

Operation Guide:
Handling and Storage of Methanol and Caustic Soda
Joseph Bornstein
23-October-2008
Whitman Direct Action
For



Handling and Storage of Methanol

Background Information and Basic Instructions: Methanol is a highly toxic and combustible chemical that has an extremely low flash point, which makes it very easy to inhale by accident. As such, when handling methanol you should make sure to minimize the amount of contact methanol has with air. Methanol can enter your body either through ingestion, inhalation through skin absorption). Methanol poisoning can be fatal due to its CNS depressant properties, or it can be metabolized into formic acid. The subsequent reaction into formate produces a toxin in your body, which inhibits mitochondrial cytochrome, causing hypoxia at a cellular level. One of the most common symptoms in methanol poisoning is permanent blindness by destruction of the optic nerve, and headaches. **Caution: dangerous doses will build up if a person is regularly exposed to vapors or handles liquid without skin protection.** Usual fatal doses are between 100-125mL. The toxic effects can take hours or minutes to begin. Effective antidotes can often prevent permanent damage. The treatment is using ethanol or fomepizole, which slow the action of methanol by means of competitive inhibition, causing the methanol to be excreted by the kidneys rather than being transformed into toxic metabolites. Keeping a bottle of strong ethanol around is a good safety precaution for emergencies when a doctor may not be available. When handling methanol in any fashion be sure to wear protective gloves and eye gear. Methanol can go through most plastic gloves, so be sure to purchase chemical-grade gloves.

Storage: Because methanol is a highly corrosive and explosive substance you should follow these safety procedures: (1) establish a no smoking zone within your building and 100 feet around its perimeter (2) ground all methanol drums to prevent static electricity build-up (3) keep methanol drums within a safety container i.e. a large box or dish that the drum can sit within; the receptacle should of course be methanol resistant (steel, iron or HDPE plastic) and have a volume sufficient to capture the volume of drums held within the safety container (this is a back-up for leaks in your methanol drums), (4) only open one container at a time, (5) store extra drums outside and away from flammable objects, (6) keep out of direct sunlight, and (6) make sure to have good ventilation.

Transferring methanol into your methoxide tank: This should be a vaporless process. You should use a hand fuel pump to transfer methanol into your HDPE methoxide tank. The hose leading out of this tank should lead into your methoxide tank which has removable synthetic rubber connection for this hose. Once your are done transferring the methanol into your methoxide tank, remove the hose and the rubber seal, and hold the hose of the hand pump high so as to drain any remaining methanol back into the steel drum.

Transferring glycerin (30% methanol by volume): This is perhaps the most commonly overlooked exposure point to methanol in biodiesel production. Draining glycerin with a bucket is an unacceptable risk and exposure to biodiesel producers. All transfers of glycerin should be done in a vaporless method, using pumps and seals to minimize exposure. When transferring hot glycerin this rule is a must considering methanol's flash point is 11°C.

Transferring dirty biodiesel (3% methanol by volume): Transferring biodiesel poses much less of a risk than glycerin, but it still has plenty of methanol to give you poisoning. All transfers of glycerin should be done in a vaporless method, using pumps and seals to minimize exposure. When transferring hot biodiesel this rule is a must considering methanol's flash point is 11 °C.

First Aid Measures: Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin: Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.

Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Induce vomiting by giving one teaspoon of Syrup of Ipecac.

Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: Effects may be delayed. Ethanol may inhibit methanol metabolism.

Incompatibilities with Other Materials: Acids (mineral, non-oxidizing, e.g. hydrochloric acid, hydrofluoric acid, muriatic acid, phosphoric acid), acids (mineral, oxidizing, e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic, e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), azo, diazo, and hydrazines (e.g. dimethyl hydrazine, hydrazine, methyl hydrazine), isocyanates (e.g. methyl isocyanate), nitrides (e.g. potassium nitride, sodium nitride), peroxides and hydroperoxides (organic, e.g. acetyl peroxide, benzoyl peroxide, butyl peroxide, methyl ethyl ketone peroxide), epoxides (e.g. butyl glycidyl ether), Oxidants (such as barium perchlorate, bromine, chlorine, hydrogen peroxide, lead perchlorate, perchloric acid, sodium hypochlorite), Active metals (such as potassium and magnesium), acetyl bromide, alkyl aluminum salts, beryllium dihydride, carbontetrachloride, carbon tetrachloride + metals, chloroform + heat, chloroform + sodium hydroxide, cyanuric chloride, diethyl zinc, nitric acid, potassium-tert-butoxide, chloroform + hydroxide, water reactive substances (e.g. acetic anhydride, alkyl aluminum chloride, calcium carbide, ethyl dichlorosilane).

Compatible Materials: Steel, iron, aluminum, copper, PET 1 plastic, and HDPE plastic.

Handling and Storage of Caustic Soda

Background Information: Caustic soda (potassium hydroxide or sodium hydroxide) coming in flakes or pellets and is a highly corrosive substance, which can cause chemical burns, injury or blindness. It is highly exothermic, and will react strongly with water and oils on your skin.

Symptoms of exposure: Inhalation: breathing this substance can cause death. Harmful effects include burns and permanent damage to the airways, including the nose, throat and lungs. Skin: causes skin to burn. Eye: Causes burns and permanent injury to eye tissue. Can cause blindness. Ingest: swallowing can cause death, damage to digestive tract, sever abdominal pain and vomiting.

Storage: Store in closed properly labeled tanks or containers. Avoid contact with skin and breathing mist. Do not eat, drink or smoke in work area. After use, wash hands prior to eating, drinking or using restroom. Plastic containers with airtight seals are the best to use.

Precautions: Keep a bottle of weak acid, i.e. vinegar, to neutralize any caustic soda burns (a strong base).

Handling while weighing for reaction: Be sure to wear protective gloves and a mask that can filter particles of caustic soda. Wear eye protection as well.

Handling while depositing into MEOH tank: Wear protective gloves and a mask that can filter particles of caustic soda. Wear eye protection as well. Use a funnel and scoop to ensure that nothing falls out. You should put the caustic soda in the MEOH tank after the methanol has already be deposited. Make sure you are in a well-ventilated area with the wind blowing away from you. If possible, develop a vaporless system for this step as well.

Stability Conditions to avoid: Mixture with water or acid, which can cause violent release of heat.