History of Process Safety at OSHA

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Occupational Safety and Health Agency (OSHA)'s first major process safety regulation, 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals (PSM) was enacted in 1992. However, OSHA’s experience with process safety began in the 1980s when a series of catastrophic chemical incidents occurred. Learnings from investigations of these incidents helped to shape PSM. More than 15 years after PSM, lessons from incidents and inspection experience continue to shape the history of process safety at OSHA. © 2009 American Institute of Chemical Engineers Process Saf Prog 28: 128–130, 2009

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PSM TIMELINE
The U.S. Occupational Safety and Health Agency (OSHA), which was created in 1970, began its first major efforts in chemical process safety in the early 1980s following several catastrophic events, as shown in Figure 1. This timeline illustrates process safety history in relation to major OSHA process safety milestones.

BHOPAL AND OSHA MIC INSPECTIONS
In 1984, a release of methylisocyanate (MIC) at Union Carbide’s Bhopal, India facility resulted in over 3,800 deaths and thousands of injuries [1]. This incident got the attention of the entire world. In 1985, while Bhopal was still on everyone’s mind, Union Carbide had a release of aldicarb oxide and methylchloride at its Institute WV facility that injured 135 people. These two incidents prompted OSHA to inspect all U.S. facilities that produced MIC, including the Union Carbide Institute plant. The inspection at Union Carbide led OSHA to believe that it needed to look beyond its then current standards and look at management systems, work practices, and protective systems [2].

CHEMICAL SPECIAL EMPHASIS PROGRAM
Soon after the MIC and Union Carbide Inspections were complete, OSHA began a special emphasis program aimed at chemical manufacturers [3]. The purpose of this Chemical Special Emphasis Program (Chem SEP) was to determine industry practices for the prevention and mitigation of catastrophic chemical releases, and to determine how OSHA could protect chemical industry workers within its legal authorities, resources, and policies. The SEP lasted from January 1986 until September 1986, and targeted manufacturers of high hazard substances. During the inspections, Compliance Officers reviewed programs rather than focusing only on physical conditions. OSHA realized that many of its standards at the time may not cover the numerous hazards found in chemical plants, and encouraged Compliance Officers to look for industry standards that applied to those hazardous conditions.

OSHA reviewed preliminary data from the Chemical SEP and reached the following conclusions [2]:

• There was more than one way to safely produce highly hazardous chemicals.
• Chemical inspections were time consuming.
  (a) Two member teams can do 8–10 Chemical SEP inspections at the cost of 120–150 inspections in other industries.
  (b) The Chemical SEP targeting program sent inspectors to the wrong place (i.e., facilities other than what OSHA intended to target) approximately 50% of the time.
• The quality of recordkeeping practices was questionable.
• In most inspections, General Duty Clause citations were issued, indicating that OSHA standards at that time didn’t cover all hazards in chemical manufacturing facilities.
• A variety of industry standards that cover hazards in chemical manufacturing facilities were available.

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Some OSHA standards were outdated or conflicted with industry practices.

OSHA’s Hazard Communication Standard was having a positive effect.

PSM AND THE CLEAN AIR ACT AMENDMENTS OF 1990

Following the Chemical SEP, several more catastrophic incidents occurred. In July of 1990, OSHA proposed the PSM standard, and, in November 1990, Congress passed the Clean Air Amendments of 1990 mandating that OSHA promulgate a rule on chemical process safety. The final rule [4], published in February, 1992 requires employers with more than a specified quantity of a highly hazardous chemical, flammable liquid, or flammable gas, to establish a comprehensive management program integrating technologies, procedures, and management practices.

Prior to implementation of the PSM standard, OSHA predicted the impact of the rule. OSHA anticipated that 24,939 establishments would be covered, including 127 industry subgroups and 3 million employees including contractors. The standard was expected to prevent 132 deaths and 767 serious illnesses and injuries in the first 5 years, and twice that by the second 5 years [3].

PETROLEUM REFINERY NATIONAL EMPHASIS PROCESS

Following a major incident at BP’s Texas City Refinery in April 2005, OSHA compiled and reviewed data from PSM incidents and found that more serious PSM incidents occurred in petroleum refining than any other industry segment. The data revealed that between 1992 and 2005, fatal (one or more employees killed) and catastrophic (three or more employees hospitalized) PSM incidents resulted in 138 fatalities and 553 injuries. The graph below shows the breakdown of incidents by SIC code. Between 1992 and 2005, 36 of 240 serious PSM incidents occurred in petroleum refineries. These 36 incidents resulted in 52 employee deaths and 250 employee injuries (Figure 2).

As a result of the incident history in petroleum refining, OSHA developed a Petroleum Refinery National Emphasis Program (NEP) that was issued on
June 7, 2007 [4]. The Refinery NEP outlines policies and procedures for OSHA Compliance Officers to use in conducting inspections of petroleum refineries, and mandates that OSHA inspect all petroleum refineries, excluding those in the Voluntary Protection Program (VPP), within federal jurisdiction over 2 years. OSHA strongly encouraged states with their own OSHA program (State Plan States) to adopt the same strategy. All states with refineries either adopted the Refinery NEP or developed their own program to inspect refineries.

The Refinery NEP emphasizes implementation of PSM programs. Compliance officers use a list of static questions, which is published in the Refinery NEP, and a smaller list of dynamic questions, which are unpublished and periodically changed. The questions focus on issues identified as contributing to previous incidents and contain compliance guidance to assist Compliance Officers in evaluation of a selected unit in the facility.

Between June 2007 and June 2008, OSHA conducted 14 Refinery NEP inspections resulting in 348 citations. The top five PSM elements cited and corresponding number of citations is given in Table 1. OSHA will continue to review the results of the Refinery NEP, and more data will be available as it is compiled.

### Table 1. Refinery NEP most frequently cited PSM element.

<table>
<thead>
<tr>
<th>PSM Element</th>
<th>Number of Citations Issued June 2007–June 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating procedures</td>
<td>67</td>
</tr>
<tr>
<td>Mechanical integrity</td>
<td>66</td>
</tr>
<tr>
<td>Process hazard analysis</td>
<td>60</td>
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<tr>
<td>Process safety information</td>
<td>44</td>
</tr>
<tr>
<td>Management of change</td>
<td>30</td>
</tr>
</tbody>
</table>

PSM’s FUTURE

In 2008, OSHA announced that it is working on a new National Emphasis Program that will target other PSM covered facilities, such as chemical plants. At this point, there are few details available on the Chemical NEP. It is likely to initially be implemented as a pilot program that targets facilities using various sources such as, EPA RMP Program 3 submittals, OSHA IMIS database, Area Office local knowledge, and explosive manufacturing NAICS codes. The Chemical NEP strategy will be to complete a large number of short inspections in a small amount of time. Data gathered during the Chemical NEP pilot will likely be instrumental in writing the next chapter in OSHA’s PSM history.

LITERATURE CITED