

The Intersection of Process Safety and Corporate Responsibility

MICHAEL J. DOLAN
EXXON MOBIL CORP.

As chemical engineers and leaders in the chemical process industries, we must ensure that process safety is integral to every aspect of what we and our companies do.

Several infamous process safety incidents have occurred during my career in the petroleum and petrochemical industries:

Bhopal, India, chemical plant, Dec. 3, 1984 — Nearly 3,000 people died from a toxic release in the first few days alone, with many children and elderly killed in a matter of minutes. Tens of thousands more were treated for exposure and inhalation.

Offshore North Sea, the Piper Alpha Platform, July 6, 1988 — One hundred sixty-seven workers on the production platform never returned home to their families in what is still considered the worst offshore oil disaster in history.

Pasadena, TX, chemical plant, Oct. 23, 1989 — Twenty-two men and one woman lost their lives in an inferno sparked by the loss of containment and the release of highly flammable gases.

Texas City, TX, refinery, Mar. 23, 2005 — A devastating explosion and fire claimed 15 lives and injured another 170, an accident investigators blamed on a culture that made too little distinction between personnel and process safety.

Offshore Gulf of Mexico, Deepwater Horizon drilling rig, Apr. 20, 2010 — Eleven workers died, leaving an extended network of grieving friends and families to pick up the pieces of their own shattered lives.

Every one of these was preventable with good engineering practice and attention to detail. And beneath each of them is a pyramid of near misses in many plants that could have been equally disastrous.

A large process safety accident can happen in an instant, often the result of some small bit of carelessness or a push to finish a task on time. Yet an instant is all it takes to claim lives, and to change the lives of family, friends, and coworkers forever. An instant is all it takes to change a corporation's reputation. An instant is all it takes to impact public perceptions of an entire industry or of a profession.

These incidents demonstrate the need to make the safety and security of our operations even more central to our profession than we already do. I hope that we might raise the bar on process safety to a new level that all of us — as engineers, as teachers, as companies, and as an industry — aspire to reach.

What's important ... what the public and shareholders expect ... what we are called to do ... is to elevate process safety to a central role in our operations and a critical component of corporate social responsibility. This emphasis on process safety must extend from the students in our engineering schools to the engineers in design houses to the shop floor and to the board room. If we fail to act in this regard, we risk doing a grave disservice to our industry, and to the billions of people around the world who depend on the innovations and the goods we produce.

Good safety is good business

Process safety and corporate responsibility are interwoven. The two not only intersect, they mutually reinforce each other. There is little question that a focus on process safety and corporate citizenship drives business success and business results.

I learned this lesson early. In my first job, I traveled the world providing technical support for new refinery and petrochemical startups. I spent time on the shop floor of many

This article is a condensed version of the keynote address that the author presented at the AIChE 2012 Spring Meeting and Global Congress on Process Safety in Houston, TX, Apr. 2, 2012. A video of the presentation will be available soon at <http://bit.ly/Lg7zhx>.

The world is relying on our contributions to create a better, wealthier, healthier future for all people, through operations that are safe, secure, and environmentally responsible.

companies, and I noticed that some demonstrated a strong commitment to safety and accountability, while others did not.

I also noticed that companies with high corporate standards operated more safely, more professionally, and, ultimately, more profitably than their competitors. Good safety is good business. It is also the ethical and moral way to do what we do.

Over my career, we have tackled the issue of personnel safety among employees and contractors. Today, for example, the oil and petrochemical industry leads American industry with personnel safety incident rates that are less than half the national average and in many cases pacesetting.

Over that same time, our industry has not placed the focus on process safety that it should have. I've seen that begin to change over the last ten years. Process safety is becoming something foundational and integral to corporate responsibility.

AICHE has a history of taking key enabling steps in the area of safety. It founded the Center for Chemical Process Safety (CCPS) in the wake of the Bhopal incident in 1984. The efforts of the CCPS have helped ensure that a disaster on that scale has not occurred since. But accidents with fatalities and injuries continue, and it is incumbent on each of us to take action.

Why does attention to process safety matter so much? As more nations seek the benefits of economic growth and development, few industries will have a more important role in shaping the world to come than the chemical process industries. The products that chemical engineers develop and supply are essential to modern life. And innovation by chemical engineers will be critical in helping society meet the challenges of a world in which global energy demand continues to grow.

The world is relying on our contributions to create a better, wealthier, healthier future for all people. But it also demands that we make those contributions through operations that are safe, secure, and environmentally responsible.

Purpose and challenge

To understand our charge, it will help to remember what chemical engineers are, the role we play in society, and why the AIChE was founded in 1908.

You may have heard the joke that a chemical engineer is someone who does for profit what a chemist does for fun. We



Spring Meeting and Global Congress on Process Safety photos by Jeff Fitlow.

can entertain such jokes confident in the high esteem in which the chemical engineering profession is currently held.

But it wasn't always that way. It is worth recalling the dispute that once played out over whether chemical engineering was even a discipline worthy of formal study.

At the 1904 meeting of the American Chemical Society, a prominent industrial chemist named Hugo Schweitzer declared himself "absolutely against the introduction of chemical engineering in the education of chemists." At that time, the prevailing wisdom held that progress in technical chemistry would best be achieved in research laboratories by researchers without engineering training.

AICHE was founded to counter such notions. The organization turned to the universities as the vehicle for legitimizing chemical engineering. Soon after, AIChE saw to it that the discipline of chemical engineering utilized the tool of accreditation to assure course consistency and quality — the first profession to do so.

That set the stage for AIChE's growth, and its success over the years represents the triumph of the practical application of the knowledge of chemistry for the betterment of society.

A century ago, the challenge for chemical engineers was merely gaining acceptance. To achieve it, AIChE focused on

Safety

education and the training necessary for chemical engineers.

One hundred years later, the challenge is different. Now it's safety and process safety. But the way we start to meet that challenge is similar to the way AIChE began a century ago — by focusing on engineering education.

The primacy of safety in engineering education

If we believe that process safety is integral to the operations of process companies, then we should also acknowledge that safety must be an integral part of the education of chemical engineers. I am heartened by the many steps our industry has taken in recent years to improve safety education in universities' engineering programs.

The Safety in Chemical Engineering Education (SACHE) program was launched by AIChE two decades ago to develop ways for process safety to be integrated into undergraduate course offerings.

Working with the U.S. Chemical Safety Board (CSB), SACHE recently began revising undergraduate curriculum requirements to include addressing process safety hazards. In the wake of the 2007 chemical plant explosion at T2 Laboratories in Florida that killed four people, the CSB specifically recommended that AIChE and SACHE work to add reaction hazard awareness to baccalaureate chemical engineering curricular requirements. I am proud to note that AIChE has exceeded that recommendation. (See sidebar.)

Until recently, process safety has been, in effect, an elective both for engineering students and for engineering schools. And too many elected not to give process safety the attention or the emphasis it deserved. These new requirements are a very positive development, and they put us closer to the goal of process safety as a fundamental component of the education of every chemical engineer.

We have to ingrain the value of safety in engineers from their earliest days in the profession, and that's when they are in school.

The essential questions

This is all part of a broader change in how we as an industry have to view process safety. No longer should it be just one important aspect of how we manage our operations. It must be central to what we do.

So we should ask the universities: Are you serious about inculcating a belief in the necessity of safety to your students? Have you embedded process safety throughout your curriculum, and not just in a single course? Are you giving students the tools to understand safety in all aspects of process operations?

While it should start with colleges and universities, it shouldn't end there. Safety must be a key element of every aspect of every job.

So we ask design engineers: Are your designs merely

good enough, or do they include measures that account for the unlikely of middle-of-the-night incidents when something may go wrong? Have you designed your facilities for not just steady state but for the transient and riskier activities of startup, shutdown, and recovery from upset? Have you designed in multiple barriers to avoid loss of containment?

We ask manufacturing engineers and process safety specialists: When you perform risk assessments and hazard reviews, do you treat them as just some of the many tasks to be accomplished that day? Or do you bring fresh eyes, critical thinking, and an appreciation for the important consequences and risks that must be understood and properly managed? Are you using the latest tools and are you learning from the root cause analysis of process safety near-misses in your facilities?

We ask executives: Are you demonstrating a visible commitment to process safety and operations integrity? Are you working to implement systems that establish policy, set high expectations, and provide the resources for safe process operations? Are your incentive systems rewarding safe operations? Is safety a core value for your enterprise, or just one of many key priorities? And are you building a culture for process safety along with the one you are building for occupational safety?

And we ask AIChE, the American Fuel and Petrochemical Manufacturers, and the American Chemistry Council (ACC): Are you doing enough to make process safety a regular focus of meetings? Is process safety just the business of focused safety groups, or does it find its way into all of the areas in which you develop programming and provide technical leadership? Are you doing enough to keep the issue at the forefront throughout the year? Are initiatives such as SACHE and Responsible Care enough, or can more be done?

These questions are as important as the answers they elicit, because asking them is vital to instituting a system and culture of safety that underpins sustained business success.

Taking up this moral charge

I believe that as an industry we have an imperative to commit ourselves to a safety-centric approach to process operations. If we fail to take up this moral charge, we risk the welfare of our employees and communities, we risk alienating the public and demeaning our profession, and we risk inviting government action that imposes well-intentioned but often misguided regulations and requirements.

To its credit, AIChE has taken important strides in this regard with the creation of CCPS.

The ACC, too, should be commended for its Responsible Care program. Responsible Care provides ACC member companies a structured framework to achieve world-class operational performance in an evergreen process of continuous improvement.

No less important, the very existence of the Responsible Care program — and the commitment of member companies to its goals — affords the industry a great degree of credibility with government officials on a wide range of operational issues. It helps give us a voice in shaping regulatory frameworks around the world. Beyond that, it provides a seal of quality that offers assurance to customers and communities.

It is our responsibility in the process industry to operate safely and responsibly. It is your responsibility as a practicing chemical engineer or as a leader in the process industry to ensure that process safety is integral to every aspect of what you and your company do. It is quite simply a moral and ethical obligation that we all share.

Calling on our successors

When an engineering student graduates in Canada, he or she takes part in a special ceremony known as the Ritual of the Calling of an Engineer. It is hosted by practicing engineers to welcome the new graduates to the profession and, in light of the history of industrial accidents, remind them of their ethical duties. Like the Hippocratic Oath taken by doctors, the Ritual of the Calling of an Engineer invites graduates to understand the ethics and obligations of their engineering profession.

On this occasion, the graduate receives a ring to wear on the little finger of the working hand. The ring is designed to rub against the engineer's drawings and designs, serving as a constant reminder of the ceremony — and the ethical obligations of our profession every day.

This ritual helps instill in new engineers the values that are central to our profession. It ensures they keep these values in mind throughout their careers. You will notice that Canadian engineers wear their ring proudly as it rubs across the work they do, the designs they complete, the drawings they approve.

This ritual also supports a basic truth — that instilling core values in young engineers is the way to guarantee the long-

term health of both our profession and the process industry.

As someone who has been around this industry now for 37 years, I have come to appreciate this truth more than ever. Dr. Charles McKenna, one of the founding fathers of AIChE, told the very first meeting of this society in 1908: "The noblest aim before us ... the one which most amply justifies us before all the world, is our ambition for the enlightenment and ample equipment of our successors; that is, for the improvement and the training of the chemical engineer of the future."

This is our calling. This is our duty. By our words and by our actions we can teach our sons and daughters ... so we must take as our solemn responsibility the need to teach the new generations of engineers who will replace us and, hopefully, build on our accomplishments in a manner that exemplifies safety, ethics, and corporate responsibility.

Let us dedicate ourselves to elevating the core values of personnel safety and process safety to a central operating principle of all our endeavors.

Let us dedicate ourselves to making the process industries the pacesetters of safe operations.

And let us simply dedicate ourselves to a future where nobody in our plants or in our host communities gets hurt.

CEP

CSB SALUTES AIChE

Previous CEP articles (1, 2) have discussed the December 2007 explosion and fire at T2 Laboratories that killed four employees and injured 32 people, the U.S. Chemical Safety Board's (CSB) investigation of the incident, and the CSB's recommendation that AIChE work with the Accreditation Board for Engineering and Technology (ABET) to include reactive hazard awareness in the undergraduate chemical engineering curriculum.

After Dolan's keynote address at the 2012 AIChE Spring Meeting and 8th Global Congress on Process Safety, CSB Chair Rafael Moure-Eraso formally commended AIChE for exceeding the CSB's recommended action. AIChE proposed, and ABET approved, changes to require proficiency in not just reactive chemical hazards but in all chemical process hazards among a broad range of engineering disciplines.

"The status of the recommendation reflects AIChE's outstanding response that surpassed the objectives envisioned by the Chemical Safety Board. If future chemical engineers are given the proper educational tools, they will be able to more fully comprehend and better manage the hazards in a chemical manufacturing process," Moure-Eraso said.

1. Berger, S., "Teaching Process Safety," *Chem. Eng. Progress*, **105** (10), p. 3 (Oct. 2009).
2. Crowl, D. A., "Process Safety Education: Meeting the New ABET Requirements," *Chem. Eng. Progress*, **108** (4), p. 19 (Apr. 2012).

MICHAEL J. DOLAN is Senior Vice President of Exxon Mobil Corp. He joined Mobil Oil Corp. in 1980 at its Paulsboro, NJ, research laboratory, where he supported Mobil's worldwide refineries in various engineering and managerial positions. He progressed through a series of strategic planning and business management functions in Mobil's petrochemicals division, and after the Exxon and Mobil merger held positions with ExxonMobil Chemical Co. in the Middle East and Africa. He returned to the U.S. in 2003 as deputy to the president of ExxonMobil Refining and Supply Co. He served as president of ExxonMobil Chemical Co. and vice president of Exxon Mobil Corp. from September 2004 until April 2008, when he was appointed senior vice president of the corporation. He served as a director of the American Petroleum Institute, the American Chemistry Council, the Society of Chemical Industry, and the Sam Houston Area Council of the Boy Scouts of America, and is on the Board of Trustees of Worcester Polytechnic Institute (WPI). He earned a BS in chemical engineering from WPI and an MBA from Drexel Univ.