Lessons Learned Database
Individual Incident Summary Report

IChemE
Safety & Loss Prevention
Special Interest Group

Incident Title	**Naphtha Spill During Maintenance**		
Incident Type	Fire		
Date	23rd February 1999		
Country	USA		
Location	Avon (Martinez), CA		
Fatalities	**Injuries**	**Cost**	
4	1	Unknown	

Incident Description

Credit: US Chemical Safety Board

A pinhole leak was discovered on a DN 150 (6" NS) pipe elbow in the naphtha sidedraw line of a crude distillation unit (CDU). The elbow was on the pipe (downstream) side of the CDU tower isolation valve 34.2 m (112' 3") above grade. Operators immediately attempted to isolate the leak while the CDU remained on stream by closing 4 valves. Subsequent inspection of the piping revealed significant thinning of the line, requiring a large section of pipe between the CDU naphtha sidedraw and its associated sidestripper to be replaced. Numerous unsuccessful attempts were made over the next 13 days to isolate and drain the corroded section of pipe. Low point drains at the sidestripper level control valve were found to be plugged.

On the day of the accident, more unsuccessful attempts were made to drain the line. A work permit was issued authorising workers to drain and remove the corroded section of pipe even though draining of the line could not be verified and the CDU was on stream. The maintenance supervisor directed workers to make 2 cuts in the pipe with a pneumatic saw. The first cut was 31.9 m (104' 6") above grade and was successful. The second cut 24.0 m (78' 7") above grade was stopped when naphtha started weeping out. The supervisor directed workers to open a flange in a vertical section of the pipe 11.6 m (38' 1") above grade. Naphtha leaking from the parted flange was collected in a plastic pan and removed via hose connection to a vacuum truck parked below. About 33 minutes later, naphtha started to blow through the open end at the top of the pipe and ignited (probably on hot equipment or piping). The resulting fire quickly engulfed 5 workers on the CDU tower and temporary scaffold structure, killing 4 workers and seriously injuring another.

Incident Analysis

Basic cause was ignition of naphtha released from process piping onto nearby hot surfaces while breaking containment during on-line maintenance.

Critical factors included: 1) The desalter was operating beyond its design limits (increasing water and corrosive salt carryover to the CDU tower), 2) The naphtha sidedraw line was extensively plugged and isolation valves passed, 3) The sidestripper level control bypass valve was routinely operated partially open, damaging its internals (allowing stripper to pressure up sidedraw line).

Root causes included: 1) Inadequate hazard identification (ignition source created by hot surfaces), 2) Inadequate preventative maintenance (corrosion management), 3) Inadequate risk assessment (valve leakage, line pluggage, inability to drain line), 4) Inadequate work planning (no escape routes from elevated workfaces), 5) Inadequate control of work (inappropriate permitry), 6) Poor judgement (allowing CDU to remain on stream), 7) Inadequate supervision (non-routine maintenance), 8) Inadequate management of change (desalter and sidestripper level control bypass valve operation), 9) Inadequate process safety management (failure to audit isolation procedure).

Lessons Learned

1) Management of change (MoC) reviews should be conducted when conditions change (crude composition, throughput etc), 2) Isolation, blinding and Lock out/Tag out (LOTO) procedures should be regularly audited, 3) Permit issuing authorities should be regularly re/trained and re/certified.

More Information

1) “Refinery Fire Incident”, US Chemical Safety and Hazard Investigation Board, Report No. 99-014-I-CA (2001).

Industry Sector	Process Type	Incident Type
Oil & Gas	Atmospheric Crude Distillation	Fire
Equipment Category	**Equipment Class**	**Equipment Type**
Not equipment related	Not applicable	Not applicable

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