

SAFETY ALERT - #19 -2009

WORKERS INJURED BY EXPLOSIONS DURING TANK MAINTENANCE

RELEASE DATE: OCTOBER 15, 2009

Function: Production Operations	Incident Dates: September 2009 / July 2008
Incident Type: Fire and Explosion	Country and Region: Western Canada

Summary:

Two separate injury accidents occurred when electric impact wrenches ignited vapour fumes inside a production tank while preparing to complete tank maintenance / repair work.

Description of Incident:

In both instances, the manway doors were being removed to complete required tank maintenance and repairs. Site hazard assessments were completed by the supervisors in charge of the activity and identified the potential for an explosive atmosphere as one of the hazards. While opening the manway door, the workers removed the top half of a 2-part manway door and set it to the side. While workers were removing the bottom half of the door, the electric impact wrench they were using ignited the hydrocarbon fumes that were coming from inside the tank. The workers injured in these incidents sustained first and second degree burns.

Incident #1: Flash Fire (750 bbl. production tank). 2 workers injured, tank damaged.



Electric Impact wrench used to remove nuts



Damaged production tank

Incident #2: Explosion (1000 bbl. sales oil tank). Worker injured, tank destroyed



View of manway where explosion / fire occurred



Production tank roof after explosion



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Fire and Explosion Analysis:

The key elements of the fire triangle were identified as follows:

- 1) Hydrocarbon Source: In both cases, the tanks were pumped down; however, there were small volumes of liquids remaining in the tanks. In incident #2, no further attempts to clean, wash or purge the tank were considered because workers did not plan to enter the confined space.
- 2) Oxygen Source: When the tank manway was opened, air was allowed to enter the tank. Due to a combination of tank configuration, product temperature and ambient temperature, there was an induced draft pulling air into the tank.
- 3) Ignition Source: The injured contractors were using an electric impact wrench to remove the nuts around the manway. These wrenches were not suitable for use in Class 1, Zones 0 & 1 work areas. After the incident, hand tools were to be used to complete manway door removal.

Causal Analysis:

- Inadequate Supervision: Roles and responsibilities specific to the Hot Work Code of Practice were not clearly defined. (i.e. hazard management, work plans and practices, equipment)
- Failure to Control Hazards: While the potential for an explosive atmosphere was identified during the hazard assessment, no measures were taken to control the hazards.
- Improper Tools: The use of electrical hand tools in an explosive atmosphere.

Recommendations for Preventing Future Incidents:

The key corrective actions identified by the Prime Contractors and Employers involved in these incidents included:

- Ensure staff understands the roles and responsibilities of the Prime Contractor. The Prime Contractor must implement a safety management system or process that verifies compliance with provincial regulations by all employers on site.
- Review Fire and Explosion Prevention Code of Practices including a review of [Industry Recommended Practice Volume: 18 Fire and Explosion Hazard Management](#); the expanded fire triangle and the fire and explosion prevention checklist. Reinforce that this checklist must be completed any time that a hot work permit is required.
- Complete an on-site hazard assessment and strictly follow safe work procedures when dealing with explosive atmospheres. Identify the hazards, and controls. Develop a detailed Job Safety Analysis (JSA) for this type of procedure. Engage and review with all employees.
- Discuss with the field operations staff which tools are acceptable when completing hot work activities. Also, review the Class 1, Zones 0 & 1 sections of the electrical code with the field operations staff and discuss how to confirm if equipment is intrinsically safe.

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DISCLAIMER:

This Safety Alert is designed to prevent similar incidents by communicating the information at the earliest possible opportunity. Accordingly, the information may change over time. It may be necessary to obtain updates from the source before relying upon the accuracy of the information contained herein. This material is presented for information purposes only. Managers and supervisors should evaluate this information to determine if it can be applied to their own situations and practices.