



SITUATIONAL AWARENESS

Information contained in this bulletin is intended to describe events currently impacting the State of Michigan. This publication provides a general description of the event with an analysis of its impact.

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Date: August 8, 2008

MI SA-05-08

OFFICER/FIRST RESPONDER SAFETY: HAZARDS INVOLVING BIODIESEL PRODUCTION

Please pass along the following information to law enforcement and other first responders, including local fire departments:

The recent rise in petroleum prices has caused an increased interest in alternative fuels. Biodiesel is used increasingly as a diesel replacement because it can be manufactured from readily available ingredients such as vegetable oil, animal fat, or recycled restaurant cooking oil and then used in existing diesel engines. The production of Biodiesel does not require a great amount of space, and the process is not easily detectable outside of the process area. Though there have been a small number of casualties reported nationwide as a result of Biodiesel production, none have occurred within the state of Michigan.

The overall process is legal and relatively safe when properly performed. The end product of Biodiesel has similar hazards to regular diesel with byproducts that can pose harm to animals and humans if not properly stored/disposed. If the processor is not careful, they can poison or burn themselves and modifications to pressure vessels by inexperienced people can result in possible explosions. As risks exist, care should be taken by first responders when signs of a Biodiesel facility are noted.

The processing of Biodiesel involves caustic, flammable and poisonous chemicals. The Michigan Department of Environmental Quality has identified two methods of producing Biodiesel.

1. The blending of vegetable oil with petroleum products: After filtration, vegetable oil is mixed with kerosene, gasoline and diesel additive. The mixing unit may be 'homemade' and of variable quality and safety for flammable/combustible materials. The standard concentration is approximately 80 percent oil to 20 percent petroleum.

Considerations for first responders:

- Petroleum products involved in production are flammable and, when stored in high quantities, can pose a significant fire hazard
- Flammability of Biodiesel varies depending on the concentration of petroleum products (commercially produced Biodiesel has a flash point of approximately 300°F, considerably higher than diesel at approximately 125°F)
- Large storage of oils can add to a fire load
- Biodiesel biodegrades about four times faster than petroleum diesel

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The State of Michigan's Intelligence Operations Center shall collect, evaluate, collate, and analyze information and intelligence and then, as appropriate, disseminate this information and intelligence to the proper public safety agencies so that any threat of terrorism or criminal activity will be successfully identified and addressed.



2. The esterification, or separation, of fats and oils with an alcohol catalyzed by an acid or caustic: The most common catalysts in the esterification of fats and oils are potassium hydroxide and methanol. When combined, these chemicals produce a caustic chemical known as methoxide. The methoxide is then used in the esterification of a fat or oil, at which point the majority of methoxide is expended. This process results in a waste product of crude glycerin. The crude glycerin contains the excess methanol left from the initial reaction. Glycerin containing less than one percent methanol can have a flash point less than 140°F. It is the most common pollutant from the process and is considered to be the key indicator of Biodiesel production due to its distinct odor.

Considerations for first responders:

- Chemicals involved in production are legal for residential storage, but only in limited quantities
- Methanol burns with an invisible flame
- Methanol vapor can be released causing poor air quality in a confined space
- Most models of photoionization detectors (PIDs) will not detect methanol
- Methoxide is a highly caustic chemical that has been associated with nerve damage caused by corrosive burns
- Chemicals involved in production are flammable and when stored in high quantities can pose a significant fire hazard
- Overheated oils may cause oil fires
- Large storage of oils can add to a fire load
- Use of pressure tanks in production can result in explosions
- The majority of methoxide is diluted during the esterification process and typically is not stockpiled
- The Department of Environmental Quality stated a specific concern with the improper disposal of byproducts

Indicators as displayed in a recent case from the Salem Township Fire Department.

On the evening of the 20th of May 2008, the Salem Township Fire Department identified the glycerin/methanol byproduct due to its “putrescent (rotten food/ French Fries) smell.” The scent was originating from milky puddles in a vacant lot of a Salem Township mobile home. Further, investigation led to the discovery of a Biodiesel lab in a non-descript 20' x 10' shed. The smell combined with illegal byproduct dumping were the only noted indicators of the production of Biodiesel.



Glycerin/methanol mix found in a Salem Township mobile home park.

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In the shed, officers found a polyethylene tank, numerous pieces of glassware, a modified hot water heater with home plumbing/gauges, and approximately 100 gallons of used vegetable oil. The home owner stated he could produce approximately 30 gallons of Biodiesel and described his batched manufacturing process as follows:

1. Used vegetable oil (27 gallons) is pumped into the modified hot water heater where it is heated to 130°F via the electrical element.
 - a. The electric water heater has been modified with an electric pump creating a closed loop piping system that allows the oil to be drawn from the bottom of the heater. The plumbing also allows for the drawing and pouring of liquids into the hot water heater.
2. One kilogram of flaked potassium hydroxide is mixed with 5 gallons of methanol to create methoxide and poured into the hot water heater through the plumbing and valves and then circulated for one hour.
3. The mixture is allowed to settle overnight.
4. The mixture phase separates into Biodiesel on top and a glycerin/methanol mixture on bottom.
5. The glycerin/methanol mixture is removed.
6. The Biodiesel is polished by a water spray in the poly tank. The Biodiesel is further heated to drive the water off, purging the Biodiesel of methanol using bubbles.
7. No other modifications to the fuel or engine are necessary to use the fuel. The cost to manufacture is estimated at \$1.00/gallon of Biodiesel fuel.



Modified water heater for Biodiesel production found in a Salem Township mobile home park.

Historically, the most common threat to homemade Biodiesel labs is improper storage/disposal of byproducts. Most home brewers want to stockpile byproducts as they are uncertain of proper methods of disposal. These large stockpiles of byproduct lead to a significant fire hazard as realized on May 7, 2006 in Colorado. A home brewer had stockpiled 600 gallons of Biodiesel, seven 55-gallon barrels of methanol, and other hazardous materials outside the distilling shed. The homeowner left the heating tank unattended, at which point it ignited causing serious property damage. There were no reported injuries from this incident.

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Photo/Kenneth Killip

Shed debris resulting from home-based Biodiesel production fire – Colorado, 2006.

It is recommended that caution be taken upon discovery of a Biodiesel lab. Though many operations can legally facilitate the production of Biodiesel, they may still pose many hazards to first responders. If indicators of a Biodiesel distillery are present proper precautions should be taken to negate the effects of flammable and caustic chemicals.

For additional information regarding regulations impacting Biodiesel production, please contact Jack Schinderle of the Department of Environmental Quality at (517) 373-8410. Other questions or comments can be directed to the MIOC at (517) 335-6389. (NG-101)

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