

SCENARIO #20

DEVELOPING CREDIBLE SCENARIOS FOR EMERGENCY RESPONSE PLANNING



FIGURE 8-64

On a hot summer afternoon, a bulk plant is in the process of off-loading 33,000 gallons of propane from a railroad tank car. As the unloading process continues, a thunderstorm begins to develop and move in from the southeast. The decision is made to stop off-loading the rail car until the storm passes. Before the pump is shut down, the rail car unloading rack is hit with a direct lightening strike and a fire breaks out.

A technician at the pump house sees a small fire at the dome of the tank car. He immediately hits the Emergency Shutoff Valve (ESV) switch at the pump house and a controlled and safe shut down of the plant begins. The ESD automatically shuts down the propane liquid transfer pump, closes valves in the transfer system, and activates the plant's emergency alarm to alert other employees of the emergency. Within seconds, the system is completely isolated.

After activating the plant ESV, the operator calls the local fire department and returns to the loading rack where he activates a fixed fire monitor tied into the plant's domestic water system. A large fire stream from the 500 gallon per minute (gpm) monitor is directed onto the rail car's tank shell near the dome. By the time the fire department arrives the fire has already gone out.

SCENARIO-BASED EMERGENCY PLANNING

What if this scenario occurred at your facility? If you have good engineering controls, trained personnel, and a well-thought out Emergency Response Plan it could happen this way. Fortunately, most emergencies in industrial facilities never develop into major events because the scenario was anticipated and planned for before the event actually occurred.

As an owner or operator, you understand the hazards of propane. But have you looked at possible emergency response scenarios within your plant? What are the probability and consequences of each scenario? This process is a critical benchmarking developing a facility Emergency Response Plan. Sometimes known as "scenario based emergency planning," this process assists you in (1) identifying likely emergency scenarios within your facility; (2) evaluating the hazards and potential risks of each event; and (3) determining the necessary procedures and/or resources to handle the event should it occur. The terms HAZARD and RISK are often used interchangeably but from an emergency planning perspective, they actually have very different meanings and represent two different activities in the planning process.

Hazards—Hazards are materials, processes, or locations within the plant that may pose some danger or peril. In emergency response operations, hazards generally refer to the physical and chemical properties of a material under certain conditions. For example, propane has very specific characteristics such as boiling point, vapor density, expansion ratio, and flammable limits, which determine how it and its container will behave under both normal and emergency conditions. The hazardous characteristics of propane remain constant. Propane will always be propane regardless of the size or type of storage container, location etc.

Risks—Risk is the probability that something will go wrong. Unlike hazards, which are constant and fairly easy to identify, risks are variable and may change. Within the fields of Process Safety Management and Safety Engineering, there are many risk evaluation tools used to help determine the probability that an event may occur and the consequences of that event. However, from an emergency planning perspective, the risk assessment process can be simplified by focusing on scenarios that represent the range of credible events that could happen.

CREDIBLE EMERGENCY SITUATIONS

Experienced emergency planners develop Emergency Response Plans based on scenarios that are "credible". In simple terms, a Credible Scenario is believable and falls within the range of accepted probability. It may be based upon either actual experiences within the facility or historical experience or events within the gas industry at-large.

On one end of the spectrum are emergencies that have a very low probability of ever occurring, but for which the consequences would be severe. An example of this scenario would be a fully loaded passenger aircraft crashing into your bulk plant with all of the storage tanks filled to capacity. This scenario is not very likely, but it could happen. However, If you developed your Emergency Response Plan around this scenario your plan will not be very realistic in addressing the more likely and probable events.

At the other end of the spectrum are scenarios that have a very high probability of occurring, but the consequences will be minimal. An example of this type of scenario might be a trash dumpster on fire in the plant's parking lot. An Emergency Response Plan built around this scenario would also be deficient in addressing emergencies that may test your capabilities and operations.

If we listed all of the possible emergency scenarios and placed them on a scale with Low Probability/High Consequence events on one end and High Probability/Low Consequence events on the other end, the "credible" emergencies would fall would be somewhere in the middle.

Although selecting credible scenarios can be somewhat subjective, but there are some practical guidelines that can be used to determine what should be addressed in the Emergency Response Plan. These include:

- What types of hazards are in your facility that could be involved in an emergency? Identifying the real hazards within your facility is a key step in determining the types of credible emergencies that could occur. These should include both physical and chemical hazards, including fires, releases, and confined spaces.
- What type of storage systems and product transfer operations are found at your facility?

Fire and leak scenarios involving propane storage and loading/off-loading systems should be practical and take into consideration how the system is designed to function during an emergency. Although large quantities of liquid propane may be found in storage vessels, most emergency response events involve the transfer and handling of product.

- Are there any fixed or semi-fixed fire suppression and detection systems in-place? What are the capabilities of the firewater system? Depending upon local requirements, some facilities may have a range of engineered fire detection, fire suppression, and emergency shutdown systems in-place. In addition, the fire flow requirements and flow capabilities of the either the plant or local water system should be assessed.
- What types of exposures are around your facility that will need special attention if there is an emergency in your plant? What are potential off-site consequences of an event at your facility?

Exposures can include people, property, environmental or systems that could be impacted by an emergency in your plant. Systems can range from transportation systems (e.g., railroad, highway and air corridors) to impacts upon electrical and utility grids. For example, if you have a propane leak and there are special occupancies downwind (e.g., school, nursing home, etc.), what are the procedures for notifying these occupancies? If there is a vapor release involving your facility, will it potential impact the highway or railroad corridor that adjoins your facility? What types of hazards are off-site that could impact your facility and/or your employees and customers?

Neighboring facilities could also pose a threat to your facility if they have an emergency. For example, if the facility next door stores or uses certain liquefied gases such as chlorine or anhydrous ammonia, how will it effect your plant? Are there procedures in-place for notification of your facility?

NFPA 58, Liquefied Petroleum Gas Code requires a facility operator or owner to conduct a fire safety analysis for propane facilities having ASME containers of aggregate storage greater than 4,000 gallons water capacity. NFPA 58 requires planning for response to incidents including inadvertant release of LP gas, fire, or security breach. Planning requires consideration of the safety of emergency responders, workers, and the public.

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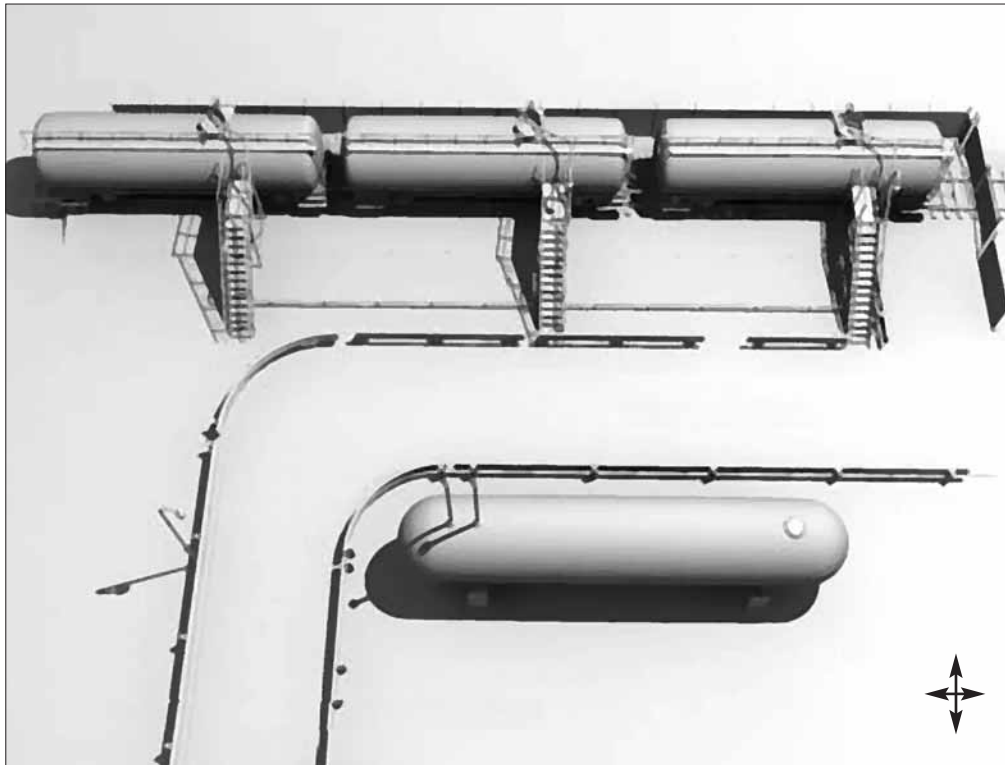


FIGURE 8-65

SUMMARY

In order to understand the hazards and risks of different types of propane container emergencies, you must be familiar with both the physical properties and behavioral characteristics of propane, as well as the basic design and construction features of propane tanks.

Hazard and risk assessment is a definitive step taken by the Incident Commander to identify the hazards involved in the incident and evaluate the potential risks of each tactical option being considered. Hazard and risk assessment should be an ongoing process along the entire timeline of the incident. It begins upon arrival at the emergency scene and continues along the incident timeline until the problem has been safely resolved and the incident is terminated.

In normal circumstances, propane dissipates quickly in open air. The use of firehoses and master streams with nozzles on fog pattern (power cone) can rapidly disperse flammable propane gas in air under most conditions.

Most emergency responders are very familiar with the potential for violent closed container failure hazards associated with large bulk LPG containers like railroad tank cars. However, they often fail to see comparable hazards and the potential for violent container failure when dealing with smaller propane tanks and cylinders. Approaching a burning propane tank from the sides with flame impingement in the vapor space is not a guarantee that you will be safe from projectiles or missiles if the tank BLEVEs. For small containers, research shows that a minimum safe approach distance from the sides of a burning tank to avoid the majority of projectiles would be about 300 feet, but beware that ruptured cylinders and containers have traveled distances much further. Use distance and shielding to your tactical advantage. The larger the tank, the further away you should be. Remember, projectiles from BLEVEs are the major hazard to emergency responders.

Rapid application of cooling water on the outside of the tank above the liquid level can reduce the likelihood of container failure by lowering the external temperature of the shell of the exposed tank. Any decision to approach a propane tank showing direct flame impingement on its vapor space must be made on a case-by-case basis after evaluating the hazards and risks and determining if an adequate water supply is available to support firefighting operations. Bulk storage tanks can fail within 10 to 20 minutes of direct flame impingement if the containers are not adequately cooled.

Propane fires should not be extinguished unless the fuel source can be isolated. If the fuel source is not shut off and the fire is extinguished, the leaking gas can migrate away from the container and may find an ignition source.

Structural firefighting gear and SCBA can offer sufficient protection to the wearer engaged in propane firefighting and leak control if the user is fully aware of the hazards being encountered and the limitations of the protective clothing. Remember, PPE will provide only minimal protection against propane liquid burns.