



U. S. Chemical Safety and Hazard Investigation Board

RECOMMENDATION STATUS CHANGE

SUMMARY

Report:	Philadelphia Energy Solutions (PES) Refinery Fire and Explosion
Recommendation Number:	2019-04-I-PA-R2
Date Issued:	October 11, 2022
Recipient:	U.S. Environmental Protection Agency
New Status:	Closed – Acceptable Action
Date of Status Change:	August 15, 2024

Recommendation Text:

Revise 40 C.F.R. Part 68 (EPA Risk Management Plan) to require new and existing petroleum refineries with HF alkylation units to conduct a safer technology and alternatives analysis (STAA) and to evaluate the practicability of any inherently safer technology (IST) identified. Require that these evaluations are performed every 5 years as a part of an initial PHA as well as PHA revalidations.

Board Status Change Decision:

A. Rationale for Recommendation

On the morning of June 21, 2019, a pipe elbow in the Philadelphia Energy Solutions (PES) hydrofluoric acid (HF) alkylation unit ruptured. A large vapor cloud—composed of about 95% propane, 2.5% HF, and other hydrocarbons—engulfed part of the unit. The vapor cloud ignited, causing a large fire. Three explosions then occurred in the unit. The third explosion was the largest and occurred when a pressure vessel violently ruptured and flew across the Schuylkill River. Two other pressure vessel fragments, one weighing about 23,000 pounds and the other 15,500 pounds, landed in the PES refinery.

PES estimated that 5,239 pounds of HF and 676,000 pounds of hydrocarbons were released during the incident. The HF alkylation unit was severely damaged resulting in an estimated property damage loss of \$750 million. Five workers and a firefighter experienced minor injuries during the incident and response. On June 26, 2019, PES announced that the refining complex would be shutting down.

The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated the incident and found several safety issues to include process safety management and other safety related standards. There were issues with PES's mechanical integrity program and their verification of safety of equipment when new safety information is discovered and published in Recognized and Generally Accepted Good Engineering Practices (RAGAGEP). Additionally, the CSB identified gaps regarding standards or regulations that address remotely operated emergency isolation valves, safeguard reliability in HF alkylation units, as well as inherently safer design considerations specific to the use of HF. As a result of these findings, the CSB issued three recommendations to the U.S. Environmental Protection Agency (EPA). This status change summary addresses **CSB Recommendation No. 2019-04-I-PA-R2**.

B. Response to the Recommendation

The final rule was published in the Federal Register on March 11, 2024 (89 FR 17622)¹ and became effective on May 10, 2024. A majority of the new requirements take effect in March 2027. Included in the final rule is a requirement under 40 CFR § 68.67(c)(9) for petroleum refineries with hydrofluoric acid (HF) alkylation processes to address through the process hazard analysis (PHA) process the safer technology and alternative risk management measures applicable to eliminating or reducing risk from process hazards. These facilities must also consider and document inherently safer technology or design, passive measures, active measures, and procedural measures as well as the practicability of the inherently safer technologies and designs considered. Finally, under 40 CFR § 68.67(h)(1)(ii), petroleum refineries with HF alkylation covered processes must implement at least one passive measure at the stationary source, or an inherently safer technology or design, or a combination of measures equivalent to or greater than the risk reduction of a passive measure after each safeguard analysis is conducted. These activities are required under 40 CFR § 68.67(f) to be performed during initial PHAs and revalidations.

C. Board Analysis and Decision

Based on these updated requirements of the EPA's newly adopted RMP rule, the Board voted to change **CSB Recommendation No. 2019-04-I-PA-R2** to: **"Closed – Acceptable Action."**

¹ <https://www.federalregister.gov/documents/2024/03/11/2024-04458/accidental-release-prevention-requirements-risk-management-programs-under-the-clean-air-act-safer> (accessed July 9, 2024).