For Environmental Health and Safety Leaders

TEN QUESTIONS ON CRUDE-BY-RAIL RISKS
Over the past 18 months, the transportation of crude oil by rail has been increasingly in the spotlight, due to more than a half-dozen incidents involving cars carrying Bakken crude. Much is being done to improve the safety profile of crude oil transport: Regulators in the US and Canada have issued or will soon issue comprehensive new safety rules; railroads have introduced new operating practices; and design standards for new tank cars are being updated. In addition, the North Dakota Industrial Commission (NDIC) recently issued new regulations, effective April 1, 2015, that will require additional processing steps to reduce the volatility of North Dakota crude oil.

In the midst of these rapid changes, senior executives and boards of oil companies have realized the need to better understand the evolving risks they face when shipping crude oil by rail – be they operational, strategic, financial, or reputational. To that end, Oliver Wyman believes that there are ten questions that oil company decision makers must ask and answer surrounding the transport of crude oil by rail. While not all of the issues addressed by these questions are within shipper control, understanding them is critical to illuminate potential operational, financial, and reputational risks and liabilities.

1. **DO I KNOW THE PROPERTIES OF WHAT I AM SHIPPING?**

All crude oil is not alike. After the Lac Megantic disaster in July 2013, regulators began asking whether there was something different about Bakken (North Dakota) crude. Testing determined that this oil contains more volatile elements and is more flammable than crude from other regions. When this oil is not classified or labeled properly (as was the case at Lac Megantic), the risks of an adverse incident are greatly magnified.

Shippers are directly responsible for the proper classification and characterization of the commodities they ship:

- Classification relates to assigning the proper hazard class and “packing group,” which refers to the packaging and handling requirements of the material, based on the degree of danger it presents. Packing Group I represents the highest danger, II medium, and III minor. Currently, all Class III crude oil, including that from the Bakken, falls into Packing Group I or II, under a US DOT Emergency Order.

- Characterization is a complete description of the properties of the material during the entire transportation cycle. In the case of crude oil, this includes corrosivity, vapor pressure, dissolved gas content, specific gravity at loading and reference temperatures, and the presence and concentration of specific compounds, such as sulfur.

Crude oil transported by rail is often derived from different sources and then blended, complicating proper classification and characterization. The Pipeline and Hazardous Materials Safety Administration (PHMSA) has pointed out the shortcomings of relying on information in Safety Data Sheets (SDS), which might include generic and outdated information about the specific material to be transported. Beginning in April 2015, for example, producers will need to ensure they update material properties for Bakken crude processed under the new NDIC regulations.
In addition, proposed new PHMSA rules call for a testing program for mined gases and liquids, which if it comes to pass will be the responsibility of oil and gas producers.

Exhibit 1: Originated Class I Carloads of Crude Oil, 2008-2014

Shippers communicate material hazards to all parties involved in the transport chain (including loading/unloading) through shipping papers, package marking and labeling, and vehicle placarding. Product characteristics and hazards also must be properly communicated to employees and readily available for emergency response situations.

In particular, in the event of a derailment, correct labeling of shipments is critical to guide first responder decisions on how to manage an incident – including spill response, firefighting, and evacuation. Recent Canadian and proposed US regulations include steps to improve the quality of information being provided to first responders. Proper labeling is also a strong indication that the shipper is aware of, and diligent about, complying with regulations and carrier rules in loading and shipping hazardous materials.
3. **DO I HAVE/WILL I HAVE THE RIGHT TANK CARS FOR WHAT I SHIP?**

Much attention has been focused on the design of the railcars used to haul crude oil and on the need for shippers to assign tank cars appropriately based on crude oil characteristics. This task will be complicated by changing regulations for tank cars. A broad set of proposed options for tank car design are now under consideration, with the goal of increasing puncture resistance, providing thermal protection to survive a pool fire, and protecting top fittings and bottom outlets during a derailment, thus reducing or delaying the release of flammable liquids.

Not only will updated US regulations (which are expected to be finalized in early 2015) impact new cars, but all existing tank cars that haul crude oil and ethanol would need to be retrofitted to meet the new standards. Tank cars not meeting the new specifications would not be authorized to carry shipments in Packing Group I after October 1, 2017, and all tank cars that do not meet the new standards would have to be removed from high-hazard flammable train (HHFT) service within 5 years. In addition, Canada plans to ban all older, unmodified tank cars from its rail lines after May 1, 2017.

The end result of these changes is that tank cars for highly volatile crude and ethanol may be in short supply for some time to come. According to one estimate, some 130,000 existing tank cars will likely need to be retrofitted, while the remainder of the fleet, due to age and condition, will probably be diverted to other services or retired. Car builders will be stretched thin to both build new replacement tank cars and modify existing ones in the time allotted.

4. **ARE MY LOADING AND UNLOADING OPERATIONS BEING DONE SAFELY BY COMPETENT EMPLOYEES/CONTRACTORS?**

Terminal loading/unloading operations represent a high level of risk and liability for oil producers. In the best case, a terminal is a highly engineered facility with the latest technology, and operated by well-trained professionals. But in reality, terminals can vary tremendously and not all meet this ideal.

Proper loading/unloading operations should be ensured through regular reviews of all operational and training procedures from a safety and risk management perspective. Are procedures adequate for the risks, including weather and other operating conditions? Do they account for differences in product temperatures, pressures, and other key characteristics? Is training sufficient for emergency response situations?
On the loading end of the process, over/under loading of railcars is a significant issue, since there are currently multiple types of tank cars in service handling crude oil. Cars have different load limits and tare weights, depending on their trucks and other equipment.

While overloading places excessive stress on the car and its fittings, for dynamic stability – as well as economic reasons – cars do need to be loaded with as much product as possible. Underloading leaves void spaces that can allow lading movement (sloshing); this will impact car movement in curves and train handling during acceleration and braking. Excessive dynamic forces can cause derailments. Extra void space also allows for more vapor accumulation. And vapors are composed of the more volatile components of the lading and thus make a car more susceptible to ignition and explosion in the event of an accident.

5. ARE MY RAILCARS PROPERLY INSPECTED AND MAINTAINED?

With the exception of 5,000 new tank cars that BNSF has on order, railroads generally do not own the tank cars used in crude oil service. Most such cars are owned or leased by shippers. Thus while railroads must inspect cars before accepting them for transport, program inspection and maintenance activities are the responsibility of the owner/lessee. For crude oil, the inspection and maintenance program is complicated by the variable properties of the product, which can corrode surfaces at different rates. Severe corrosion on crude oil tank cars has been noted on the internal surfaces of the tank, man-way covers, and valves fittings.

Regulations specify the intervals for required inspections and recertification of tank cars. Make sure these intervals are respected. Then go one step further and have your loading crews keep an eye out for anything which does not look normal and for areas exhibiting signs of corrosion. If there is a doubt, do not load the car and have it thoroughly inspected prior to its next loading.

6. WHERE IS MY CRUDE OIL GOING – AND HOW WILL IT BE ROUTED?

Making an informed decision about where to ship crude requires an understanding of how rail routing decisions are made and the associated risks (see next question). As it is, there can be a good deal of variability in how a crude oil shipment is routed and who handles it along the way.

For the majority of crude shipment miles, tank cars travel on major railroads, known as “Class I’s,” which have well defined operating, maintenance, and safety procedures. If a single Class I does not own or have rights to operate on a portion of the routing, it will hand off the cars to a second Class I, known as an “interchange.” Trains also may have to travel a short distance over short line or terminal railroads at either end of the main line to reach loading/unloading terminals. Such short line railroads generally do not have to meet the same rigorous standards for track and equipment as the Class I’s.
In addition, while the number of train accidents per year in general is low and has been improving for both Class I and regional/short line railroads, our analysis of rail accident reporting shows a higher rate of incidences/accidents for short lines than for the Class I carriers.

Another critical aspect that impacts routing is the number of cars of crude oil being shipped on a single train. Many of the more stringent operating regulations and practices related to crude oil only impact shipments of 20 or more carloads of Class III flammable liquids. Thus there are additional risks for crude oil cars that move in smaller blocks and are mixed in with other cargo. These risks are associated with handling at classification yards and additional time in transit.

Exhibit 2: Decision Tree For Moving Crude Oil By Rail
7. **DO I KNOW THE RISK FACTORS FOR ROUTINGS?**

Risk factors for routings will be different of course for lines that pass through urban centers versus those that are routed primarily through rural areas. Terminal placement will also determine if a crude oil train must pass through dense population areas. With the exception of interchange decisions made at the time of contracting, shippers do not have control over how their railcars are routed, but it is worth knowing ahead of time what risks a route might impose, particularly in the event of a derailment or collision.

For a number of years, railroads have been required to follow a special protocol to determine the safest routing for certain hazardous materials. Crude oil was not originally on this list, but the PHMSA’s proposed regulations would require the hazmat protocol to be applied for all trains carrying 20 or more carloads of crude oil.

The hazmat protocol requires a railroad to collect data related to 27 different routing factors for each proposed trip (such as network, operating, and train characteristics). The carrier then must select a route based on the findings of a route analysis, which is conducted using a computerized Federal Railroad Administration route risk evaluation system. The goal of the route analysis is to minimize environmental and population exposure, and so it considers a range of trade-offs, including distance, the presence of highly populated areas, environmental concerns, historical accident/incident rates, and other factors.

In addition, the rail industry has implemented a 50 mph speed limit for trains carrying 20 or more cars of crude oil and further restricts the speed to a maximum 40 mph when those cars include at least one older DOT-111 tank car and are operating within one of the 46 high threat urban areas designated by the Department of Homeland Security.

8. **DO I HAVE PROPER EMERGENCY RESPONSE PROCEDURES IN PLACE?**

According to the Association of American Railroads, “Emergency responders have control of railroad accidents in which hazardous materials are spilled, but railroads provide the resources for mitigating the accident.” But the shipper (who most likely owns/leases the cars), also should have its own emergency response plans. The oil company’s incident command structure should match that of railroads and regulators. There may be a need to work with responders and local municipalities to provide data on the material being shipped. Communication, authority and accountability issues need to be defined, practiced, and executed.
9. **DO I UNDERSTAND MY RESPONSIBILITIES AND LIABILITIES IN CASE OF AN ACCIDENT?**

Traditionally, freight railroads were responsible for goods until delivery, under “common carrier” rules. But now most goods move under negotiated contracts, and responsibility for cargo and property damage or personal injuries may not be spelled out. As a result, plaintiff attorneys are showing an increasing willingness to go after brokers and shippers to obtain compensation.¹

Shippers of Canadian crude into the US must also consider the legal ramifications of routings that cover two countries. How will your liabilities change depending on your location and the location of the incident? Further, liability rules in both countries may undergo revision as fallout from the Lac Megantic disaster, which exposed shortcomings in rail liability coverage and insurance.²

Has your legal team reviewed all contracts with supply chain partners to understand what might be your firm’s residual responsibilities and liabilities in case of an accident? Do you know the financial strength and insurance coverage of those supply chain partners? Also, bear in mind that failure to exercise proper diligence in the testing, loading, labeling, or declaration of product may expose a shipper to direct liability in the event of an accident – as well as failure to maintain railcars to the proper standard. Finally, what is the risk to the company’s brand and reputation as a result of being party to an incident?

10. **CAN I VERIFY THE ANSWERS TO QUESTIONS 1 THROUGH 9?**

Ronald Reagan famously said “trust, but verify” in relation to Russian disarmament. The same is true for crude by rail safety – shippers need to ensure there are audit and verification protocols in place to ensure optimal risk management along the entire crude by rail transport chain. Some audit requirements fall squarely on the oil companies. Others must be managed and influenced through third parties. In addition, crude by rail activities should be part of your overall emergency response drilling protocol. These can range from tabletop drills that focus on scenario evaluation, to full scale drills that require the cooperation of multiple stakeholders.

In summary, crude by rail is not new – for either the oil industry or the railroads. Railing of crude actually started back in 1889, when Rockefeller built his first refinery on the shores of Lake Michigan. But the consequences of mishandling crude by rail have increased dramatically, putting every involved firm’s “license to operate” at stake. Knowing the answers to the above questions can help your company avoid a world of trouble and harm.

For more information, please contact your account representative or:

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