

Module

6

Health & Safety Considerations for Ethanol-Blended Fuel Emergencies

Terminal Objective

Upon the successful completion of this module, participants will be able to determine a method for cleaning up blended fuel spills at specific locations.

Enabling Objectives

1. Discuss the possible combinations of fuel/blended fuel spills.
2. Determine the tools/personnel/steps necessary to clean up spills of various fuels.

Instructor Note:

Module Time: 1 hour

Materials:

- LCD projector
- Paper chart or dry erase board

Introduction

Instructor Note:

The video mentioned that dilution with water was not an effective tactic for ethanol and ethanol-fuel blend fires. Why is this true?

Answer: *Ethanol diluted up to 500 percent with water will still burn.*

Understanding the properties and characteristics of both gasoline and ethanol will help emergency responders mitigate incidents involving ethanol-blended fuels.

By doing some simple tests it has been shown when ethanol is blended with gasoline, even at high mix ratios like E-85, the ethanol develops a bond to the gasoline. With this bond, the ethanol-blended fuel retains hydrocarbon/gasoline characteristics. Absorbents and booms that are designed to pick up oil-type substances will pick up the ethanol-blended fuel. As long as no water is present, the ethanol stays bonded to the gasoline and absorbs into the booms and absorbents.

However, if water is introduced, even at low quantities, it will more readily attract the ethanol and form a water/ethanol solution that drains to the bottom of the fuel mix. In this situation, an oil-type boom or absorbent will pick up the remaining gasoline on top leaving the water/ethanol solution. The water/ethanol solution can then be picked up with a water absorbing boom or absorbent. Keep in mind that depending on the water-to-ethanol ratio, the solution may still be flammable. Also remember that if foam is used to contain the ethanol-blended fuel vapor, a portion of the foam solution will absorb into the ethanol-blended fuel, forming a solution that sinks below the gasoline level. This solution again will have water/ethanol properties, which will require a water-type boom or absorbent. The ethanol-blended fuel located just below the foam membrane will require an oil-type absorbent since the ethanol/gasoline blend will still maintain hydrocarbon characteristics.

Detection and Monitoring

Detection and identification of hazardous materials using monitoring equipment is performed by most responders today. Today's response community carry multi-gas meters on response units that allow for immediate detection capabilities to be put in place.

Monitoring equipment is a crucial resource for responders to use in the incident assessment and during mitigation. Monitoring equipment will help responders determine the concentration levels of hazardous materials and make response decisions based on these readings. In ethanol blended fuels responses, monitoring devices with LEL and Oxygen sensors will assist in establishing flammability concentrations and during foam operations will be used to determine effectiveness of the foam blanket in the suppression of vapor. Readings will help responders determine how best to protect themselves and others from the effects of the material and how far the public should be removed from the contaminated area.

Control zones are the areas established around a hazardous materials incident and indicate the safety level and degree of hazard in that particular zone.

There are three control zones that must be established: hot, warm, and cold.

- The hot zone is located immediately around the release of a material. This area encompasses materials that are hazards. It is the area of greatest danger and contamination.
- The warm zone is located immediately outside of the hot zone and is the area where decontamination takes place.
- The cold zone begins where the warm zone ends. The command post, as well as other support functions, is located in the cold zone. Personal protective clothing in this area may be limited to safety equipment and normal working clothes.

Personal Protective Equipment (PPE)

Instructor Note:

Ask participants if they can list the health hazards of ethanol. Put them on a paper chart or white board. Typical hazards include:

- *Irritation to the eyes and skin*

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Instructor Note (continued):

Typical hazards include:

- *Inhalation:*
 - *Central nervous system depression*
 - *Irritation*
 - *Nausea*
 - *Vomiting*
- *Long-term exposure:*
 - *Liver damage*
 - *Kidney damage*

Ask participants what they consider the most important type of PPE when responding to ethanol emergencies including spills, releases, and fires.

Remind participants that we often think of the dangers of materials when they are involved in a fire, however, it is just as important to consider PPE and in particular respiratory protection for materials involved in spills and releases.

Instructor Note:

Remind participants that this is an awareness course on ethanol and ethanol-fuel blends. However, it is always critical to stress the importance of proper PPE. This course is not designed to provide instruction in the use or selection of PPE, but this section is presented as a reminder of its importance.

Ethanol and ethanol-fuel blends will burn somewhat similarly to gasoline fires; therefore, it is critical that all responders wear appropriate firefighter PPE. Protective clothing is designed to protect the wearer from head to toe and has proven to reduce the severity of injuries as well as save the lives of many firefighters. The following components constitute a generic set of firefighter PPE:

- a helmet with either a face shield or eye protection
- a protective hood
- a turnout coat
- turnout pants
- gloves

- boots
- Respiratory protection.

Respiratory protection is especially critical since the respiratory system is the primary route of exposure into the body for hazardous chemicals. There are three types of respiratory protection:

- Air-Purifying Respirators (APR) and Powered Air-Purifying Respirators (PAPR);
- Supplied Air Respirators (SAR); and
- Self-Contained Breathing Apparatus (SCBA).

Remember that all personnel responding to a spill or fire must wear and be trained in the use of the specific PPE required for a given emergency situation (see Figure 6.1).

Figure 6.1: Firefighter Wearing Full Set of Protective Clothing



Summary

Regardless whether you are confronted with a spill or a fire, there are certain procedures that must be followed in order to ensure safe incident management. Knowing the type of fuel that has spilled or is burning is essential to the success of your operation. In addition, you should take steps to contain the event and appropriately distribute the proper foam.