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Personal Growth and Lessons Learned from Two Global Tragedies

The 30-year anniversaries of two events of significance to the chemical engineering profession, particularly the process safety community, occur in November and December — the PEMEX disaster outside of Mexico City, Mexico, and the Union Carbide Corp. tragedy in Bhopal, India. These two incidents, two-and-a-half weeks apart, molded my professional career and ultimately motivated me to work for the Center for Chemical Process Safety (CCPS) at AIChE, where our mission is to prevent such tragedies from occurring.

After graduating from college in 1981, I accepted a position in Texas as a plant engineer at a facility that produced chlorine, caustic, and chlorinated solvents. With numerous learning opportunities, this was an exciting atmosphere for a new engineer. Lessons I learned in school had new value when applied in real-world situations. My unit operations class came to life when I was able to climb inside a distillation column to install bubble caps made of various metals for performance and corrosion testing.

In the spring of 1984, I was entrusted with what would be one of the most impactful projects of, as well as on, my career — the installation of one of the first computerized spill-response monitoring systems in the U.S. This computer model used real-time data for wind speed, wind direction, temperature, and humidity to calculate the dispersion of a chemical component or compound. Part of the project included evaluating the equipment and pipeline capacities to be included in the database, which would be used for release calculations of anhydrous ammonia, hydrochloric acid, and chlorine. Without the aid of the engineering tools available today, it took over six months just to collect data, perform capacity calculations, and update piping diagrams to provide to the programmers for the calculations. At the time, this was state-of-the-art technology, and it was fascinating to work with.

Successful tests validated our work, but it was put to a real test when we experienced an actual release. Fortunately, the release was small and dispersed out over the Houston Ship Channel. Luckily, no one was injured or exposed.

A post-release, lessons-learned discussion raised the question, "What if the wind had been blowing in the opposite direction?" If the release had not blown out over the water, the likelihood of exposure and injuries would have been much greater. At that moment, I came to the vivid realization that, as a chemical engineer, I was responsible for potentially dangerous chemical processes, and, if the equipment and infrastructure associated with these processes were not designed, constructed, operated, and maintained in a safe and reliable manner, people — including me — could be injured, or even killed.

A few months after realizing the weight upon my shoulders, on Nov. 19, 1984, a leak of liquefied petroleum gas (LPG) found an ignition source (the flare), which triggered a major fire and a series of vapor-cloud explosions at the PEMEX LPG terminal in San Juan Ixhuatepec, Mexico City. Over 500 people lost their lives and the terminal was completely destroyed. This was the worst chemical incident that I had ever heard of, and I struggled to comprehend its implications. (See the Process Safety Beacon on p. 20 for more information on this event.)

While the incident investigation in Mexico City was still underway, another catastrophic incident occurred. This one happened on Dec. 3, in Bhopal, India, at a facility owned by a company I grew up with in Charleston, WV — Union Carbide.

Every year, Union Carbide would invite our school's chemistry class to visit its Global Technical Center for demonstrations and presentations about science and engineering. This company, which later became infamous for one of the worst accidents in the chemical industry, motivated me to pursue a career in chemical engineering — which made a geographically distant accident hit close to home.

The Bhopal incident, as it has come to be known, occurred when 40 tons of toxic methyl isocyante was released from a storage tank. At the time of the incident, the safety systems, which included refrigeration, a flare, and a scrubber, were not functioning, allowing the release to unfold without reduction or mitigation. As a result, thousands of people lost their lives and over a 100,000 were exposed to the toxic chemical. It is difficult to comprehend such consequences. (In the December issue of *CEP,* the Process Safety Beacon, as well as a special section of three articles, will focus on the Bhopal incident.)

As the anniversaries of these tragedies approach, think about how you, in whatever your role is, affect process safety. Remember those who lost their lives as a result of these preventable disasters as you are designing, constructing, operating, maintaining, or dismantling elements of a chemical process. We are all capable of making a positive impact on process safety to eliminate incidents of this kind, and as professionals in the industry, we have an obligation to do so.

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