

Instructor Manual

Module

8

Storage and Pre-planning Considerations

Module Objective

Upon the completion of this module, participants should be able to develop plans to fight or contain fires at tank farms and bulk storage facilities.

Enabling Objectives

1. List the major concerns associated with fighting fires at tank farm and bulk storage facilities.
2. Describe the components of pre-planning.
3. Develop methods to mitigate each of the concerns associated with fighting fires at tank farms and bulk storage facilities.

Instructor Note:

Module Time: 20 minutes/ 30 minutes

Materials:

- *Activity 8.1 and 8.2*
 - *Worksheet 8.2*
- *Emergency Response Considerations video – (Show the video segment from 17:50 to 22:24)*

Instructor Note:

Show the video Emergency Response Considerations (17:50 to 22:24).

Introduction

Tank farm and bulk storage fire operations can be extremely dangerous and require an extremely advanced technical knowledge of flammable liquids firefighting and fire protection. Because of the amount of time to set up operations and contain such a fire and the number of resources necessary to handle an incident and defend against a re-flash or re-ignition, they can become very tedious operations. It is imperative the departments have good relations and cooperation with the facility operators and staff and should establish extensive pre-fire plans and schedule drills and walk-throughs on a regular basis. In most cases it will require additional special equipment and apparatuses for these facilities. In many cases a major fire incident at one of these facilities will be beyond the capabilities of the department, therefore it is important to have relationships with sources of mutual aid and contract services. It may be prudent to contract outside services for these incidents depending on magnitude and location. The best single avenue of defense for these installations is prevention.

Bulk Storage Fire Operations

The following are some considerations for fire incidents at major facilities:

- Pre-fire plans with predetermined flow rates should be established and reviewed regularly. Mutual aid and second-in companies should also be included in planning and drills. We also recommend that your pre-plan includes neighbors and how any incident could impact them.
- Fire foam flow rates should be established before the incident occurs and reviewed regularly.
- Storage tanks containing ethanol-blended fuels should be identified and known by the fire department personnel well in advance of any incident.
- If tanks are provided with pre-piped foam systems, connection locations and required pressures and flows should be identified. Personnel should be aware of the potential danger that systems installed on tanks that previously contained regular gasoline may not work or be appropriate for ethanol-blended fuels being stored in those tanks. Greater flow capacities may be required, and subsurface systems do not work with ethanol components.
- Fires in storage tanks where no fixed systems are available or usable or in cases where fixed systems are rendered inoperable may not be extinguishable with non-fixed appliances. Lowering the fuel level and protecting exposures may be the only options for reducing the overall impact of the event.

Pre-planning

Pre-planning is a vital factor in the strategy of controlling an emergency situation. The amount of success obtained in resolving an emergency can, in most cases, be determined by the amount of advance preparation made by firefighting personnel. The purpose of pre-incident planning is to enable attack preparations and fire-fighting operations to be carried out at the scene of an emergency as efficiently and effectively as possible. The incident management attack operation can begin more quickly if details about the incident site are known prior to the arrival of the firefighters and if positions of equipment and possible hose layouts have been predetermined. When effective pre-incident plans have been made, less time needs to be spent on making decisions concerning the incident site during and after the size-up process.

Instructor Note:

Ask participants to list items they would look for when conducting an exterior survey at a tank farm or bulk storage facility.

- **Answers** should include:
 - *Facility dimensions*
 - *Fire hydrant locations*
 - *Fire Department Connection (FDC) locations*
 - *Utility shut-offs*
 - *Fences*
 - *Power lines locations and sizes of tanks or other storage containers*
 - *Landscaping*
 - *Obstructions*
 - *Exposures*
 - *Doors, windows, and fire escapes*

Steps involved in the pre-planning process include:

- **Information gathering:** Collecting pertinent information at the selected site that might impact incident management operations, such as construction features, exposures, utility disconnects, fire hydrant location, water main sizes, and anything else that would impact response operations if an emergency should occur.
- **Information analysis:** The information gathered must be analyzed in terms of what is pertinent and vital to incident suppression operations. An operable pre-incident plan must then be formulated and put into a usable format that can be used at the incident site.
- **Information distribution:** All parties that will help to solve the problem should receive copies of the plan so they become familiar with both the plan and pertinent factors relating to it.

It may not be feasible to keep adequate foam stock on hand. It is important to consider a consortium approach for bulk AR-AFFF storage and availability. It is also important to ensure there is an adequate foam resource management plan and foam stock rotation.

Summary

In the event of a major incident at a fuel storage facility, you will be better positioned to respond if you have done your homework in advance. You should have an incident plan in place and be in the habit of maintaining good relationships with the agencies that can offer support in your time of crisis. Drills and walk-throughs are essential parts of planning for major incidents and should be conducted on a regular basis.

A final note: Sometimes all you can safely do is contain the incident and let the fire run its course. Knowing when to let this happen is an important component of safety. Knowing the limitations of your resources and personnel, protecting the safety and wellbeing of your community all play a role in your emergency response decisions.

Activity 8.1: Ethanol Emergency Procedures

Purpose

To allow participants to utilize all the information discussed in the course to determine the appropriate procedures for fire and non-fire ethanol emergencies.

Instructor Note:

Time: 15 minutes

Materials: None

Instructor Directions:

1. Allow the participants to work in groups of two to three for this activity.
2. Assign either scenario #1 or #2 to each group.
3. Participants should determine appropriate procedures based on their scenario.
4. After 10 minutes call time and randomly call on groups to provide their answers.
5. Participants should mention the following:
 - Methods to identify the product;
 - What potential dangers need to be considered based on the chemical and physical properties of the Ethanol Flex-Fuel;
 - Establishing a safety zone;
 - Spill containment;
 - Environmental issues;
 - Fire suppression methods, techniques, and considerations; and
 - Cleanup considerations.

Participant Directions

1. For this activity you will work in groups of two to three.
2. For your scenario you will determine appropriate containment, mitigation, and cleanup procedures including:
 - Methods to identify the product
 - What potential dangers need to be considered based on the chemical and physical properties of the Ethanol Flex-Fuel;
 - Establishing a safety zone
 - Spill containment
 - Environmental issues
 - Fire suppression methods, techniques, and considerations
 - Cleanup considerations
 - Be prepared to share your findings with the class

Scenario #1

A transport vehicle carrying 8,500 gallons of Ethanol Flex-Fuel to a retailer is involved in an accident at an intersection. A passenger car ran a red light hitting the trailer in the side rupturing one tank holding 3,200 gallons of Ethanol Flex-Fuel and causing the fuel to leak from the trailer. The fuel is running downhill into a creek which runs next to the street toward an entrance to a shopping center.

Scenario #2

A transport vehicle carrying 8,500 gallons of Ethanol Flex-Fuel to a retailer is involved in an accident at an intersection. A passenger car ran a red light hitting the trailer in the side rupturing one tank holding 3,200 gallons of Ethanol Flex-Fuel and causing the fuel to leak from the trailer. The fuel is running downhill into a dry ditch which runs next to the street toward an entrance to a shopping center. After approximately 12 minutes the spilled fuel on the ground near the cargo tank truck catches fire.

Activity 8.2: Ethanol Incident Procedures

Purpose

To allow participants to show comprehension of the firefighting foam capabilities and inabilities to combat polar solvent fire emergencies.

Instructor Note:

Using the video Responding to Ethanol Incidents, show the segment from 10:50 to 13:53. After the clip ask the following questions:

- *In the table-top demonstration, why were most of the foams ineffective on polar solvent fuels?*
 - **Answer:** *Because ethyl alcohol and water mix together and foam bubbles are mostly water.*
- *What was in the two Alcohol-Resistant (AR) foams that allowed them to create the foam blanket?*
 - **Answer:** *Polymers*
- *Why is dilution with water not an effective mitigation technique for polar solvent fires?*
 - **Answer:** *Even at 5:1 ratio/ 500% dilution ethanol will still burn.*

Instructor Directions:

- 1. Have participants attempt to properly order the steps in the following procedures.*
- 2. Participants can work individually or in groups.*
- 3. After the participants have put the procedures in order, go over the correct order and then discuss the rationales behind each.*

Participant Directions

1. Use Worksheet 8.2 to properly order the steps in the procedures.
2. You can work individually or in groups.
3. Be prepared to discuss the correct order and the rationales behind each step.

Worksheet 8.2: Fire Incident Procedures with Ethanol-Blended Fuel Spills

- A. Monitor and contain run-off from foam application.
- B. Attempt to identify the burning product by placards, labels, shipping documents, and other identifying factors, staying upwind and uphill using appropriate PPE. The absence of black smoke and reduced visible flames will give visual indicators of the presence of ethanol. Heat intensity may appear greater than normal gasoline as a result of the presence of ethanol.
- C. Apply foam from upwind and uphill, banking or deflecting foam off tanks, objects, structures, or ground ahead of the spill to accomplish gentle application with Alcohol-Resistant (AR) type foam. Backup lines should be in place to protect personnel operating hose lines. When possible, application by unmanned devices should be considered. Make sure only AR foam is used and there is no application of water in the foam area.
- D. Attempt to provide containment of any flowing fuel. Protect exposures as needed depending on location and situation, and use extreme caution around any exposed containers or pressure vessels. Evaluate the burning fuel area to determine appropriate flow or application rate for the foam solution. Minimal rate of application should be 0.2 gallons per minute (gpm)/ square foot (example: 1,000 square feet of burning ethanol-blended fuel will require $0.2 \times 1,000 = 200$ gpm foam solution). Before beginning foam application adequate supply of foam concentrate and water should be secured and on site. At least a 10-minute supply of foam and water should be available for suppression operations and an additional 10 minutes reserve for maintaining scene.
- E. Maintain stable conditions until full cleanup and remediation can be completed.
- F. Maintain a good blanket of foam on the spilled fuel, and monitor vapor release after the fire has been extinguished. When using the foam blanket to maintain vapor suppression, a full visible blanket should be kept on the fuel surface at all times. Do not rely on film formation or membrane formation.

Instructor Note:

B
D
E
C
A
F

Instructor Note:

Ask participants what emergency personnel, in addition to cleanup personnel, they would like to have on stand-by as they conduct their cleanups. Why?