



CSB ISSUES FACTUAL UPDATE CONCERNING JUNE 21ST FIRE AND EXPLOSION EVENT AT PES REFINERY IN PHILADELPHIA, PA

The U.S. Chemical Safety and Hazard Investigation Board (CSB) recently issued a Factual Update in connection with its on-going investigation of the fire and explosion event at the Philadelphia Energy Solutions (PES) Refinery in Philadelphia, Pennsylvania that occurred during the early morning hours on June 21st.¹ According to the Factual Update, the origin and cause of the incident appears to be the rupture of a pipe elbow on the discharge side of a pump that was part of a distillation train within the facility's hydrofluoric alkylation (HF) unit. This rupture apparently led to the loss of containment of process fluid consisting mostly of lighter hydrocarbons and approximately 2.5 percent HF acid. The vapor cloud resulting from the loss of containment ignited, and several successive explosions occurred shortly thereafter. The last and largest of these was the catastrophic explosion of the HF alkylation unit's feed drum. This explosion resulted in several large fragments of the feed drum being hurled into the air. One fragment weighing approximately 38,000 lbs – roughly the weight of a coach bus – was hurled clear across the nearby Schuylkill River.²


Although five workers experienced minor injuries that required first aid, there were no fatalities or serious injuries as a result of the incident. In addition, CSB indicated that it was unaware of any offsite or onsite impacts resulting from exposure to HF.

The investigation of the event is on-going. Nonetheless, it appears that the areas of focus for the investigation will at least consist of the following:

- While the facility implemented a program for regular ultrasonic testing to measure pipe thickness, the area around the ruptured pipe elbow was not one of the pipe locations subject to such testing. The smallest measured thickness of the recovered ruptured pipe elbow was less than 7 percent of the facility's default retirement thickness. Presumably,

¹ *Fire and Explosions at Philadelphia Energy Solutions Refinery Hydrofluoric Acid Alkylation Unit Factual Update*, No. 2019-06-I-PA, Incident Date: June 21, 2019 (CSB Oct. 16, 2019)(referred to herein as the "Factual Update") - https://www.csb.gov/assets/1/6/pes_factual_update_-_final.pdf. See also *Chemical Safety Board Releases Factual Update and New Animation Detailing the Events of the Massive Explosion and Fire at the PES Refinery in Philadelphia, PA* (CSB Press Release Oct. 16, 2019) - <https://www.csb.gov/chemical-safety-board-releases-factual-update-and-new-animation-detailing-the-events-of-the-massive-explosion-and-fire-at-the-pes-refinery-in-philadelphia-pa/>

² CSB has produced an interim animation of this event which can be found at the following link - https://www.youtube.com/watch?v=J4wKjGHvs_4&feature=youtu.be



one area of focus will be the effectiveness of the facility's program for assessing the mechanical integrity of its piping networks.

- The Factual Update notes that the piping in and around the ruptured pipe elbow was installed in the early 1970s and has not been replaced since. The Factual Update also included a discussion of ASTM pipe specification standards that were in place at the time of this installation, as well as subsequent updates to the standards. Presumably, the investigation is focusing, and will continue to focus, on whether this piping complied with applicable specifications for this type of service.
- The Factual Update noted that rates of HF corrosion can be significantly impacted by subtle variations in the composition of steel alloy pipe in HF service. Presumably, CSB will continue to pursue this line of inquiry.

It should be noted that CSB's investigation of this incident is occurring in the wake of two other recent refinery fire and explosion events that occurred in proximity to HF alkylation units. Although neither of these events occurred within the HF alkylation units themselves, the proximity of the events to HF alkylation operations prompted CSB to issue a letter to EPA encouraging the Agency to update a 1993 study of hazards associated with industrial use of HF.³ In particular, CSB encouraged EPA to determine whether the existing risk management plans of refineries with HF alkylation units are sufficient to prevent catastrophic releases, and to determine whether there are commercially viable, inherently safer alkylation technologies for use in the refining industry.

Unlike the incidents that prompted CSB's letter to EPA, the fire and explosion incident at PES occurred within the HF alkylation unit itself, and actually resulted in a release of HF. As a result, barring any sort of significant and unforeseen change in the course of this investigation, it seems plausible that upon completion of this investigation, CSB may conclude that this incident confirms their concerns about the potential hazards and risks associated with HF alkylation operations in the refining industry. Correspondingly, it also seems plausible that EPA and the refining industry will feel increased pressure to address such potential hazards and risks. This may include, among other things, investigating potentially safer alternative technologies.

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³ Letter from Kristen M. Kulinowski, Ph.D., CSB Board Member to the Hon. Andrew R. Wheeler, USEPA Administrator dated Apr. 23, 2019 - https://www.csb.gov/assets/1/6/letter_to_epa_4.23.2019.pdf