable liquid and vapor
H301 – Toxic if swallowed
H311 – Toxic in contact with skin
H331 - Toxic if inhaled |
Methanol
Version 2.1
Effective Date 1-June-2012

Material Safety Data Sheet

H370 - Causes damage to central nervous system, visual organ.

Environmental Hazards : Not classified as an environmental hazard under GHS criteria.

GHS Precautionary statements

Prevention : P 210 - 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 mist/vapours/spray.
P264 - Wash hands thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P281 - Use personal protective equipment as required.

Response : P303+P361+P353 - IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
P370+P378 - In case of fire: Use appropriate media for extinction.
P305+P351+P310 IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313 - If eye irritation persists: Get medical advice/attention.

Storage : P403+P235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.

Disposal : P501 - Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.
3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Identity: Methyl alcohol, Methanol
CAS No: 67-56-1
EINECS No: 200-659-6

Classification of components according to GHS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Synonyms</th>
<th>CAS</th>
<th>Hazard Class (category)</th>
<th>Hazard statement</th>
<th>Conc.</th>
</tr>
</thead>
</table>

4. FIRST AID MEASURES

General Information: Keep victim calm. Obtain medical treatment immediately.
Inhalation: Remove to fresh air, restore or assist breathing if necessary. Obtain medical attention.
Skin Contact: In case of contact, remove contaminated clothing. In a shower, wash affected areas with soap and water for at least 15 minutes. Seek medical attention if irritation occurs or persists. Wash clothing before reuse. Prolonged contact with methanol may defat skin tissue, resulting in drying and cracking.
Eye Contact: Remove contact lenses if worn. In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower eyelids occasionally. Obtain medical attention.
Ingestion: Swallowing methanol is potentially life threatening. Onset of symptoms may be delayed for 18 to 24 hours after digestion. If conscious and medical aid is not immediately available, do not induce vomiting. In actual or suspected cases of ingestion, transport to medical facility immediately.

Notes to physician
Most important: Acute exposure to methanol, either through ingestion or...
symptoms/effects, acute & delayed

breathing high airborne concentrations can result in symptoms appearing between 40 minutes and 72 hours after exposure. Symptoms and signs are usually limited to the Central Nervous System (CNS), eyes and gastrointestinal tract. Because of the initial CNS’s effects of headache, vertigo, lethargy and confusion, there may be an impression of ethanol intoxication. Blurred vision, decreased acuity and photophobia are common complaints. Treatment with ipecac or lavage is indicated in any patient presenting within two hours of ingestion. A profound metabolic acidosis occurs in severe poisoning and serum bicarbonate levels are a more accurate measure of severity than serum methanol levels. Treatment protocols are available from most major hospitals and early collaboration with appropriate hospitals is recommended. Ethanol significantly decreases the toxicity of methanol because it competes for the same metabolic enzymes, and has been used to treat methanol poisoning.

5. FIRE FIGHTING MEASURES

Specific Hazards

Methanol vapours may burn with an invisible flame. During a fire, carbon monoxide, carbon dioxide and irritation and toxic gases such as formaldehyde may be generated. Vapours can accumulate in confined spaces resulting in a toxicity and flammability hazard. Closed containers may rupture violently and suddenly release large quantities of methanol when exposed to fire or excessive heat for a sufficient period of time. Vapours are slightly heavier than air and may travel long distances toward sources of ignition.

Extinguishing Media

Small fires: Dry chemical, CO2, water spray Large fires: Water spray (see note in Unsuitable Extinguishing Media), AFFF(R) (Aqueous Film Forming Foam (alcohol resistant)) type with either a 3% or 6% foam proportioning system.

Unsuitable Extinguishing Media

General purpose synthetic foams or protein foams may work, but much less effectively. Water may be effective for cooling, but may not be effective for extinguishing a fire because it may not cool methanol below its flash point.
Protective Equipment for Firefighters:
Methanol burns with a clean clear flame that is almost invisible in daylight. Stay upwind! Isolate and restrict area access. Concentrations of greater that 25% methanol in water can be ignited. Use fine water spray or fog to control fire spread and cool adjacent structures or containers. Contain fire control water for later disposal. Fire fighters must wear full face, positive pressure, self-contained breathing apparatus or airline and appropriate protective fire fighting clothing as per NFPA. Note that methanol fires may require proximity suits. Take care not to walk through any spilled chemical.

Other Advice:
Vapours can flow along surfaces to distant ignition sources and flash back.

6. ACCIDENTAL RELEASE MEASURES

Overview:
Flammable liquid! Can burn without a visible flame. Release can cause an immediate risk of fire and explosion. Eliminate all ignition sources, stop leak and use absorbent materials. If necessary, contain spill by diking. Fluorocarbon alcohol resistant foams may be applied to spill to diminish vapour and fire hazard. Maximize methanol recovery for recycling or re-use. Restrict access to area until completion of cleanup. Ensure cleanup is conducted by trained personnel only. Wear adequate personal protection and remove all sources of ignition. Notify all governmental agencies as required by law.

Personal Protection:
Full face, positive pressure self-contained breathing apparatus or airline, and fire resistant protective clothing with chemical resistant splash suit must be worn. If product ignites, approach and fire fighting must be done with appropriate fire fighting clothing.

Environmental Precautions:
Biodegrades easily in water. Methanol in fresh or salt water may have serious effects on aquatic life. A study on methanol’s toxic effects on sewage sludge bacteria reported little effect on digestion at 0.1% while 0.5% methanol retarded digestion. Methanol will be broken down to carbon dioxide and water.

Remedial Measures:
Flammable liquid. Release can cause an immediate
fire/explosion hazard. Eliminate all sources of ignition, stop leak and use absorbent materials. Collect liquid with explosion proof pumps. Do not walk through spill product as it may be on fire and not visible.

**Small Spills**

Soak up spill with non-combustible absorbent material. Recover methanol and dilute with water to reduce fire hazard. Prevent spilled methanol from entering sewers, confined spaces, drains, or waterways. Restrict access to unprotected personnel. Put material in suitable, covered, labeled containers. Flush area with water.

**Large Spills**

If necessary, contain spill by diking. Fluorocarbon alcohol resistant foams may be applied to spill to diminish vapour and fire hazard. Maximize methanol recovery for recycling or reuse. Collect liquid with explosion proof pumps.

---

**7. HANDLING AND STORAGE**

**Precautions for safe Handling**: No smoking or open flame in storage, use or handling areas. Use explosion proof electrical equipment. Ensure proper electrical grounding procedures are in place.

**Conditions for safe Storage**: Store in totally enclosed equipment, designed to avoid ignition and human contact. Tanks must be grounded, vented, and should have vapour emission controls. Tanks must be diked as per NFPA or API Standards. A flammable mixture of methanol vapour and air is possible inside a storage tank or transportation tank, and handlers should take appropriate precautions to reduce the risk of ignition. Handlers must eliminate ignition sources or purge the tank with an inert gas such as nitrogen. All equipment must be grounded - bonded when transferring product in order to avoid static discharge from the equipment, and subsequent possible fire. Avoid storage with incompatible materials. Anhydrous methanol is non-corrosive to most metals at ambient temperatures except for lead, nickel, monel, cast iron and high silicon iron. Coatings of copper (or copper alloys), zinc (including galvanized steel), or aluminum are unsuitable for storage. These materials may be attacked slowly by the methanol. Storage tanks of welded construction are normally satisfactory. They should be
designed and built in conformance with good engineering practice for the material being stored. While plastics can be used for short term storage, they are generally not recommended for long-term storage due to deterioration effects and the subsequent risk of contamination.

Corrosion rates for several construction materials:
- <0.508 mm/year: Cast iron, monel, lead, nickel
- <0.051 mm/year: High silicon iron
- Some attack: Polyethylene
- Satisfactory: Neoprene, phenolic resins, polyesters, natural rubber, butyl rubber
- Resistant: Polyvinyl chloride, unplasticized

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

#### 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>Methanol</td>
<td>ACGIH</td>
<td>TLV-TWA (skin)</td>
<td>200</td>
<td>262</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLV- STEL (skin)</td>
<td>250</td>
<td>328</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEL-TWA (skin)</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEL—STELE(SKIN)</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IHDL</td>
<td>6000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Acute inhalation toxicity to animals</td>
</tr>
</tbody>
</table>

**Appropriate Engineering Controls**: In confined areas, local and general ventilation should be provided to maintain airborne concentrations below permissible exposure limits. Ventilation systems must be designed according to approved engineering standards.

**Respiratory protection**: NIOSH/OSHA recommendations for methanol concentrations in air:
- Up to 2000 ppm: supplied air respirator
- Up to 5000 ppm: supplied air respirator operated in a continuous-flow mode.
- Up to 6000 ppm: supplied air respirator with a tight-fitting
facepiece operated in a continuous-flow mode; or Full-facepiece self-contained breathing apparatus or Full-facepiece supplied air respirator.
- Cartridge type respirators are NOT recommended.
Respirator selection must be done by a qualified person and be based upon a risk assessment of the work activities and exposure levels. Respirators must be fit tested and users must be clean shaven where the respirator seals to the face. Exposure must be kept at or below the applicable exposure limits and the maximum use concentration of the respirator must not be exceeded.
Positive pressure, full-facepiece self-contained breathing apparatus; or Positive pressure, full-facepiece supplied air respirator with an auxiliary positive pressure self-contained breathing apparatus.

Skin protection
: Butyl and nitrile rubbers are recommended for gloves. Check with manufacturer. Wear chemical resistant pants and jackets, preferably of butyl or nitrile rubber. Check with manufacturer.

Eye and Face protection
: Face shield and chemical splash goggles when transferring is taking place. Contact lenses should not be worn when working with methanol.

Footware
: Chemical resistant and as specified by the workplace.

Others
: Eyewash and showers should be located near work areas. NOTE: PPE must not be considered a long-term solution to exposure control. PPE usage must be accompanied by employer programs to properly select, maintain, clean, fit and use. Consult a competent industrial hygiene resource to determine hazard potential and/or the PPE manufacturers to ensure adequate protection. Careful consideration must be made of the added danger of the concentration being in the LEL/UEL.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colourless Liquid.</td>
</tr>
<tr>
<td>Odour</td>
<td>Characteristic alcohol odour</td>
</tr>
<tr>
<td>Odour threshold</td>
<td>Detection 4.2 -5960 ppm. (geometric mean 160ppm)</td>
</tr>
</tbody>
</table>
### Material Safety Data Sheet

**Methanol**  
Version 2.1  
Effective Date 1-June-2012

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>53 - 8940 ppm (geometric mean 690 ppm)</td>
</tr>
<tr>
<td>pH</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Boiling point</td>
<td>64.7 °C</td>
</tr>
<tr>
<td>Melting / freezing point</td>
<td>Typical -97.8 °C</td>
</tr>
<tr>
<td>Flash point</td>
<td>Typical 11 °C (Closed cup)</td>
</tr>
<tr>
<td>Explosion / Flammability</td>
<td>6 – 36.5 %</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>464 °C</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>12.8 kPa at 20 °C / 68 °F</td>
</tr>
<tr>
<td>Density</td>
<td>Typical 791 kg/m3 at 20 °C (ASTM D-1298)</td>
</tr>
<tr>
<td>Water solubility</td>
<td>Completely miscible.</td>
</tr>
<tr>
<td>n-octanol/water partition coefficient (log Pow)</td>
<td>0.82</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Note: Stable under normal conditions of use.</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>4.1 (ASTM D 3539, nBuAc=1)</td>
</tr>
<tr>
<td>Vapour density (air=1)</td>
<td>1.105 at 15 °C</td>
</tr>
</tbody>
</table>

### 10. STABILITY AND REACTIVITY

**Chemical stability**  
Stable under normal conditions of use.

**Conditions to Avoid**  
Avoid any source of ignition. Avoid contact with heat, sparks, open flame, and static discharge.

**Incompatible materials**  
Avoid contact with strong oxidizers, strong mineral or organic acids, and strong bases. Contact with these materials may cause a violent or explosive reaction. May be corrosive to lead, aluminum, magnesium, and platinum. May react with metallic aluminum or magnesium and generate hydrogen gas. May attack some forms of plastic, rubber, and coatings.

**Decomposition Products**  
Formaldehyde, carbon dioxide, and carbon monoxide.

### 11. TOXICOLOGICAL INFORMATION

**Information on Toxicological effects**

**Basis for Assessment**  
Information given is based on product testing, and/or similar products, and/or components.

**Likely routes of exposure**  
Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Toxicity

Acute Oral Toxicity: Calculation was done based on rat oral LD50 value = 6200mg/kg [EHC 196 (1997), ACGIH (7th, 2001), DFGOT vol.16 (2001), PATTY (4th, 1994)], 9100mg/kg[EHC 196 (1997), PATTY (4th, 1994)], 12900mg/kg [EHC 196 (1997), DFGOT vol.16 (2001), PATTY (4th, 1994)], and 13000mg/kg [EHC 196 (1997), ACGIH (7th, 2001), PATTY (4th, 1994)]. The calculation value was 7939mg/kg, and it was judged to be the outside of Category from the result of the animal experiments. On the other hand, there is description that the toxicity of methanol appears highly in primates compared with rodent [EHC 196 (1997)]. And the dose leading to death in an about half in humans is 1400mg/kg (DFGOT vol.16 (2001)).

Acute Dermal Toxicity: Based on rabbits percutaneous LD50 value = 15800mg/kg [DFGOT vol.16 (2001), PATTY (4th, 1994)]

Acute Inhalation Toxicity: Based on rat inhalation LC50 (8 hours) value = 22500ppm [DFGOT vol.16 (2001)]

Skin corrosion/irritation: While there is description that the moderate irritation was seen after 24-hour exposure with the degreasing action in rabbit test [DFGOT vol.16 (2001)], there is description that irritation was not seen in another test which applied it on rabbit for 20 hours obstructions, and since the test data based on exposure of less than 4 hours was not obtained, it was not able to classify.

Serious eye damage/irritation: There is description that mild or moderate eye irritation was admitted by the test using the rabbit.

Respiratory Irritation: Since data was insufficient for judging the existence of skin sensitization from these information, it could not be classified.

Germ cell mutagenicity: There is insufficient information available to conclude that methanol is mutagenic.

Reproductive and Developmental Toxicity: May damage fertility or the unborn child.

Carcinogenicity: Not listed by IARC, NTP, ACGIH, or OSHA as a carcinogen.

Specific target organ toxicity - single exposure: According to the descriptions that central nervous system depression and visual organ disorder are observed by acute oral or inhalation exposure by humans (EHC 196 (1997), ACGIH (7th, 2001), DFGOT vol.16 (2001), PATTY (4th, 1994))
Specific target organ toxicity - repeated exposure:
Target organs are a central nervous system and an optic organ according to the description of the central nervous system depression and the optic organ's disorders were seen in a case of long-term exposure in humans (EHC 196 (1997), ACGIH (7th, 2001), and DFGOT vol.16 (2001)).

Aspiration hazard:
Insufficient data available.

12. ECOLOGICAL INFORMATION

Acute toxicity to the aquatic environment
It was classified as Out of Category from 24-hour LC50=900.73mg/L of Crustacea (Brine shrimp) (EHC196, 1998).

Chronic toxicity to the aquatic environment
Since it was not water-insolubility (aqueous solubility =1.00 x 10^6mg/L (PHYSPROP Database, 2005)) and acute toxicity was low, it was classified as Out of Category.

Biodegradability
Biodegrades easily in water and soil.

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.

### 14. TRANSPORT INFORMATION

**Land (as per ADR classification)**: Regulated
- **Class**: 3 (subsidiary risk 6.1)
- **Packing group**: II
- **Hazard identification no.**: 33
- **UN No.**: 1230
- **Proper shipping name**: METHANOL
- **Environmentally Hazardous**: No

**IMDG**
- **Identification number**: UN 1230
- **Proper shipping name**: METHANOL
- **Class / Division**: 3 (subsidiary risk 6.1)
- **Packing group**: II
- **Marine pollutant**: No

**IATA (Country variations may apply)**
- **UN No.**: 1230
- **Proper shipping name**: Methanol
- **Class / Division**: 3
- **Packing group**: II

### 15. REGULATORY INFORMATION

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

AICS : Listed.
DSL : Listed.
INV (CN) : Listed.
ENCS (JP) : Listed.
TSCA : Listed.
EINECS : Listed. 200-659-6
KECI (KR) : Listed.
PICCS (PH) : Listed.

16. OTHER INFORMATION

Acute Toxicity Category 1 may be assigned to classification based on human experience rather than the strict application of classification criteria set out in the Recommendations on the Transport of Dangerous Goods, Model Regulations Special Provision 279.

Swallowing even small amounts of methanol could potentially cause blindness or death. Effects of sub lethal doses may be nausea, headache, abdominal pain, vomiting and visual disturbances ranging from blurred vision to light sensitivity.

MSDS Version Number : 2.1
MSDS Effective Date : 1-June-2012
Uses and Restrictions : Industrial solvent, Bio-diesel production
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.