Pipeline Emergency Preparedness & Training: Analysis of Response to a Natural Gas Pipeline Emergency

The following is a summary of an account of an actual incident involving a response to a natural gas emergency. The parties involved have not been identified and the intent is for this to be presented as a learning opportunity for public and private sector responders.

At approximately 1:00 p.m. an engine company, a Battalion Chief (who would serve as the Incident Commander), and an ambulance were dispatched to a reported natural gas leak at a commercial strip mall. Some fifteen minutes prior to the arrival of the emergency responders, a natural gas company first responder arrived on the scene and began looking for an underground leak. Within a few minutes, a natural gas leak was found near the rear exterior corner of the building. An evacuation of the building’s occupants was ordered.

A fire officer exited the rear door of the business that had called in the gas leak and noticed a fire along the roof line. As fire crews began to deploy hoses another fire officer observed an electrical meter located on an exterior wall on fire. Anticipating an explosion, the officer attempted to quickly egress the building, as the explosion occurred. Several firefighters and the natural gas company first responder were injured in the blast. A “Mayday” was issued, followed by evacuation orders. Several firefighters, and the gas company first responder were transported to local hospitals with injuries ranging from third degree burns to muscle sprains.

An investigation of the incident was conducted, and the following findings were noted as contributing factors leading up to the injury of the firefighters:

- Insufficient execution of the fire department’s updated standard operating guideline on incidents involving flammable gas, e.g. apparatus and firefighters operating in a flammable area (hot zone)
- The accumulation of natural gas in the structure’s void spaces
- An unmitigated ignition source
- Insufficient combustible gas monitoring equipment usage and training
- Ineffective ventilation techniques

So what are the “take-aways” that we can use to better prepare for response to a natural gas emergency?

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• **Evacuations** - the need to evacuate was identified early in the incident which probably led to no civilian injuries. Life safety is always the top priority!

• **Scene Size-Up** - conducting a thorough scene size-up early in the response is critical for scene safety. Avoid tunnel vision and engage a Safety Officer early in the response.

• **Ignition Sources** - Eliminate possible ignition sources as quickly as possible! Think outside of the box - when electrical power is cut to the structure, will a generator kick in? If so, where is the generator in proximity to the gas leak? Are all responders’ communication devices intrinsically safe?

• **Understand the properties of flammable gases** - Natural gas is lighter than air. Propane is typically heavier than air and can accumulate in low lying areas. Flammable ranges, auto-ignition temperatures and other physical properties vary by product. Review these characteristics and be familiar with the contents of applicable material safety data sheets (MSDS’s).

• **Combustible Gas Monitors** - If you have monitoring equipment, such as combustible gas indicators or “CGI’s”, when was the last time they were calibrated? When you take them out of the case, are they leaking battery acid? Most importantly, are responders trained on how to use them and do they understand what the device is indicating? A hundred percent of gas is significantly different than a hundred percent LEL (Lower Explosive Limit)!

• **Coordinate and train with pipeline operator personnel** - Pipeline operators are the best source for information on the products that they transport and how to respond to pipeline related emergencies.

**Pipeline Emergency Response Tactics: Establishment of Hazard Control Zones**

Isolation of the area surrounding a hazardous materials incident is a critical step to protecting responders and the public. There are numerous factors that affect establishment of Hazard Control Zones. Before considering these factors, we must first define Hazard Control Zones and describe how they are implemented.

Best Practices from Emergency Response Peers

“We attend several tabletop exercises, plus yearly hazmat continuing education classes, and usually have a full scale drill every other year, plus the materials that you all send out.”

Reno County Sheriff’s Office, Hutchinson, KS

“We hold yearly pipeline incident tabletop drills and attend local pipeline operator-sponsored training meetings. We interact with our local Kinder Morgan facility and find them...”
Hazard Control Zones, also known as Site-Work Zones, or Scene-Control Zones are centered with a Hot or “Exclusion Zone” which contains a hazardous material with a potentially serious risk. Entry into the Hot Zone is only by responders wearing protective equipment, and clothing appropriate for the hazards based on a thorough risk assessment. The diameter of the Hot Zone is large enough to protect persons from exposure to the harmful effects of the hazardous material. A Warm Zone, or “Contamination Reduction Zone” adjoins the Hot Zone and serves as an area for decontamination of response personnel and equipment. Decontamination areas can vary in complexity based on the properties of the hazardous materials involved in the incident. The Cold Zone, or “Support Zone” borders the Warm Zone and contains support activities for the response which do not require personal protective equipment such as the Command Post, equipment donning and doffing areas, rehabilitation and treatment functions, and the staging area.

An effective and thorough size-up is essential when establishing Hazard Control Zones. There are numerous factors such as wind direction and speed, atmospheric conditions, time of day, and terrain among others that should be considered when determining how to establish the zones. Equally important is to continue to assess these factors during the response and determine if any changes are occurring that necessitate adjustments to the Hazard Control Zones.

Private sector responders involved in the shipping of the hazardous materials should be consulted early in the incident to provide technical assistance concerning how to handle the material. The Emergency Response Guidebook (ERG), and when available, material safety data sheets (MSDS’s) are key sources of information for responders. In many cases, private sector responders also have access to specialized atmospheric monitoring equipment and other tools and materials to aid in mitigating the incident.

Overview of Pipeline Systems: Liquids Pipeline Operations – Truck Loading and Unloading Operations

While liquid product pipelines are used to efficiently transport large volumes over long distances, truck loading racks are often used to load and unload bulk refined petroleum products at terminal facilities for distribution. It is important for emergency responders to be familiar with these operations.

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The U.S. Department of Transportation regulates the construction specifications of cargo tank trucks that load and unload at terminals. Cargo tank trucks used for the transportation of flammable liquids can be sub-divided into atmospheric pressure with the designation MC-306/DOT-406, or low-pressure with the designation of MC-307/DOT-407. In addition, tank trucks with the designation of MC-331 are used for the transportation of propane and butane.

Truck loading and unloading operations have numerous inherent safeguards which minimize the risk of product spillage or other incidents. Electrical connections between the loading rack and the cargo tank truck are required to bleed off any static charge that may be generated during the loading of the tanker and also arms the overfill probes in the tanker to prevent overfilling a compartment during the loading process. During transfer operations, dead-man switches may be used to provide the ability to instantly interrupt product flow in the event of an operational upset. In addition to these measures, computerized presets are used by the driver to set loading volumes to further minimize the risk of overfilling a tanker.

In the unlikely event of a product spill resulting in a fire, fixed fire extinguishing systems, as well as portable fire extinguishers are readily available for emergency response purposes. Truck loading and unloading racks are designed so that in the event of a product release, the liquid flows through an oil water separator to prevent contaminants from spreading off site.

Employees engaged in truck loading and unloading operations are highly trained to perform these tasks, as well as how to respond in the event of an emergency. Further, employees are trained to serve as technical experts on truck loading rack operations and specifics concerning the products themselves when supporting public sector responders.

**Article Pipeline Safety Brochure for Emergency Responders Available Online**

Download a copy of Kinder Morgan’s safety brochure for emergency responders at [www.kindermorgan.com/public_awareness/AdditionalInformation/KMSafetyBrochures.cfm](http://www.kindermorgan.com/public_awareness/AdditionalInformation/KMSafetyBrochures.cfm). The brochure includes pipeline emergency response information and details about Kinder Morgan’s operations including emergency contact numbers.