



U. S. Chemical Safety and Hazard Investigation Board RECOMMENDATIONS STATUS CHANGE SUMMARY

Report:	Motiva Enterprises Sulfuric Acid Tank Explosion
Recommendation Number:	2001-5-I-DE-R12
Date Issued:	August 28, 2002
Recipient:	American Petroleum Institute (API)
New Status:	Closed – Acceptable Action
Date of Status Change:	October 26, 2020

Recommendation Text:

Ensure that API recommended practices address the inerting of flammable storage tanks, such as spent H₂SO₄ tanks. Include the following:

- *Circumstances when inerting is recommended*
- *Design of inerting systems, such as proper sizing of inerting equipment, appropriate inerting medium, and instrumentation, including alarm*

Board Status Change Decision:

A. Rationale for Recommendation

On July 17, 2001, an explosion occurred at the Motiva Enterprises refinery in Delaware City, Delaware. A work crew had been repairing a catwalk above a sulfuric acid storage tank farm when a spark from their hot work tool ignited flammable vapors that were released from a corroded tank. One worker was killed and eight others were injured. The tank released 264,000 gallons of spent sulfuric acid (e.g., H₂SO₄) which quickly overcame its secondary containment. Environmental damage was significant; approximately 99,000 gallons of acid reached the Delaware River, killing fish and other aquatic life.

After evaluating the storage tank's design elements and components, the U.S. Chemical Safety and Hazard Investigation Board (CSB) investigation determined that if an adequate inerting system¹ had been installed with proper tank integrity, it is likely that there would have been no combustible fuel/air mixture inside the tank.

As a part of its investigation the CSB also examined regulatory and industry consensus standards that applied to the inerting of flammable liquids inside storage tanks. These included Occupational Safety and Health Administration (OSHA) regulations and industry consensus standards published by the National Fire Protection Association (NFPA) and the American Petroleum Institute (API). Regarding the applicable API consensus standards, the CSB noted in its investigation report that while NFPA standards contained information on proper inerting practices, API Recommended Practices pertaining to operation and inspection of storage tanks

¹ An inerting system reduces the probability of combustion of flammable vapors in the headspace of a storage tank by replacing the oxygen normally present with an inert gas, such as nitrogen.

lacked this important safety information. As a result, the Board issued a recommendation to API to incorporate this information in future revisions of its Recommended Practices.

B. Response to the Recommendation

In February of 2020, the API responded to the CSB that it had updated four of its Standards/Recommended Practices to address the concerns raised in the CSB recommendation pertaining to inerting practices. A summary of those changes are listed below:

- Revised API Standard 653, *Tank Inspection, Repair, Alteration and Reconstruction*, Fifth edition to enhance Section 1.4 entitled “Safe Working Practices” and Section 11.4 entitled “Welding Safety” which contain warnings and references to other API Standards/Recommended Practices which discuss inerting practices and design criteria for tank inspectors.
- Revised API Standard 2000, *Venting Atmospheric and Low-pressure Storage Tanks*, Seventh edition, to discuss inerting practices in Section 3 and provide design criteria in Annex F for storage tanks.
- Revised API Standard 2015, *Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks*, Eighth edition, to discuss inerting in the context of vapor freeing, degassing, cleaning and inspecting storage tanks
- Revised API Recommended Practice 2009, *Safe Welding, Cutting, and Hot Work Practices in the Petroleum and Petrochemical Industries*, Seventh edition, to discuss inerting while purging and while doing hot work and added Appendix B which discusses inerting of vessels.

C. Board Analysis and Decision

As the most recent versions of API Standards 653, 2000, 2015 and Recommended Practice 2009 address all the requirements listed in the CSB recommendation, the Board voted to change the status of CSB Recommendation No. 2001-5-I-DE-R12 to: “Closed – Acceptable Action.”