



U. S. Chemical Safety and Hazard Investigation Board

RECOMMENDATION STATUS CHANGE

SUMMARY

Report:	Motiva Enterprises Sulfuric Acid Tank Explosion
Recommendation Number:	2001-5-I-DE-R10
Date Issued:	August 28, 2002
Recipient:	American Petroleum Institute (API)
New Status:	Closed – Acceptable Action
Date of Status Change:	April 9, 2024

Recommendation Text:

Work with NACE International (National Association of Corrosion Engineers) to develop API guidelines to inspect storage tanks containing fresh or spent H₂SO₄ at frequencies at least as often as those recommended in the latest edition of NACE Standard RP 0294-94, Design, Fabrication, and Inspection of Tanks for the Storage of Concentrated Sulfuric Acid and Oleum at Ambient Temperatures.

Board Status Change Decision:

A. Rationale for Recommendation

On July 17, 2001, an explosion occurred at the Motiva Enterprises refinery in Delaware City, Delaware (Motiva). A contractor work crew was repairing a catwalk above a sulfuric acid (H₂SO₄) storage tank farm when a spark from their cutting torch ignited flammable vapors emitted from a corroded tank below. This resulted in the death of one contract worker, eight other contract workers being injured, and the tank releasing 264,000 gallons of spent H₂SO₄ that overwhelmed the plant's spill containment systems resulting in a release that caused significant environmental damage. Approximately 99,000 gallons of the spent H₂SO₄ reached the nearby Delaware River, killing fish and other aquatic life.

After discovering significant corrosion in the tank shell and holes in its roof, the U.S. Chemical Safety and Hazard Investigation Board (CSB) investigation determined that Motiva had not properly maintained the tank to prevent the release of flammable vapors. The CSB also examined regulatory and industry consensus standards that applied to the inspection of storage tanks containing fresh and spent H₂SO₄.

The CSB noted in its investigation report that American Petroleum Institute (API) Standard 653, *Tank Inspection, Repair, Alteration, and Reconstruction* (1995 edition) frequencies and criteria for storage tank inspections differ from those contained in the National Association of Corrosion Engineers (NACE) Recommended Practice 0294-94, *Design, Fabrication, and Inspection of Tanks for the Storage of Concentrated Sulfuric Acid and Oleum at Ambient Temperatures* (1994 edition). NACE RP 0294-94 recommended that tanks containing H₂SO₄ be inspected externally every two years and internally every five years. API Standard 653 recommended that aboveground atmospheric storage tanks be inspected externally at least every five years, and

internally at least every ten years. Although Motiva planned to inspect its tanks at intervals prescribed by API, the tank involved in the incident had not been inspected either internally or externally for seven years.

Consequently, the Board issued parallel recommendations to API and NACE to develop consistent guidelines for inspection of fresh and spent sulfuric acid storage tanks [e.g., 2001-5-I-DE-R10 and 2001-5-I-DE-R14]. This evaluation addresses CSB Recommendation No. 2001-5-I-DE-R10.

The recommendation to NACE [R14] was previously closed by the Board as an “Acceptable Action” on March 28, 2006 following the issuance of NACE Recommended Practice RP 0205-2005, *Design, Fabrication, and Inspection of Tanks for the Storage of Petroleum Refining Alkylation Unit Spent Sulfuric Acid at Ambient Temperatures*. Subsequent to their original releases, both RP 0294-94 and RP 0205-2005 have been renamed and reissued by NACE as SP0294 and SP0205, respectively.

B. Response to the Recommendation

API published a revision of their standard *Tank Inspection, Repair, Alteration, and Reconstruction with Addendum 3* (API STD 653) during November of 2023. This revision contains new annex material (Annex R) addressing additional references for tank inspection guidance. Amongst other references listed, there is a document addressing storage tanks systems for fresh sulfuric acid¹ and another addressing storage tanks systems for spent sulfuric acid². The annex also directs the user as to the intended use of these references. Additionally, API provided documentation demonstrating collaboration with NACE International to align tank inspection frequencies.

C. Board Analysis and Decision

Based upon the information above, the Board voted to change CSB Recommendation No. 2001-5-I-DE-R10 to: “Closed – Acceptable Action.”

¹ NACE SP0294: Design, Fabrication and Inspection of Storage Tank Systems for Concentrated Fresh and Process Sulfuric Acid and Oleum at Ambient Temperatures

² NACE SP0205: Design, Fabrication and Inspection of Tanks for the Storage of Petroleum Refining Alkylation Unit Spent Sulfuric Acid at Ambient Temperature