The Chemical Industry: Striving for World-Class Safety, Cleanliness

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Members of a tough industry with a spotty reputation, chemical manufacturers are working to adapt world-class production practices and create safe, environmentally conscious workplaces.

The business of manufacturing chemicals doesn't come easy. There's the inherent danger of the materials produced and the danger of those used to produce them; there are the stringent environmental regulations; and there's the NIMBY (not-in-my-back-yard) factor. Any one of these can sink a business; the chemical industry deals with all three, and others, every day.

The industry's environmental and safety records have not always been exemplary. Major disasters like Love Canal and Bhopal are just two instances of serious chemical-company blunders that were so egregious they have become part of our culture. It wouldn't take long to compile a list of other, lesser-scale disasters.

The good news is that the industry is working hard to minimize if not eliminate the chance for events like these within its working environments. Experts say its efforts are wide ranging, including designing more environmentally friendly plants, using process practices that meet or exceed government requirements, creating company cultures that foster safety, and involving local communities in their businesses. According to an industry consultant contacted for this article, the industry has learned from past mistakes and is well on the way to repositioning itself.

"Safety and environmental issues associated with chemical operations are well understood by everyone in the industry," stresses Ralph Cox, a principal with Tompkins Associates, in Irving, TX. "All the big producers are doing a great job of addressing these aspects of almost every facet of the plant." Maybe EPA and OSHA shouldn't turn their attention elsewhere yet, but according to Cox and others, progress is being made.

One way chemical manufacturers have addressed safety and environmental concerns is in plant design, whether for a new facility or, more often, upgrades for older facilities. Environmental impact now tops the list of design issues, says Deborah McNeil, with Dow Chemical Co.'s Houston, TX-based Project Best Practices. Points of attention include and go well beyond air- and water-discharge issues to detailed specifications for equipment, such as pump seals and flanges that might release fugitive emissions, and other areas where chemicals might leak. Additional precautions include planning for worst-case scenarios like equipment breakage that could cause leaks. "We must always consider that a piece of equipment might break and that chemicals could escape," says McNeil. "We design the plant so there is always a method of containing chemical escapes. Plant designers are required to design a highly controlled environment so we know where every chemical ends up and that it will be treated properly before it leaves the plant fence." The need for this level of control, she adds, typically pushes plant design costs up by as much as 20%.

And mechanical safety elements are just part of the picture. Chemical

manufacturers are required to comply with a wide and evolving range of local, stare and federal regulations. These include the three main EPA regulations which affect every chemical manufacturer in the U.S.: the Clean Water Act, the Clean Air Act, and the Resource Conservation and Recovery Act (RCRA). Many must also adhere to special provisions for hazardous materials and hazard communication laws. All must adhere to OSHA mandates regarding personal protective equipment and issues like proper guarding of equipment. In addition, OSHA requires adherence to special process-industry safety regulations and the creation of a Risk Management Plan.
To assist with compliance of these regulations and to enhance the safety and environmental practices in chemical manufacturing plants, many processors turn to the American Chemistry Council (ACC). In 1988, the Arlington, VA-based organization launched the Responsible Care Program, which is aimed at helping the industry improve its performance in the environmental and safety arena. It includes guidelines for six areas of management practice:
&#149 Community awareness and emergency response
&#149 Distribution codes that pertain to transporting raw and finished products safely
&#149 Process safety codes that are designed to make sure that equipment has the right integrity for the product it's processing and that manufacturers have controls and safety technology in place
&#149 Pollution-prevention codes that have helped the chemical industry significantly reduce pollution since the program's inception &#149 Employee health and safety codes
&#149 Product stewardship codes that are used to bring important safety information to the customers that use and handle the products chemical manufacturers make.
Although federal laws and the ACC codes are designed to make the industry safer, these alone are not enough. Experts stress that the safety and environmental angle must be engrained in the company culture. For instance, Ashland, Inc., incorporated all of its safety and environmental programs under the same Responsible Care banner. "No matter what our people do, it's done under Responsible Care," says Glenn Hammer, vice president of environmental health and safety for refiner Ashland, Inc., Columbus, OH, the parent company of Ashland Specialty Chemical Co.
But implementing the safety-intensive program requires effort. "Responsible Care is not a prescriptive program," says Hammer. "You have to take the guiding principles and codes and develop your own program. Then you spend a lot of time conducting training sessions and building a culture inside the company. This approach encourages people to think about Responsible Care, in terms of their obligations to co-workers as well as their legal obligations."
To spread the word, the company developed a number of computer-based training programs for priority topics such as confined-space entry and others. Responsible Care objectives are also part of each employee's annual goals. "Every employee has Responsible Care objectives that must be met," says Hammer. "We are measured on how well we met those when we get our yearly evaluations."
In addition, Ashland formed Responsible Care committees that discuss initiatives under the program. The company also publishes an annual Environmental Health & Safety report for employees. To gauge the effectiveness of its efforts, Ashland conducts detailed bi-annual surveys that track employee familiarity with the company's Responsible Care initiatives. "We try to keep it fresh in people's minds

all the time," says Hammer, "because it's crucial that we communicate the importance of safety."

Nearly as important as internal safety, say many chemical producers, is the importance of external communication through local involvement. "In the past you may have lived beside us and not known what we were doing in the plant," says Hammer. "Now we are striving to be open and transparent about what we do. We want people in the community to understand what kind of safety and environmental precautions we take to make sure our operations are sound."

Community involvement programs sometimes include Community Advisory Panels (CAPS). In use throughout the U.S., CAPS provide a forum in which chemical manufacturers can have a dialogue with those who live in plant communities. Topics at the town-meeting style gatherings will include anything from plant expansion projects to environmental health and safety issues, and others. Many chemical manufacturers also offer periodic open-house tours for community members.

While the chemical industry works to clean up its reputation and the environment through stringent environmental and safety procedures, at least one expert says it still needs to improve an overlooked area. "When you get past the process itself, the same level of training, commitment, infrastructure and controls related to environmental safety and health doesn't always exist in the processing segment," says Tompkins' Cox. He points to a rising number of personal injuries that come from automatic equipment on packaging lines in the chemical industry.

"I've been involved in 30 chemical-industry injury cases," says Cox, "and a third of those involved automatic packaging equipment." The typical cause for these injuries, he says, it that operators don't follow proper procedures for making equipment adjustments. "Of those cases there have been three deaths," he says, "and that's too many for any one industry."

Cox adds that the reason this problem is common in the chemical industry is that manufacturers have so far mainly focused on core production processes for improvement, not those related to it. "When you get to the packaging and bulk loading of product," he says, "chemical producers often slack off. Here we still see people exposed to chemicals and product being exposed to the atmosphere."

In an industry where, demand often exceeds capacity for significant periods of time, it's understandable why production has received the lion's share of attention. The industry is also fragmented, both in the number of players and the wide range of products made. For these reasons, the chemical industry has been slow to adopt new forms of technology, says Dr. Richard Jackson, managing director at Fiatech, a not-for-profit research and development consortium devoted to developing and deploying new technologies via industry collaboration. One area that will greatly improve the operations and maintenance aspect of the chemical industry, he says, is the growing trend toward smart-chip technology. Chemical manufacturers are beginning to "embed smart chips on critical pieces of equipment throughout the plant and use them to store information about those pieces of machinery," explains Jackson. The chips, he says, enable maintenance crews to quickly determine information about a pump, for example, including installation, renovation and maintenance history, and operating specifications. "Using that chip, the pump could be queried from the front office to find out when it requires maintenance, then maintenance could be performed as needed," says Jackson. "This type of technology is available now."

According to Jackson, however, the technology is not being widely used in the

chemical industry "because there's too many people and training barriers. Also, no one is dominant enough to say they are doing it and have everyone else follow in their footsteps."

Some chemical manufacturers are embracing other types of technology, though. An Atofina Chemicals plant in Calvert City, KY, for example, recently implemented a software program that has helped it boost both performance and reliability.

"We were getting a lot of valuable information from our distributing control systems," says Dwight Stoffel, principal plant electrical and instrumentation engineer, "but because we couldn't store it for the long term, we were essentially throwing it away. We weren't taking advantage of something that would allow us to improve our process operation, productivity and yields."

The software they employed, the PI product from OSISoft, allows for the accurate storage and retrieval of information from many aspects of plant operation. Stoffel says it has been most useful in pump maintenance, where the company can "now use data from the past to improve operation in the future."

The company's high cost of pump repair prompted a staff mechanical engineer to "put together a system using the PI software that stores historical information about each pump and examines the current of each pump," says Stoffel. When a pump begins to "get nervous," he explains, the software alerts an engineer by pager. Using a messaging system, the engineer can then notify maintenance via a message on their PC screen that the pump has a problem. A screen link connects to a troubleshooting sheet for that pump with all the information from the PI system regarding what the operating conditions are at the moment and what needs to be done to get the pump out of trouble.

"By doing this we cut the amount of pump-repair parts by $363,000 a year," says Stoffel. "The other good thing is that we eliminated a lot of design problems that were inherent to the system," he says. "This technology has actually allowed us to fix the root cause of problematic pumps."

As the industry continues its efforts to balance productivity needs, implement environmental, health and safety initiatives, and keep costs in line, such gains are proof of what can be done. For more information about the American Chemistry Council's Responsible Care program, visit www.americanchemistry.org; for more information about Fiatech, visit www.fiatech.org.

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