Pipeline and Hazardous Materials Safety Administration

# CRUDE OIL RAIL EMERGENCY RESPONSE

# LESSONS LEARNED ROUNDTABLE REPORT

***Office of Hazardous Materials Safety***
***Field Services Support***

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## INTRODUCTION

The safe transportation of hazardous materials in bulk quantities by rail and cargo tank truck is a priority for the U.S. Department of Transportation (DOT). The Department remains committed to the safe transport of flammable liquids by all modes of transportation, including the nation's 140,000 mile freight railroad network.

The rapid increase in energy production from shale formations in the United States in regions such as North Dakota, Texas, Colorado and Pennsylvania during the last decade has dramatically increased the volume of crude oil moving by rail and truck. While overall rail accidents have declined by 43 percent, and accidents involving the transportation of hazardous materials have been reduced by 16 percent during the last decade, incidents that do occur can pose tremendous challenges for public safety officials and may have significant and devastating consequences to the public, local communities, and the environment.

Derailments in Canada, Alabama, North Dakota, and Virginia involving crude oil shipments have underscored the need for a renewed focus on the safe transportation of bulk hazardous materials, specifically flammable liquids by rail. The Pipeline and Hazardous Materials Safety Administration (PHMSA) and the Federal Railroad Administration (FRA) have been taking aggressive efforts to ensure the safety of the American public and the environment.

In response to these incidents, DOT Secretary Anthony Foxx issued a "*Call to Action*" in January 2014, calling on rail company executives, associations, shippers, and others to discuss how stakeholders can prevent or mitigate the consequences of rail accidents that involve flammable liquids. The goal of this effort is to ensure shippers and carriers are taking all required precautions to transport crude oil safely. Moreover, the Department has issued a series of emergency orders and safety advisories to address specific crude oil transportation safety-related issues.

Another key element of the Department's safety approach is *Operation Safe Delivery*, which is based on an aggressive comprehensive plan to address risks, prevent derailments, reduce the consequences of incidents involving the transportation of flammable liquids by rail, and provide relevant emergency response guidance in the event of an accident. These efforts include:

- product testing and analysis;
- spot inspections and enforcement actions;
- data collection and sampling at strategic locations and facilities that service crude oil;
- promoting voluntary actions by industry to enhance the safe transportation of crude oil;
- conducting public outreach and developing partnerships with key stakeholder groups;
- rulemakings, and
- providing emergency responders with relevant guidance to safely and effectively manage incidents.

With the increased movement of crude oil by rail and highway, it is important that the risk of incidents be minimized through a strategic approach that promotes effective pre-incident planning, preparedness, response, outreach, and training.

To that end, PHMSA in partnership with the U.S. Fire Administration-National Fire Academy (NFA), is working to develop and provide access to emergency response guidelines and resources for first responders to safely respond to crude oil transportation incidents. The goal of this effort is to expand awareness of critical information and provide the emergency response community with incident management best practices. A key component of this initiative is to learn from past experiences and to leverage the expertise of public safety agencies, rail carriers, and industry subject matter experts to better prepare first responders to safely manage incidents.

## KEY FINDINGS

On May 29, 2014, in conjunction with the Virginia Department of Fire Programs, a *Lessons Learned Roundtable* forum was convened that consisted of a panel of fire chiefs and emergency management officials from some of the jurisdictions that experienced a crude oil or ethanol rail transportation incident. The purpose of this forum was to share firsthand knowledge about their experiences responding to and managing these incidents and discuss things that went well and things that did not.

Based on the input provided by the forum participants, the following list represents the key factors that were identified as having a direct impact on the successful outcome of managing a crude oil transportation incident:

- An Incident Management System (IMS) that includes a *Unified Command Structure* that is representative of all agencies operating at the scene must be established for all incidents (*based on the National Incident Management System (NIMS)* model).

- All agencies involved in emergency response operations need to understand NIMS, their specific role within NIMS, and must have a representative assigned to the Command Post to facilitate communications and coordination with all response assets.

- At a minimum, the following NIMS command staff positions must be filled:

    - Incident Commander
    - Safety Officer
    - Operations Section
    - Planning Section
    - Logistics Section
    - Finance Section
    - Public Information Officer
    - Liaison Officer

- Pre-incident planning and communication with all organizations, specifically shippers and carriers (railroads), is essential to learn about the product(s) being transported and the availability of emergency response resources.

- Emergency responders are not fully aware of the response resources available from the railroads and other organizations (*e.g., air monitoring capabilities*). This information would be useful in pre-incident planning, preparedness and response operations.

- Emergency response and public safety organizations need to have realistic expectations in terms of their capabilities and capacity to effectively manage an incident of this magnitude. For example, the availability of firefighting foam, foam production, equipment, appliances, water, and trained personnel need to be seriously evaluated to determine the ability to initiate and sustain such operations during an incident.

- Traditional structural firefighting strategy and tactics may not be effective in these situations. These incidents need to be approached and managed as hazardous materials incidents and this concept needs to be reinforced in emergency response plans, procedures and training programs.

- The *Emergency Response Guidebook* (ERG) is helpful to obtain initial response guidance for first arriving units.

- The use of proven planning and response tools and protocols such as the D.E.C.I.D.E. process and The 8 Step Process© should be integrated into emergency response plans and procedures.

Note: The D.E.C.I.D.E. process is a framework used for decision making in hazardous materials emergencies. It consists of six steps – *detect hazardous materials presence; estimating likely harm without intervention; choosing response objectives; identifying action options; doing the best option* and *evaluating progress*.

The 8 Step Process© is a standard operational guideline used by many public safety and industrial hazardous materials emergency response teams to safely and effectively manage a hazardous materials incident. The steps are: *site management and control; identifying the problem; hazard and risk evaluation; selection and use of personal protective clothing and equipment; coordination of information and resources; implementation of response objectives; decontamination;* and *termination of an incident*.

## LESSONS LEARNED

The following is a list of the public safety officials that were invited and/or attended the forum and shared the *lessons learned* on behalf of their respective jurisdictions:

*Battalion Chief Allen Geeser*
*Cherry Valley, IL Fire Department*

*Dave Rogness*
*Emergency Manager, Cass County, ND*

*Battalion Chief Robert Lipscomb*
*Lynchburg, VA Fire Department*

Note: In addition, Mr. Ken Gibson, Director, Emergency Management Agency, Pickens County, AL, (and one of the on-scene commanders of a crude oil train derailment in Aliceville, AL), was invited but was unable to attend. However, Mr. Gibson did submit a pre-exercise *Lesson Learned Form* and the information is included as part of this report.

The incidents represented in this report are listed below:

| DATE | LOCATION | INCIDENT TYPE |
|---|---|---|
| June 19, 2009 | Cherry Valley, IL | Ethanol Derailment/Fire |
| November 7, 2013 | Aliceville, AL | Crude Oil Derailment/Fire |
| December 30, 2013 | Casselton, ND | Crude Oil Derailment/Fire |
| April 30, 2014 | Lynchburg, VA | Crude Oil Derailment/Fire |

Prior to attending the forum, participants were requested to complete a *Lessons Learned Form*. The form included the following questions that were intended to elicit specific feedback to guide the collection and presentation of information deemed fundamental to the goal of developing incident management best practices and commodity-specific emergency response guidance:

- *List the top three (3) things that went wrong or could have helped better manage the incident.*
- *What communication did you have with the shipper, railroad, or contractors PRIOR TO the incident?*
- *What communication did you have with the shipper, railroad, or contractors DURING the incident?*
- *How effective and timely was the emergency response information provided – (e.g., shipping documents, ERG, Safety Data Sheets)?*
- *Was the emergency contact for the shipper called? If so, was the information provided helpful?*
- *Would having information about these shipments PRIOR to the incident been of value?*
- *What training/awareness would you like to see provided to first responders to better manage these incidents?*
- *Was an Incident Management System (IMS) implemented on-scene? If so, who was the Incident Commander?*
- *Were all parties operating at the scene knowledgeable of the IMS?*
- *If you could make one recommendation to improve the safety of first responders involved in these incidents, what would it be?*

The information submitted by the participants and presented during the forum, was broken down into the following key operational areas:

- Incident Management
- Communications
- Emergency Response Information
- Resources
- Training
- Responder Safety

A summary of the feedback provided by the participants for each of these operational areas is outlined below.

## 1. *Incident Management*

- The need to adopt a comprehensive IMS as soon as possible is critical to the successful outcome of an incident. Although an IMS was established in all the incidents reviewed, not all agencies were knowledgeable of some of the basic principles nor were they part of the system that was implemented. This was especially true for some personnel from outside the public safety arena.

- A true *Unified Command Structure* is essential for managing incidents of this magnitude.

- Pre-incident communication and coordination with law enforcement, the railroad, and other responding agencies as part of the pre-incident planning process is necessary to be successful.

- Since these incidents may last several days (multiple operational periods), Incident Commanders should consider additional support from a Type II or III *All Hazard Incident Management Team* (AHIMT). Also, the depth of personnel to support IMS for extended operational periods should be considered, especially for key positions within the IMS such as:

    - Logistics
    - Planning
    - Finance

- Outside federal and state investigative/regulatory agencies that are not part of the initial operational response (i.e., rescue, control, suppression and recovery), must be knowledgeable in the basic principles of IMS and Unified Command to the extent necessary to provide required support to the Incident Commander.

## 2. *Communications*

- In only one incident was there prior engagement with the shipper or railroad. In that case, the railroad provided periodic first responder training and also reviewed and provided comments on the local rail emergency response plan.

- Pre-incident, during the incident, and post-incident communications and operations must involve the responsible party [shipper and carrier].

- A list of railroad contacts should be maintained and utilized prior to an incident to establish effective working relationships and to share information before an incident occurs.

- During the incident, there was no direct communication with the shipper; only railroad response personnel.

- There needs to be a common means of communication with the railroads and other responders and contractors during an incident. One viable option is to provide personnel with radios on a common frequency for direct communication with one another and the Command Post. In addition, a current cell phone contact list of key organization representatives should be maintained.

- Providing response agencies with information about all hazardous materials shipments moving through the community prior to an incident has limited value. The frequency of such movements through many communities would generate a tremendous volume of notifications that most response officials would not find useful in terms of changing their organization's response posture. Pre-incident planning in conjunction with coordination with the rail carriers is the key to understanding and developing effective response strategies for any hazardous materials incident regardless of the commodity involved.

- Developing an *Incident Action Plan* (IAP) for each operational period using the planning process provides a system for formal briefings that provides situational awareness. Using a planning section to forecast resource needs and tactical considerations as the event progresses is also essential.

- Responders should contact CHEMTREC and integrate the Call Center into their emergency drills and exercises [by actually calling CHEMTREC and not just simulating contact with them].

- Integrate the National Response Center (NRC) into drills, exercises, and planning activities. For example, the NRC can provide 24-hour access to federal government agency resources and technical assistance. The NRC also serves as the EPA's *Hazardous Materials Hotline* and the USCG *Oil Spill Hotline.*

## 3. *Emergency Response Information*

- Safety Data Sheets (SDSs) were obtained primarily from the railroad and their usefulness in formulating an effective response strategy and managing the incidents varied since they were not necessarily for the specific product involved in the incident and some were outdated—
    - CHEMTREC (or the shipper's emergency contact) was not called to obtain SDSs or to facilitate direct contact with shipper product experts.
    - Responders need product-specific data for decision-making.
- The ERG was used by first arriving units to obtain initial guidance.
- Interaction with Railroad (carrier)—
    - First responders need a better understanding of rail documents.
    - *Railroad Standing Order Report* [which was available from one railroad], that listed the position in the train of each car, car number, product, and hazard class, was received by emergency responders in approximately 30 minutes in one incident.
    - Responders were unable to immediately obtain a manifest or train consists from train crews. In some cases, two hours passed before the train consist was obtained. In one case, three hours passed before an accurate consist was obtained.
- Air monitoring capabilities—
    - The railroads have contractor support for air monitoring and toxicology assessments. Emergency responders are not aware of this capability and how they can be used during an emergency response.
    - The *National Weather Service* (NWS) can provide a plume dispersion forecast to support decision-making. In one incident, data was received within 30 minutes of the request and was helpful to make assessments of potential downwind impacts.
    - Federal, state, and local EPA capabilities and resources need to be identified as part of the pre-incident planning process.
    - Fire departments can use thermal imaging devices to detect heat levels in tank cars to identify liquid and vapor levels.

## 4. *Resources*

- Mutual aid assistance (*e.g., trained personnel and specialized equipment*) may be needed to supplement local response capabilities.

- Pre-incident knowledge of available rail assets and response times is critical and needs to be part of the organization's emergency response plan.

- Extended operations require adequate support – rehabilitation of personnel for extended campaigns may be required.

- Firefighting and vapor suppressing foam supplies need to be identified and deployed as quickly as possible. Agencies need to determine resource requirements (*e.g., water, foam supply, equipment, appliances, and people*) for this type of operation to be used effectively.

- The time delay for assets to arrive on scene and initiate operations must be taken into account since long delays can diminish operational effectiveness. Logistics for access, positioning, and movement of these resources should be considered, including the need for escorts to facilitate prompt access to the scene.

## 5. *Training*

- Hazardous materials incident management training for the awareness/operations levels is needed.

- Hazard and risk assessment needs to be stressed in first responder awareness/operations training.

- Hands-on training targeted to specific commodities based on risk assessments and the local level of response capability is needed.

- Training provided by the railroads on locomotive/tank car operations, equipment and damage assessment is needed, including more frequent "safety train" refresher training.

- Adequate training is needed for emergency responders on rail emergency response operations, capabilities and resources.

- NIMS training and exercising for all agencies is essential.

- More access to on-line and blended training programs is needed.

- Training and exercises on a regular basis would help responders be better prepared.

- The importance of pre-incident planning and coordination with the railroads must be stressed in all training venues.

- Table-top exercises and simulations are effective tools that help first responders learn and retain information.

**6. *Responder Safety***

- The mindset that public protection and responder safety is a priority needs to be instilled in all response personnel.

- First responders would benefit from information on how to safely operate around rail cars, tracks and associated equipment.

- First responders need to consider other potential risks during an incident (*e.g., pipeline and other utilities shut down if impacted by an incident*).

## 3 UP/3 DOWN INFORMATION

The forum participants were asked to identify the top three things that went well that contributed to the successful outcome of the incident, as well as the three things that were problematic that hampered their ability to effectively manage the incident. These factors are listed below.

*Things that Went Well—*

- Some incidents occurred in isolated areas so structural/physical exposures were not an issue

- Prior experience, training, planning, and preparedness

- Initial size-up and implementation of a *Unified Command Structure*

- Decision to let the product burn versus attempting to extinguish the fires

- Cooperation among the agencies involved in the incident

- Timely mutual aid support

*Things that Did Not Go Well—*

- Delay in railroad personnel arriving with train consist and providing a representative at the Command Post

- Consist and SDSs for product(s) involved were not made available to the Incident Commander in the early phases of the incident due to difficulty locating train crews

- First arriving units positioned apparatus too close to the derailment which required them to relocate shortly after arrival

- Need better coordination and communications capability with all agencies involved – (*e.g., no direct radio communication with all personnel operating at the scene, Internet connection disrupted which caused delays in obtaining information*)

- Inability of law enforcement to set-up an adequate perimeter early in the incident

- Inadequate mobile incident command vehicle for cold weather environment which was unable to effectively support operational needs

- Some federal agency representatives were not well versed with the fundamentals of NIMS and a *Unified Command Structure*

## SUMMARY

The safe and successful management of any hazardous materials incident is based on effective pre-incident planning, preparedness, training, exercises and implementation of an incident management system. Agencies need to adopt and practice an integrated risk-based response strategy that is coordinated with all parties involved in incident response and mitigation activities to successfully manage the potential consequences of a crude oil transportation incident. One of the most important elements of this strategy is for emergency response personnel to have access to timely and accurate information and technical assistance to help make informed decisions during all phases of an incident.