METHANOL VEHICLES
TRAINING BULLETIN #60

This Training Bulletin provides firefighting and emergency medical service personnel with a general understanding of the chemical properties and associated hazards of methanol, firefighting methods for methanol fuel, and methanol fueled vehicle characteristics.

At the present time there are many vehicles in the City of Los Angeles that are fueled by methanol. Although these vehicles are cost effective and have relatively low emission characteristics, they do present emergency incident responders with the necessity to possess special knowledge in dealing with these vehicles and their fuels.

Both the City and the state currently operate passenger vehicles that are fueled by methanol and there are several fueling facilities for these vehicles in the City. In addition, the Southern California Rapid Transit District-has introduced into service a fleet of 30 new methanol powered buses. The abundance of these buses demand that our operating procedures be safe and effective. So we shall examine these particular vehicles closely, but first, what is methanol?

Methanol is a promising alternative to diesel fuel and is considered the leading contender among test fuels to replace diesel fuel in the transit industry. The excellent combustion properties of methanol have made it the alternative fuel of choice in the automotive industry.

Its power and safety aspects have prompted its use in the racing industry, and its low emission characteristics have generated considerable interest from EPA and state and local air quality agencies.

Product Name:	Methanol Fuel
Chemical Name:	Methanol
Chemical Family:	Alcohol
Hydrocarbon:	Methane
Synonyms:	Methanol Alcohol, Carbinol, Monohydroxymethane, Methyl Hydroxide
United Nations Number:	UN 1230
DOT Emergency Response Guide Number:	28

Methanol (CH30H) is the first member in the series of primary aliphatic alcohols. It is a clear, colorless, volatile, flammable liquid with a faint alcohol odor. Methanol is also known as methyl alcohol, carbinol, and wood alcohol.

Methanol is normally produced by one of three methods:

1. High pressure catalytic synthesis from carbon monoxide and hydrogen.

Z. Partial oxidation of natural gas hydrocarbons.

3. Destructive distillation of wood.

Methanol is not gasohol. Gasohol is gasoline that contains one percent to ten percent methanol or ethanol.

Physical Properties

Vapor Density: 1.11 - The density of methanol is 1.1 times the density of air. Therefore, methanol vapors will tend to settle in low areas.

Reactivity: Methanol is more chemically reactive than diesel fuel or gasoline. It will corrode some metals and certain plastics, i.e., carbon steel and aluminum.

Solubility: Methanol, unlike gasoline or diesel fuel will mix with water. A mixture of methanol and water is still flammable when diluted with approximately five parts water to one part methanol.

Additional physical properties are listed on the Material Safety Data Sheet in Appendix A.

Fire Hazards

Methanol is a Class I-B flammable liquid as defined by the National Fire Protection Association and the United States Occupational Safety and Health Administration (OSHA). Evaporation of the liquid at ordinary room temperatures creates a potentially explosive methanol-air mixture when the methanol content reaches 6.0 percent volume. Methanol-air mixtures containing more than 36 percent volume do not flash because these mixtures are too rich to burn. A fire hazard exists if the storage temperature of methanol in contact with air approaches the flash point of 11C (52F).

A methanol-water mixture is still a flammable liquid by OSHA definition (flash point 100F) with as little as 21 percent methanol by volume (25 percent by weight).

Unlike gasoline, methanol burns with low flame luminosity. The luminosity of burning pure methanol is about 1/3000 of the luminosity of a comparably sized gasoline fire. The luminosity is especially low for turbulent methanol flames (turbulence may be caused by wind). Thus, in the case of pure methanol, the flames are hard to see in daylight and virtually invisible in bright sunlight.

The reason methanol fires are less visible than gasoline or diesel fuel fires is that burning methanol produces no soot. This presents a distinctive safety hazard to emergency incident responders in the event of a leak or fire. Fire suppression and rescue personnel may have to rely on alternate signs of burning; for example, involvement of ordinary combustibles in the immediate area or the visible emission of vapors without flame.

Additional Hazards

Inhalation of methyl alcohol vapors is hazardous. While single exposures to fumes in low concentrations may cause no harmful effects, heavier concentrations can be dangerous. The greatest danger from methyl alcohol is its specific toxic effect upon the eyes. It can atrophy the optic nerve and retina. In addition, exposure to methyl alcohol liquid may cause the skin to become dry and cracked, and poisoning can occur through breaks in the skin.

Methods of Extinguishing Methanol Fires

There are several methods of extinguishing methanol fires. The more effective methods are listed first.

- Dry Chemical Extinguisher

  ABC Rated Dry Chemical Extinguisher Purple-K Extinguisher Sodium Bicarbonate

- Halon

  Halon Extinguishers are effective although not as effective as the appropriate Dry Chemical Extinguishers.

  NOTE: RTD buses are equipped with a Halon System in the engine compartment.

- AFFF/ATC

  For larger spills or fires, "alcohol" foam AFFF/ATC resistant form is appropriate. Supply and Maintenance Division has 700 gallons in supply available.

- Water

  Since methanol is a water soluble, dilution techniques can be used for extinguishment. However, methanol will still burn with mixtures of up to five parts water per one part methanol. In addition, water fog, in conjunction with dry chemical and carbon dioxide have been used successfully.

Southern California Rapid Transit District Bus Data

The new methanol fleet will be comprised of two types of buses, 30 new models and several converted former diesel models. Each vehicle will be lettered "METHANOL" in bold letters on the front, rear, and both sides.

General Data:

Maximum Vehicle Length:	35' and 40'
Maximum Vehicle Height:	9'11"
Maximum Vehicle Width:	8'6"
Engine Crankcase Capacity:	25 Quarts
Transmission Capacity (Approximate):	36 Quarts
Steering System Capacity (Without Wheelchair Lift):	6.5 Quarts
(With Wheelchair Lift):	10.5 Quarts
Rear Axle Capacity:	22 Pints
Fuel Tank Capacity:	285 Gallons

Methanol has a lower fuel value than gasoline. In other words, it takes more methanol than gasoline to drive the same distance. In order to provide the same driving range as a gasoline powered vehicle, a methanol powered vehicle requires a fuel tank approximately twice the size of those found in a gasoline vehicle.

The engine fuel filler is located behind a small access door on the right-hand side of the buses.

On some models a magnet mounted to the inside of the door trips a microswitch which is mounted just inside the door opening. This microswitch is part of the engine's starting circuitry; and unless the door is closed, the engine will not start.

To' prevent "Vapor Locks" a fuel cooling system is located next to the fuel pump. Methanol is circulated through the cooling system and delivered to the engine.

Fire/Explosion Protection

Each bus will be equipped with an on-board fire/explosion suppression system designed by Santa Barbara Research Center, a subsidiary of Hughes Aircraft.

The system is based on Santa Barbara Research Center's Dual Spectrum Infrared Fire Sensor design and has successfully completed years of developed and field testing by the United States military.

The components of the system include three dual-spectrum infrared sensors mounted in the engine compartment, two directed discharge nozzles positioned at the top and bottom of the engine compartment, and two 20 pound Halon 1301 cylinders mounted beneath the chassis (left side near the fuel tank) on the new buses and the rear right side upper quarter panel on the diesel to methanol converted buses.

The infrared fire sensors are programmed to recognize the light wave lengths emitted by methanol fire flames and trigger the release of the first cylinder of Halon into the engine compartment. After a 15 second time delay, the second Halon cylinder will discharge. Additionally, when the system goes into the alarm mode, a fuel shut down is activated deenergizing the fuel pump.

With the increase in the number of methanol fueled vehicles in the City, it is necessary for all Department members to have appropriate knowledge in dealing with these vehicles and their associated hazards. As emergency responders, proper initial actions and consideration for personal safety is imperative. A thorough knowledge of methanol alcohol characteristics will ensure effective firefighting methods and safe operating procedures.