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Inherently Safer Technology (IST) Implementation Summary/Update

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Introduction

The Department of Environmental Protection adopted new rules under the Toxic Catastrophe Prevention Act (TCPA) Program, published in the May 5, 2008 New Jersey Register at N.J.A.C. 7:31-3.6 and 4.12, that required all facilities regulated under the TCPA to conduct inherently safer technology (IST) reviews and to submit an initial IST review report to the Department by September 2, 2008. As a result of this action, food manufacturing and handling facilities, water and wastewater treatment facilities, power generation facilities, refineries, and other facilities that handle Extraordinarily Hazardous Substances (EHSs) performed IST reviews, as Chemical Sector facilities did previously under the Best Practices Standards issued in November 2005 by the New Jersey Domestic Security Preparedness Task Force.

The TCPA IST rules and the Best Practices Standards are similar in that they require the subject facilities to conduct the IST review and to evaluate identified IST alternatives to determine whether they are feasible. The IST alternatives deemed feasible are not mandated to be implemented, but if the facilities decide to implement any of the ISTs, the implementation schedule is required to be included in the IST review report submitted to the Department. Per the TCPA rule, regulated facilities are required to update their IST review submittals at least every five years. In the updates, the facility is to identify any additional ISTs that have been implemented as well as any new ISTs that have been developed since the previous IST review.

The paragraphs that follow summarize the results of the implementation of the IST review requirements under the TCPA rule, focusing mainly on the IST reports submitted most recently during the period spanning from 2016 to mid-2021. It should be noted that the majority of these facilities have been regulated under the TCPA program for many years, resulting in the past implementation of numerous IST and risk reduction measures. For these particular facilities, any IST report they've submitted during the 2016 to mid-2021 timeframe represents at least their second or third IST review since entering the TCPA program. Based on the latest round of reports, none of the registrants have completely eliminated the use of an EHS as a direct result of their IST reviews. Nevertheless, even after thirty years of the TCPA program targeting risk reduction, approximately 40 percent of the facilities registered with the program still continued to discover additional implementable IST alternatives.

Summary

This summary is based on the Department's review of 91 IST reports/updates that were submitted by TCPA registrants as required by the rule during the period spanning from 2016 through mid-2021. Of the facilities reporting during this timeframe, 37 implemented or scheduled to implement from one to seventeen additional IST measures, resulting in a total of 118 additional IST measures being implemented or scheduled to be implemented. Table 1 below provides a summary of IST implementation, broken down by the following sectors: chemical, food (ammonia refrigeration), water/wastewater, power generation, petroleum refinery, and other.

Table 1: Summary of IST Measures Implemented or Scheduled*

Sector	# of Facilities Submitting an IST Report	Total # of IST Measures Recently Implemented or Scheduled to be Implemented	# of Facilities Reporting 1 or More Additional IST Measures to be Implemented	Percentage of Facilities Implementing Additional IST Measures	Maximum # of ISTs to be Implemented by a Facility
Chemical	27	65	16	59	11
Food	16	12	5	31	5
Water/Wastewater	9	3	2	22	2
Power	3	1	1	33	1
Refinery	2	5	1	50	5
Other	34	32	12	35	17
Total	91	118	37	41	17

*Based on IST reports submitted by TCPA registrants in 2016 through mid-2021

Chemical Sector Facilities

Twenty-seven of the 91 reports reviewed by the Department were from TCPA-regulated facilities in the chemical sector. Sixteen of these locations implemented or scheduled to implement additional IST measures, ranging in number from one to eleven depending on the particular facility. In total, 65 additional IST measures were described as being implemented during the 5-year period covered by the reports or scheduled to be implemented within the next 5 years. Facilities listed some significant IST measures resulting from their most recent IST review. For example, one facility replaced their three reactors with new vessels having updated design features, including improved instrumentation. Another facility is installing a foam suppression system in their tank truck unloading and containment pit areas that will be automatically activated by a flame detection system. Other significant examples of IST measures reported to be implemented include alarm management improvements, the addition of remotely activated valves and automatic shutdown systems with interlocks, upgrades to piping metallurgy for better corrosion resistance, the installation of seal-less pumps, computer control

system improvements, the installation of power backup systems, and the installation of additional leak detectors. Several of the chemical sector facilities that had no additional IST recommendations had already implemented IST measures in the past that were identified in prior process hazard analysis and risk assessment studies as well as previous IST reviews. Also, many of these chemical manufacturing facilities run processes for which there is no feasible alternative for the registered EHS, and their EHS inventories have already been minimized to the extent possible.

Ammonia Refrigeration at Food Manufacturing and Handling Facilities

Sixteen food/ammonia refrigeration facilities submitted IST reports during the period spanning from 2016 to mid-2021. Five of the facilities reported implementing or scheduling to implement anywhere from one to five additional IST measures, resulting in a total of 12 additional IST measures being implemented or scheduled to be implemented. Examples of IST measures implemented or targeted for implementation at the time of report submittal include adding leak detectors to shut down equipment, updating computer controls, replacing mechanical controls with microprocessors, installing additional interlocks, removing unnecessary piping and equipment, improving ventilation systems, and replacing heat exchangers with more reliable equivalents. Several facilities reported they would not replace ammonia with other refrigerants such as hydrochlorofluorocarbons or hydrofluorocarbons due to environmental concerns related to their global warming potential and/or ozone depletion potential. A number of facilities continue to identify carbon dioxide systems or carbon dioxide/ammonia cascade systems as potential replacements for their existing systems but state that they would not implement these alternatives due to the substantial cost to completely replace their entire refrigeration system as well as the potential introduction of new hazards to their facilities (e.g., higher operating pressures, increased asphyxiation potential, etc.).

Water/Wastewater Treatment Facilities

Nine water/wastewater facilities submitted IST reports. Two of the facilities in this sector implemented or scheduled to implement one or two additional IST measures, for a total of three additional IST measures. One facility installed an emergency gas scrubber that is automatically activated by the leak detectors in its chlorine room. Other IST measures reported include the addition of more leak detectors, and improvements to the facility's emergency communication system. Some of the water/wastewater facilities utilize ozone for treatment, which is considered an IST since ozone, although a regulated EHS, is generated onsite and continuously consumed. The facilities that are registered for chlorine have implemented past IST measures such as indoor storage, leak detectors, remote and automatic shutdown systems, scrubbers, and mitigation systems such as water fogs/sprays. Facilities in this sector continue to identify alternatives to using chlorine or ozone but have not reported plans to implement them because the common alternatives are often noted as introducing other issues and/or being less effective for water treatment.

Power Generation Facilities

Three power generation facilities, all of which use aqueous ammonia to reduce nitrogen oxides emissions via a selective catalytic reduction process, submitted IST reports. Only one of these facilities reported that any additional IST measures were implemented. Although listed as one modification in the report, the IST measure involved two changes: upgrading the pump room exhaust ventilation system, and providing local audible/visual leak alarms both inside and outside of the pump room. Some IST measures reported to already be in use include storage tank spill containment, leak detection, deluge systems, and remote shutdown systems.

Petroleum Refineries

Two petroleum refineries submitted IST reports, but only one of the refineries implemented or scheduled to implement additional IST measures as a result of their most recent IST review. A total of five additional IST measures were reported to have been implemented or scheduled to be implemented by that facility. Examples of the IST measures described as being implemented include upgrading heat exchanger metallurgy while improving tube design, and removing extraneous equipment after rerouting process streams and relief device discharges. Both refineries reported that many IST measures were identified in past process hazard analysis and risk assessment studies/IST reviews and had already been implemented.

Other Sector Facilities

Thirty-four facilities in other miscellaneous sectors (e.g., packaging facilities, warehouses, blending or storage facilities, etc.) submitted IST reports. Twelve of these facilities implemented or scheduled to implement a total of 32 additional IST measures, ranging from one to seventeen per facility. Examples of IST measures reported to be implemented or scheduled to be implemented include adding a water deluge system, installing secondary containment, replacing propane powered forklifts with intrinsically safe equivalents, providing a dedicated EHS staging area, utilizing uniform pipe labeling, and providing EHS monitoring equipment with alarms that report to a continuously attended station.

Conclusion

Adopted by the New Jersey Department of Environmental Protection in 2008, the TCPA rules regarding IST reviews continue to encourage a substantial number of facilities spanning across multiple sectors to implement additional IST measures as evidenced in reports submitted during the 2016 to mid-2021 timeframe. Approximately 40% of the 91 facilities stated that they had implemented or scheduled to implement IST measures as a result of conducting their most recent IST review. After being in the TCPA program for several decades, a number of facilities reported that there are no additional IST measures available at this time beyond those that have already been implemented in their processes. A few facilities did identify additional IST measures but chose not to implement them, primarily for economic reasons.