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| Incident Title | | Extractor Mixed Feed Line Rupture | |
| Incident Type | | Fire | |
| Date | | 16 th February 2007 | |
| Country | | USA | |
| Location | | Sunray, TX | |
| Fatalities | | Injuries | Cost |
| 0 | | 4 | Direct > US\$ 50 m (2007) – Ref .1 |
| Incident Description | | A leak of high pressure propane on a Propane Deasphalting (PDA) unit formed a large flammable vapour cloud which found an ignition source causing a series of jet fires and collapse of an elevated pipe rack which further fuelled the fire. Three employees and one contractor suffered serious burns and several others suffered minor injuries. The resulting damage forced the refinery to remain shut down for just under 2 months. It then operated at reduced capacity for nearly 1 year. | |
|  <p>Credit: US Chemical Safety Board</p> | | <p>The intensity of the fire resulted in blistering of the paint on the surface of a neighbouring butane storage sphere and prevented emergency responders reaching the fire water deluge valves provided to protect the sphere from overheating due to fire exposure. If the wind direction had been different and flames had impinged directly on the sphere or if the sphere had been exposed to significant overheating for an extended duration, there could easily have been a catastrophic rupture of the sphere and a major explosion. Furthermore, one of the jet fires caused a large release of highly toxic chlorine gas stored in pressurised cylinders near the PDA unit (used as biocide in cooling water). Fortunately, first responders and all other refinery personnel had already been evacuated from the refinery by then.</p> | |
| Incident Analysis | | <p>Basic cause was a freeze-related rupture of an elbow below an isolation valve at a control valve station on 1 of 2 propane feed lines to the Extractor Tower which had been taken out of service some 15 years earlier.</p> <p>Critical factors included: 1) An isolation valve at the redundant control valve station was passing due to a piece of metal debris trapped between its gate and seat, 2) Absence of positive isolation of the dead-leg from the propane supply system, 3) Absence of fireproofing on steel support columns of the elevated pipe rack some 23 m (77 ft) away, 4) Absence of remote-operated emergency block valves (EBVs).</p> <p>Root causes included: 1) Failure to conduct a management of change review (removing control valve station from active service), 2) Inadequate process hazard analysis (failure to adequately engage operating staff), 3) Inadequate risk assessment (fire exposure from neighbouring process plant), 4) Inadequate design (absence of remote-operated EBVs and structural steel fireproofing), 5) Inadequate freeze protection practices (including periodic inspection of dead-legs and infrequently-used piping and equipment).</p> | |
| Lessons Learned | | <p>1) Process units and piping systems should be systematically reviewed and field-checked to identify presence of dead-legs, 2) Dead-legs should be eliminated (by design) or removed (by positive isolation with blinds); if this is impractical, freeze protection should be provided or (as a last resort) regular monitoring and draining of low points should be implemented, 3) Remote-operated emergency block valves (EBVs) can help control large accidental releases of flammable materials, 4) Pressurised storage vessel water deluge valves should be located where they are accessible in an emergency, 5) Inherently safer biocide chemicals should be used instead of pressurised chlorine gas to prevent microbial fouling in refinery cooling water systems.</p> | |
| More Information | | 1) "LPG Fire at Valero McKee Refinery", US Chemical Safety and Hazard Investigation Board, Report No. 2007-05-I-TX (2008). | |
| Industry Sector | | Process Type | Incident Type |
| Oil & Gas | | Propane Deasphalting | Fire |
| Equipment Category | | Equipment Class | Equipment Type |
| Mechanical | | Piping | Fittings (Elbow) |