

Process Safety Forum

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Caribbean Petroleum Tank Terminal Explosion and Multiple Tank Fires

On the night of October 23, 2009, a large explosion occurred at the Caribbean Petroleum Corporation (CAPECO) facility in Bayamón, Puerto Rico, during offloading of gasoline from a tanker ship, the Cape Bruny, to the CAPECO tank farm onshore. A 5-million-gallon aboveground storage tank (AST) overflowed into a secondary containment dike. The gasoline spray aerosolized, forming a large vapour cloud, which ignited after reaching an ignition source in the wastewater treatment (WWT) area of the facility. The blast and fire from multiple secondary explosions resulted in significant damage to 17 of the 48 petroleum storage tanks and other equipment onsite and in neighbourhoods and businesses offsite. The fires burned for almost 60 hours. Petroleum products leaked into the soil, nearby wetlands and navigable waterways in the surrounding area.



There are striking similarities to the Buncefield explosion and fires of the 11th December 2005, highlighted in the key findings below.

Key Findings

- Control and monitoring failures
 - Inadequate tank filling operations
 - Unreliable tank gauging equipment
- Safety Management System failures
 - No independent high level alarm system
 - No independent automatic overfill prevention system
- Human Factors failures
 - Bund valve system design meant that it was difficult to determine if a valve was open or closed
 - Insufficient lighting in the bund area
- Lack of reporting requirements
 - Incomplete national incident database of incidents, meaning that failure frequencies could not be determined – inhibiting targeted improvements.

- Emergency response weaknesses
 - CAPECO and local fire-fighting teams lack of relevant equipment
 - Lack of emergency planning and training
 - Lack of co-ordination between federal, commonwealth and non-governmental agencies that responded to the explosion and fire

- Regulatory weaknesses
 - US regulatory system does not recognise large above-ground storage tanks storing flammable material to have a Major Accident Hazard (MAH) potential
 - Tank terminal facilities are not required to conduct risk assessments to address potential MAH
 - High level alarm systems or overfill prevention systems are not required under regulatory standards

- Industry standards
 - Despite similar incidents, stakeholders in the US have been slow to react to learnings
 - NFPA 30, API 2350 and ICC standards vary and none provide adequate information on risk assessment and overfill prevention system design.

Further reading

To download a copy of the full Chemical Safety Board (CSB) report, visit the CSB website here: http://www.csb.gov/assets/1/16/06.09.2015_FINAL_CAPECO_Draft_Report_for_Board_Vote.pdf

An animation of the incident is also available: <http://www.csb.gov/videos/filling-blind/>

More information on the Buncefield explosions can be found here: <http://www.hse.gov.uk/comah/buncefield/response.htm>

Reference can also be made to PSF Learning Brief 14 *Learning from Buncefield*: <http://www.p-s-f.org.uk/?p=365>

The Process Safety Forum has been set up to provide an industry association platform whereby initiatives, best practice, lessons from incidents and process safety strategy can be distilled and shared across sectors, to influence our stakeholders (including the Regulators), and to drive the process safety management agenda. The Process Safety Forum consists of representatives from UKPIA, TSA, CIA, OGUK, CBA, RSSB, ENA, ECIA, UKLPG, BAMA, EIG, UKOPA, SWA, MPA, UKLPG, BAMA, SWA and SDF. For further details contact: peter.davidson@ukpia.com.