
1.0 EXECUTIVE SUMMARY

On Wednesday, February 18, 2015, an explosion occurred in the ExxonMobil Torrance, California refinery's Electrostatic Precipitator (ESP), a pollution control device in the fluid catalytic cracking (FCC) unit that removes catalyst particles using charged plates that produce sparks—potential ignition sources—during normal operation. The incident occurred when ExxonMobil was attempting to isolate equipment for maintenance while the unit was in an idled mode of operation; preparations for the maintenance activity caused a pressure deviation that allowed hydrocarbons to backflow through the process and ignite in the ESP.

The CSB found that this incident occurred due to weaknesses in the ExxonMobil Torrance refinery's process safety management system. These weaknesses led to operation of the FCC unit without pre-established safe operating limits and criteria for unit shutdown, reliance on safeguards that could not be verified, the degradation of a safety-critical safeguard, and the re-use of a previous procedure deviation without a sufficient hazard analysis that confirmed that the assumed process conditions were still valid.

This report discusses the key factors that caused this incident, which include:

1. ExxonMobil did not establish the safe operating limits for operating the FCC unit in Safe Park—a standby mode of operation—or determine process conditions that required unit shutdown. As a result, the FCC unit was unknowingly placed in an unsafe condition when a critical safeguard—pressure induced by steam flow—was reduced below a safe level;
2. ExxonMobil re-used a procedure developed for a similar maintenance operation in 2012 that allowed deviation from typical refinery safety requirements. ExxonMobil did not, however, perform a sufficient hazard analysis to determine if the unit conditions specified in the 2012 procedure were valid for the 2015 operation. The safeguards specified in the 2012 procedure were not sufficient for the 2015 operation, and they failed to prevent hydrocarbons from backflowing through the process and into the ESP;
3. ExxonMobil operated FCC unit equipment beyond its predicted safe operating life.¹ The failure of the equipment allowed hydrocarbons to reach the ESP;
4. ExxonMobil lacked safety instrumentation to detect flammable hydrocarbons flowing through the equipment and into the ESP. The inability to detect hydrocarbons flowing to the ESP appears to be an industry-wide problem; and
5. ExxonMobil refinery management permitted opening process equipment without conforming to refinery standards.

As a result of this incident, a near miss event occurred in the modified hydrofluoric acid (MHF) alkylation unit when explosion debris nearly hit tanks in close proximity to the ESP, each containing hydrofluoric acid (HF), water, hydrocarbons, and a chemical additive intended to reduce the amount of HF vaporized during a loss of containment event.² HF is a highly toxic chemical that can seriously injure or cause death at a concentration of 30

¹ ExxonMobil does not define a piece of equipment's safe operating life, but the company's equipment strategy documentation does set forth inspection and maintenance intervals.

² The CSB was not provided with documentation quantifying the resulting effect of the chemical additive on a potential HF release, and as such the CSB cannot comment on the effectiveness of this additive.

parts per million (ppm).³ ExxonMobil resisted CSB requests for safety information pertaining to the potential release of HF in the event the tanks were struck by explosion debris. ExxonMobil continues to refuse to provide the CSB with information detailing safeguards to prevent or mitigate a release of HF. The CSB has issued subpoenas for this information, and is pursuing enforcement in US Federal district court.⁴

As a result of the investigation findings of the February 18, 2015 incident, the CSB issues recommendations to ExxonMobil, Torrance Refining Company (the current operator of the refinery), and American Fuel and Petrochemical Manufacturers (AFPM). These recommendations aim to:

- Ensure all ExxonMobil and Torrance refinery safety-critical equipment can effectively perform its safety-critical function;
- Ensure ExxonMobil procedure deviations are analyzed for safety by a diverse, experienced team prior to their approval and implementation;
- Ensure ExxonMobil and Torrance refinery ESPs are assessed for potential siting risks and are designed with safeguards to prevent major consequences of an ESP explosion; and
- Ensure the lessons from this incident are learned broadly throughout the refining industry.

³ The National Institute for Occupational Safety and Health (NIOSH), "NIOSH Pocket Guide to Chemical Hazards, Hydrogen fluoride," 11 April 2016. [Online]. Available: <https://www.cdc.gov/niosh/npg/npgd0334.html>. [Accessed 27 February 2017].

⁴ ExxonMobil has not provided this information to the CSB because they have stated that the requested documents are not within the CSB's jurisdiction in investigating the causes of the February 18, 2015 incident.