Bhopal: Could it happen again?

Angela E. Summers, PhD, PE

"Bhopal: Could it Happen Again?" Hydrocarbon Processing, Guest Editorial, March 2005.

The International Symposium "Bhopal and Its Impact on Process Safety" was held at the Indian Institute of Technology in Kanpur India December 1-3, 2004. Twenty years ago on December 3, 1984, water was introduced into a methyl isocyanate tank used to produce the insecticide Sevin at the Union Carbide India Limited (UCIL) site in Bhopal India. The water started a chain reaction that resulted in the release of a large toxic gas cloud. The photographs presented at the conference of the immediate and chronic effects continue to haunt me: bodies of dead children, mass graves, funeral pyres, crippling illnesses, and birth defects. More than 10,000 people died in the first month after the release alone. More than 500,000 people have chronic health effects.

As I sat and listened to experts from around the world discuss the latest scientific research, risk assessment methods, design practices, and emergency response tactics, I pondered the question "Could this happen again?" In response to the incident, many developed countries passed process safety regulations, such as the US Process Safety Management (PSM) program and the EU Major Accident Hazards Directive. Many industrial societies wrote standards and guidelines addressing good engineering practices for safe design of chemical processes. These efforts continue with recent focus on the development of international standards.

There are many theories about how the Bhopal tragedy occurred. However, the lessons to be learned extend beyond water and methyl isocyanate to the flawed safety culture used to operate the UCIL site. The tragedy occurred 20 years ago due to cost cutting in staffing, training, procedures, and maintenance. UCIL systematically cut out nearly everything that provided them with protection against a release. They cut costs until a simple, predictable operator mistake resulted in a total loss of plant assets and a catastrophic event affecting 100,000s of people.

We have learned a lot from the tragedy, but ironically, similar choices are still made around the world every day throughout industry. "Prove to me that it is unsafe" has become a far too frequent

refrain. Process industry leaders recognize that an investment in resources and equipment to prevent process incidents is essential to achieve the lowest lifecycle cost. But, there are many who lag behind, unwilling to make the necessary investment.

The lessons to be learned from the Bhopal tragedy also include acknowledgement of the poor judgment of local authorities who were so hungry for skilled employment opportunities and an increased tax base that they allowed UCIL to continue to operate even though there were repeated safety incidents, including worker fatalities and an off-site release, leading up to the December 3, 1984 release. Who protects the community, if not local authorities?

The Mary Kay O'Connor Process Safety Center (MKOPSC) at Texas A&M University states that its purpose is to make safety second nature. MKOPSC (http://process-safety.tamu.edu/) is supported by a steering committee of chemical industry representatives who believe, as I do, that safe operation equates to economic operation. Dramatic improvements in plant operation and economics can be realized when plant design, operation and maintenance is bounded by safety principles. MKOPSC also believes that education and research are important tools in the prevention of process safety incidents, resulting in Texas A&M University being one of few universities in the world to require that chemical engineering students take a course in process safety as part of the core curriculum.

Many universities wrongly believe that process safety is a regulatory matter that should be addressed through training after employment. The educational process focuses solely on engineering fundamentals, such as chemistry, fluid flow, thermodynamics, and kinetics. However, overlooked hazards resulted in the Bhopal incident, when water went into the wrong tank starting a chemical reaction driven to a deadly consequence by thermodynamics and kinetics. Students can not be expected to understand the danger that their decisions pose when they have not been exposed to basic safety principles, such as risk assessment and failure analysis. Students who are taught how to optimize process operation to achieve production and product quality should also be introduced to the concepts of safe operating limits and maintenance practices.

It is important that the lesson we learn from Bhopal not simply be a historical one. The Bhopal tragedy and its continuing effects should remind us that safety is not a choice to be made, but is a fundamental principle that should drive every decision. Engineers must be educated on process safety, so that future generations are empowered with the knowledge of safe operation. Government and local officials must embrace safety records over employment opportunities and tax revenues. To prevent incidents like the Bhopal tragedy, we must make safety second nature.

Angela E. Summers is president of SIS-TECH Solutions, an engineering company, and SIS-TECH Applications, a hardware and software company, located in Houston, TX. Her companies specialize in providing services and solutions that enable safe and reliable operation of facilities in the process industry. www.sis-tech.com. asummers@sis-tech.com 281-922-8324