RISK MANAGEMENT PLANNING:

WILL IT LEAD TO INHERENTLY SAFER OPERATIONS?

Will facilities be persuaded to minimize off-site consequences?

The Clean Air Act's Accidental Release Prevention and Risk Management Program has no direct tie to pollution prevention. However, it will cast a spotlight on facility operations—and particularly on the storage and use of certain toxic and flammable substances. As a result, at least a portion of the ensuing public dialogue will revolve around traditional pollution prevention issues such as source reduction.

This article discusses the issues that will invariably be raised regarding chemical safety. Indeed, many of these issues are already being raised in anticipation of the public availability of information required under the program. What the Emergency Planning and Community Right-to-Know Act (EPCRA) began in the way of public discussion regarding the potential effects of industrial activities will continue with a vengeance under the risk management program. As this article discusses, accident prevention and mitigation have distinct parallels with pollution prevention and pollution control.

The Accidental Release Prevention and Risk Management Program

The final rule for the Clean Air Act Accidental Release Prevention and Risk Management Program, which was published in the *Federal Register* on June 20, 1996, is based on Section 112(r)(7) of the CAA Amendments of 1990. The intent of Section 112(r)(7) is to prevent accidental releases to the air and to mitigate the consequences of releases that do occur by focusing prevention measures on those chemicals that pose the greatest potential risk to the public and the environment.

Although the majority of the program's regulations specify the technical requirements that "covered sources" must meet, both the rule's requirements that facilities coordinate emergency response capabilities with local responders *and* the public availability of information reported under the rule mean that its consequences reach significantly beyond mere technical compliance.

Maureen Wood of the Chemical Manufacturers Association (CMA) comments, "The risk management program is about understanding risk

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CCC 1079-0276/97/070305-11

at the community level. Unlike EPCRA, where information was collected, but emergency responders were not required to look at it, let alone use it, the risk management program has the benefit of delivering information to local emergency responders directly, and therefore, to the community."

The following excerpt from the rule's preamble provides insight into EPA's thinking as well as a hint, to those familiar with the power of public pressure to shape environmental policy and regulation, of the direction that the public dialogue regarding the prevention of chemical accidents is likely to take:

> With today's rule, EPA continues the philosophy that it embraced in implementing the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). Specifically, EPA recognizes that regulatory requirements, by themselves, will not guarantee safety. Instead, EPA believes that information about hazards in the community can and should lead public officials and the general public to work with industry to prevent accidents.... EPA intends that officials and the public use this information to understand the chemical hazards in the community and then engage in a dialogue with industry to reduce risk. In this way, accident prevention is focused primarily at the local level where the risk is found.[1]

The hazard assessment must include calculations of the potential off-site extent of worst-case and alternative release scenarios and a five-year accident history for the facility.

Says John Ferris of EPA's Chemical Emergency Preparedness and Prevention Office, "The risk management program links health, safety, emergency preparedness, and pollution prevention groups at the state and, hopefully, local levels and gets them talking about chemical safety. EPCRA began the process of providing information on hazards at the local level, but what was missing was the dialogue on accident prevention. The Risk Management Program (RMP) helps provide that piece."

Ferris adds, "The states know that there are large quantities of chemicals out there that don't need to be. By providing information on hazards at the community level, communities may place pressure on facilities and cause them to consider how they might change their operations. Communities may look at the worst case and say, 'We don't want this.' Then facility management will have to ask itself, 'What can we do to make the circle of impact smaller?'"

Major Risk Management Program Reporting Requirements

Under the RMP regulations, facilities that have on hand any of 77 toxic or 63 flammable substances in amounts above threshold quantities, the release of which could affect off-site receptors, must develop and implement risk management programs that include hazard assessments, prevention programs, and emergency response programs.

The hazard assessment must include calculations of the potential off-site extent of worst-case and alternative release scenarios and a five-year accident history for the facility. The RMP must be described in a risk management plan (RMP) that will be submitted to a central point specified by EPA prior to June 21, 1999. RMPs will be made available to the public.

EPA has devised three "programs" for covered sources based on such variables as the potential for off-site consequences, accident history, coverage under the Occupational Safety and Health Administration's (OSHA) Process Safety Management (PSM) regulations, and Standard Industrial Code (SIC) (see **Exhibit 1**). The requirements for each program are shown in **Exhibit 2**.

EPA estimates that approximately 66,000 facilities will be required to submit RMPs. The types of facilities that will have to comply cover a wide range, including chemical makers and other types of manufacturers; publicly owned facilities such as drinking water and wastewater treatment works; food and cold storage facilities; electric and gas utilities; and military installations. Many other unlikely sources—such as nursing homes that have propane tanks to serve as backup energy supplies—may also be covered. Many facilities that have not been subject to reporting under EPCRA will have to submit RMPs, thus expanding the public dialogue regarding chemical safety into new territories.

In addition to information on accident prevention and emergency response capabilities, RMPs must include information on potential off-site consequences of accidental releases and five-year accident histories. This information, which is described below, will no doubt catch the attention of many community residents.

Worst-Case Release Scenarios

The regulations require facilities to calculate the potential off-site extent of worst-case release scenarios. The worst-case release scenario is defined by the regulations as the release of the largest quantity of a regulated substance from a vessel or process line failure.

In the case of toxic substances, facilities will use air dispersion models to determine the distance to "endpoints" which, according to the rule's preamble, are based on either the American Industrial Hygiene Association's Emergency Response Planning Guideline level 2 (ERPG-2)—which is defined as the "maximum airborne concentration below which nearly all individuals could be exposed for up to an hour without experiencing or developing irreversible or other serious human health effects or symptoms that could impair their ability to take protective action"[2]—or some other measure of toxicity. "Endpoints" for flammable substances are based on calculations regarding the force of explosive pressures, radiant heat, and the flammability limits of airborne vapors.

Facilities must report one worst-case release scenario for all flammables and one worst-case release scenario for all toxics. EPA states in the preamble to the rule that the worst-case scenario is designed primarily to support a dialogue between the facility and the community on release prevention, and not to serve as the sole or main focus for local emergency planning. However, EPA believes that worst-case release scenarios will inform the broadest range of individuals that they could be affected by a release from the facility, and thus encourage them to participate in a dialogue about prevention, preparedness, and emergency response actions.

Alternative Release Scenarios

Facilities must also identify possible events (e.g., line failure and loading/unloading accidents and spills) that could lead to alternative release scenarios. An alternative release scenario must be reported for each toxic substance held above the threshold quantity at the facility, the release of which could result in off-site consequences. One alternative scenario must be reported that represents all flammables held above the threshold.

Since facilities are allowed to take credit for both active and passive mitigation when calculating their effects, alternative release scenarios are likely to lead to some lively discussions

Exhibit 1. Program Eligibility Criteria

Program 1	Program 2	Program 3
No off-site accident history No public receptors in worst-case circle Emergency response coordinated with local responders	The process is not eligible for Program 1 or 3	Process is subject to OSHA PSM Process is in SIC 2611, 2812, 2819, 2821, 2865, 2869, 2873, 2879, or 2911

Exhibit 2. Program Requirement Comparison

PROGRAM 1	PROGRAM 2	PROGRAM 3
Hazard Assessment Worst-case analysis 5-year accident history	**Hazard Assessment** Worst-case analysis Alternative release 5-year accident history	**Hazard Assessment** Worst-case analysis Alternative release 5-year accident history
Management Program	**Management Program** Document system	**Management Program** Document system
Prevention Program Certify no additional step needed **Emergency Response Program** Coordinate with local responders	**Prevention Program** Safety information Hazard review Operating procedures Training Maintenance Incident investigation Compliance audit	**Prevention Program** Process safety information Process hazard assessment Operating procedures Training Mechanical integrity Incident investigation Compliance audit Management of change Pre-startup review Contractors Employee participation Hot work permits
Risk Management Plan Contents Executive summary Registration Worst-case data 5-year accident history Certification	**Emergency Response Program** Develop plan and program	**Emergency Response Program** Develop plan and program
	Risk Management Plan Contents Executive summary Registration Worst-case data Alternative release history 5-year accident history Prevention program data Emergency response data Certification	**Risk Management Plan** Executive summary Registration Worst-case data Alternative release history 5-year accident history Prevention program data Emergency response data Certification

between facility management and neighbors or activists, who may disagree with assumptions that mitigation devices dependent on electricity or human activation will indeed function during an accident.

Public and Environmental Receptors

In addition to calculating the potential extent of worst-case and alternative-case releases, facilities must also identify "public receptors" and "environmental receptors" that could be affected by a release.

Providing an indication of actual geographic boundaries, even if they are based only on the modeling of a *potential* release under specific atmospheric circumstances, will make this data very real to many stakeholders. "Plume maps" showing the geographic extent of toxic or explosive effects from a potential chemical release—"kill zones" or "death zones" in the informal parlance of many industry personnel and activists—will no doubt evoke a much more visceral response among community residents than toxic chemical release inventory (TRI) data typically have.

The TRI includes information on emissions to air, land, surface waters, or via underground injection and transfers off-site for treatment or disposal of approximately six hundred compounds from facilities in certain standard industrial classifications. TRI reporting provides communities with significant information about the substances present at facilities, but it does not indicate what the consequences could be if these substances were actually released. By contrast, the worst-case and alternative-release scenarios required to be included in RMPs will put these potential consequences front and center, and thus will "connect the dots" for nearby residents. The graphic depictions of plume maps will make strong impressions on the public, especially those who may live within or immediately adjacent to the areas in question.

Five-Year Accident History

Facilities are required to include in their RMPs five-year histories of all accidental releases from covered processes that resulted in either on-site deaths, injuries, or significant property damage, or known off-site deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage. This information is also likely to stimulate public dialogue about chemical safety issues.

EPA intends that the RMP information should be made available to "all interested parties." The Agency favors making RMPs available electronically, and wants to use a standardized format, particularly for certain "data elements" of the RMPs, such as frequency of inspections, so that persons who are reviewing the plans will be able to compare RMPs for various sites across the country. In addition to the "data elements," which capture technical information about a facility, RMPs must also include executive summaries that EPA intends, according to the preamble, will provide facilities an opportunity to explain their risk management programs in a manner that will be easy for community residents to read and understand.

How the Program Will Affect the Public Dialogue—and Encourage P2

At the most basic level, preventing the accidental release of hazardous substances prevents pollution, since a single catastrophic release can negate all of a facility's pollution prevention efforts. This is the most obvious link between the risk management program and pollution prevention.

Maureen Wood of CMA believes that the RMP information will result in public interest in pollution prevention as well as accident potential. She states, "Pollution and safety issues are not clearly separated in the mind of the public. In both cases, people are concerned about things that they see as causing risk to health and the environment.

"Having to prepare worst-case scenarios and RMPs is going to be significant," continues Wood. "It will drive the dialogue in the local community—and pollution prevention will definitely be a part of that dialogue. By talking about what chemicals one should worry about in terms of pollution, which ones could pose a risk to the community in terms of accidents, and which ones could pose a risk to workers, RMP will close the loop on TRI. RMP is not actually a pollution prevention vehicle, but it *is* another driver in the direction of minimizing environmental impact by driving facilities to more effectively manage chemicals that could cause harm if accidentally released."

Wood adds, "Not only does RMP raise the protection level of process safety management systems, it also brings community experts, such as emergency responders, health care workers, and other stakeholders into the dialogue and the planning process. This is important, and has the potential to raise the quality of the dialogue on chemical safety at the local level."

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EPA also anticipates that the rule will raise interest in pollution prevention. "We know that RMP isn't exclusive of pollution prevention," says

Ferris. "The intent of RMP is to build safer facilities. Since preventing accidents also prevents pollution, there is a definite overlap between RMP and pollution prevention."

As discussed later in this article, while pollution prevention and primary accident prevention share the same mind-set to the extent that fundamental changes to production processes are required, these changes are different for pollution and accident prevention.

EPA held a session November 18, 1996, with the state media (e.g., air, water, and land) pollution prevention representatives that included information on RMP. The meeting included a brainstorming session on how to fit RMP into other pollution prevention initiatives. Says EPA's Ferris, "Ideas ran from source reduction to integrating state pollution prevention assistance programs into the networks for RMP."

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The Link Between P2 and Primary Accident Prevention

Another, more profound link, both in terms of actual emphasis on source reduction and in terms of parallel thought processes, exists between the concepts of pollution prevention and pollution control and the continuum of methods that can be used to prevent, mitigate, or respond to chemical accidents.

For many facilities, public availability of the TRI data resulted in certain basic questions from the public: "Why are your emissions so high?" and "Can't you reduce (or eliminate) pollution altogether?"

A parallel set of questions will invariably be asked of some facilities regarding RMP information: "Can't you do something to reduce the size of your plume?" and "Why do you need to make, store, or use hazardous substances?"

Just as public concern about the emissions levels reported in TRI data was one of the factors that spurred interest in pollution prevention, RMP will inevitably spur interest in increasing the level of safety in regard to facility operations. This interest is likely to embrace primary accident prevention or "inherent safety."

The goal of inherent safety or primary accident prevention is to eliminate the possibility of catastrophic accidents by redesigning processes, reducing the amount of hazardous materials used in a process, substituting nonhazardous or less hazardous substances for hazardous ones, or making other design changes so that, if a process does fail, it will do so in a noncatastrophic manner.

Primary accident prevention does not involve add-ons such as double-walled tanks or sprinkler systems. Proponents of inherent safety hold that chemical accidents typically result from complex systems and human interactions that are prone to occasional lapses or failures that may actually be exacerbated by add-on mitigation systems. Such "secondary" accident-prevention systems may give a false sense of security, and cannot address all of the possible interactions in chemical processes.

In contrast to primary accident prevention, secondary accident prevention reduces only the probability of an accident. Mitigation and emergency response concentrate on reducing the severity of an accident's consequences or effects. None of these activities focuses on eliminating risk altogether—the goal of primary accident prevention.

Since inherent safety constitutes eliminating or greatly minimizing the source of accidents, a strong parallel can be drawn between inherent safety and pollution prevention. Both minimize or eliminate unwanted consequences, whether pollution or the potential for catastrophic accidents, at or near the source, rather than mitigating or controlling accidents or pollution after the fact.[3] In this context, concentration on emergency response could be likened to concentration on remediation and waste disposal—removing and treating unwanted consequences after the fact.

However, successful adoption of primary accident prevention is a complicated endeavor that is not going to be solved overnight—or even within the next decade. As with other aspects of environmental protection, there is a need to make use of the full spectrum of options—from primary accident prevention through improved emergency response—for minimizing the risks posed by chemical accidents, just as pollution control and waste treatment or disposal are used to manage pollution that cannot yet be prevented.

It should be noted that not all pollution prevention projects result in inherently safer processes. An example is the use of pressurized carbon dioxide in dry cleaning. Although the substitution of carbon dioxide for certain solvents may serve pollution prevention purposes, it may not be inherently safer because its use requires high pressure. Thus, as in the case of analyzing the merits of pollution prevention opportunities, experts in the area of inherent safety stress the need to look at the entire process including workers' and other potential receptors' contact with it to determine what the potential safety and environmental consequences really are.

Some comments submitted to EPA during the rulemaking process surrounding the RMP regulations urged the adoption of requirements for technology options analysis (TOA) to identify opportunities for inherently safer technology. EPA decided that the requirements under the rule for hazard assessment—particularly the more rigorous process hazard assessment required for Program 3 sources (see Exhibits 1 and 2)—would be sufficient to help facilities identify opportunities for improving the safety of their systems.

Explains EPA's Ferris, "We do want to expand people's thinking," adding, however, that "EPA has taken the approach that safety is a management issue. You can't just change technology. You have to take a management of change approach."

Omission of the requirement for TOA in the RMP regulations continues to be a particularly sore spot for many of the proponents of inherent safety who commented in favor of its inclusion in the rule. Thus, it is likely that TOA will also be raised in the public dialogue about RMP, inherent safety, and chemical safety.

Impediments to Adopting Inherent Safety: Nobody Expects Accidents

Pollution prevention initiatives frequently result in significant cost savings—which is one of the reasons why both public and private sector organizations have willingly embraced them. Unfortunately, inherent safety initiatives do not always have the same clear-cut economic advantages when applied retroactively,[4] although some of the writings of British engineer Trevor Kletz, a pioneer and prolific writer on the subject of inherent safety and primary accident prevention, suggest that new facilities designed to be inherently safer would often be more cost effective than those designed without inherent safety features, and some retrofits also prove cost effective.

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"The incentives in the gradual pollution area, which gave rise to pollution prevention, aren't there in inherent safety. You don't plan for a chemical accident," says Nicholas A. Ashford, professor of technology and policy at Massachusetts Institute of Technology (MIT) and a leading proponent of inherent safety. He continues, "Many of the social costs of injuries and damage to the environment aren't borne by the company that had the accident. Additionally, the negative feedback the company experiences comes *after* the accident."

The fact that nobody expects to have a catastrophic accident creates a Catch-22 situation: Unless such an accident occurs, the cost of implementing some of the types of process-wide changes required for primary accident prevention may not be considered cost effective, particularly in existing facilities. As a result, Ashford believes that inherent safety will not be readily embraced without either a strong economic or regulatory driver.

According to Ashford, one option would be to make the cost of accidents so high that facilities will have an economic incentive to look to primary accident prevention. Another option would be—as discussed previously—to require TOAs for inherently safer technologies to encourage companies to investigate process options. Ashford was among those who commented in favor of including a requirement for TOA in the RMP rule.

Ashford is critical of EPA's Risk Management Program and OSHA's Process Safety Management regulations (which addresses on-site accident prevention) because both focus on secondary accident prevention and mitigation rather than primary accident prevention. He is skeptical that public pressure from the disclosure of RMPs will be sufficient to encourage firms to seek out and adopt inherently safer technology without additional regulatory or economic inducements.

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Given the history of pollution prevention, Ashford's point appears to have validity. Pollution prevention has occurred, in large part, because the cost of causing pollution rose during the 1980s and, as a result, facilities have actively sought out technological advances that allowed them to move up the waste-minimization hierarchy toward pollution prevention. Absent an incentive to look for opportunities to move toward primary accident-prevention, similar progress on the accident prevention front is likely to be significantly slower than it has been for pollution prevention.[5]

In addition to regulatory requirements, Ashford would like to see a clearinghouse of information on inherently safer technology, possibly linked to the Pollution Prevention Information Clearinghouse.

Interest in Inherent Safety by Environmental Advocacy Groups

Several environmental advocacy groups are already introducing the concept of inherent safety into the public dialogue surrounding chemical accidents and RMPs at both the national and the local levels. These groups see the public availability of RMP information as an opportunity to encourage a dialogue on chemical safety and other issues such as source reduction.

The National Environmental Law Center (NELC) is one advocacy group that has been addressing the issue of chemical safety for a number of years. NELC sees a strong link between inherent safety and source reduction. A joint NELC-State Public Interest Research Groups (PIRG) publication, *Accidents Do Happen: Toxic Chemical Accident Patterns in the United States*, discusses the prevalence of chemical accidents using Emergency Response Notification System (ERNS) data.

The author of the 1996 update of this publication, Linda Phillips, who holds a Ph.D. in chemistry, maintains that the data indicate that, particularly in some highly industrialized areas, there is a potential for a significant increase in chemical exposures from accidental releases. Phillips, a charter member of her own Local Emergency Planning Committee (LEPC), which is located in a highly industrialized area, also observes that emergency planners tend to be preoccupied with responding to accidents rather than working to prevent them.

"We know that backup systems don't always work," says Phillips. "We need to find ways of preventing catastrophes, even when systems fail and humans make errors. The most effective way of doing this is through primary accident prevention."

NELC is currently working with a multi-stakeholder project team and the Illinois Waste

Management Research Center to promote an understanding of inherent safety by offering training to LEPCs. LEPCs were established under EPCRA, and include in their memberships local officials, emergency responders, health and environmental professionals, and representatives from community groups, the media, and industry.

The training program, called the Great Lakes Pollution Prevention and Chemical Safety Project, acquaints LEPCs with the concepts of inherent safety and pollution prevention to provide them with tools to identify opportunities for making chemical use safer. Many of the methods the training program presents to promote inherent safety are quite familiar to persons who work in pollution prevention—using less hazardous substances, decreasing the amounts of hazardous substances used, and changing process designs to minimize the potential for leaks.

As Phillips points out, "Many of the ideas behind inherent safety and pollution prevention are the same. If we make hazardous waste, we have to get rid of it, but if we don't make it, we don't have to get rid of it," adding that the move from pollution control to pollution prevention required a paradigm shift for managers. NELC and other proponents of pollution prevention are endeavoring to promote another paradigm shift, away from accident mitigation and toward primary accident prevention.

Phillips adds that, "NELC has targeted LEPCs because LEPCs are the local bodies explicitly formed and mandated by law to plan for chemical accidents, and facilities are required to provide information and assist in planning. EPA expects LEPCs to review the RMPs. But LEPCs are focused on emergency response rather than on accident prevention.

"We are trying to change the mind-sets of those who deal with accidents," continues Phillips. "Public responders haven't made the link yet. They can think in terms of fire prevention, but they can't think in terms of chemical accident prevention. We are trying to make this link for them. We have to change their culture the way industry has changed theirs in regard to pollution prevention."

Phillips adds, "The reason we are focusing on this area now is because accidents are still happening. According to the ERNS data, the number of accidents per year involving injuries, evacuations, or deaths has stayed the same since *Accidents Do Happen* was first issued in 1994 with data from 1988 to 1992. The 1996 update included data from 1993–1995. We still haven't achieved the results we have hoped for."

The first LEPC training session was held in Chicago on June 4. Upcoming training sessions will be held in Cleveland, Detroit, and Buffalo. Additional information can be obtained by calling NELC at (617) 422-0880.

Some local environmental advocacy groups are also looking to RMPs to serve double duty: promotion of inherent safety and pollution prevention. Bowden Quinn, Pollution Prevention Coordinator for the Grand Calumet Task Force, an environmental advocacy group in the highly industrialized northwest Indiana area, encourages facilities to engage in source reduction, although he is also mindful of transferring risk through ill-conceived efforts to reduce inventories of covered chemicals below the regulatory thresholds that trigger applicability of the RMP requirements.

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"We want to make sure facilities are reducing risk through actual source reduction, as opposed to simply taking deliveries more often," says Quinn—though adding that each case is individual, and that more frequent deliveries of small amounts of certain types of chemicals would be preferable to the storage of very large amounts, which could result in catastrophic consequences in the event of a worst-case release. Quinn, who is also a member of the Lake County, Indiana

LEPC, adds, "We want to work with area industry to encourage solutions that will best reduce risk to the public."

The Grand Calumet Task Force has gathered and distributed TRI information on area businesses to the public and the media in northwest Indiana for a number of years. The group intends to aid in disseminating RMP information to the public when it is available, as well.

The concept of inherent safety—like pollution prevention—has much to offer to the promotion of public safety and environmental protection.

Unreasonable Expectations?

Some industry representatives have raised concerns regarding the trend toward advocating inherent safety in conjunction with RMPs, questioning whether a dialogue that includes discussion of inherent safety will place unreasonable expectations and burdens on companies to eliminate all risk. As this article discusses, questions about (or demands for) primary accident prevention are inevitable as community residents obtain information on potential off-site consequences. Facilities will need to be able to discuss what they are doing along the entire continuum of primary and secondary accident prevention, mitigation, and emergency response.

It should be acknowledged that some community residents will not readily embrace the idea that a facility cannot eliminate all risk. Providing these people with a level of comfort and understanding regarding risks that must be managed rather than eliminated is a communication and community relations challenge that many facilities will face in regard to the RMP information. Effective risk communication will be an important component of the public dialogue.

MIT's Ashford dismisses the concept that discussion of inherent safety will raise unreasonable expectations, and agrees that the public dialogue will need to include a good dose of risk communication along with efforts, wherever possible, to adopt inherently safer technology. "Some things are inherently unsafe—such as natural gas—but we use it anyway. It's not that we can make the world totally safe—but there are many things we can do to make it safer. We're so far away from even touching the 'low-hanging fruit' in terms of safety, that to shy away from talking about inherent safety out of concerns about burdening industry with the goal of making everything safe is ridiculous."

Ashford, EPA's Ferris, and NELC's Phillips all agree that it is typically easier and more feasible to build inherent safety into new facilities than it is to retrofit old facilities. For this reason, as well as the lack of economic and regulatory drivers discussed previously, Ashford believes that movement toward inherent safety will take much longer than the widespread adoption of pollution prevention has taken.

Still, Ashford holds that, "in many cases, alternative chemical processes exist which completely or almost completely eliminate the use of highly toxic, volatile, or flammable chemicals. Facilities should look at implementing them."

The Dialogue to Come

The public availability of RMPs represents a unique opportunity to engage stakeholders in substantive dialogues regarding chemical safety. Because of the visceral nature of the subject—chemical accidents with potentially devastating off-site consequences—these dialogues may, at times, be tense or acrimonious. Facility management should not shy away from talking about accident prevention, however. Since the stakes in this dialogue are high, all groups—including industry, environmental advocacy organizations, emergency responders, and the general public—need to work together to achieve the results that *all* parties want: the prevention of accidents involving the release of hazardous substances.

The concept of inherent safety—like pollution prevention—has much to offer to the promotion of public safety and environmental protection. An approach to dialogues regarding RMPs that could minimize adversarial encounters and maximize creative prevention and response planning could follow the template of the waste minimization hierarchy: A parallel hierarchy of primary and secondary accident prevention, mitigation, and emergency response that would encourage the adoption of inherently safer technologies, where feasible, as facilities are expanded or retrofitted, or as new facilities are built.

As in the case of pollution prevention, improvements take place when people begin to consider possibilities for improvement, and take a fresh look at familiar systems. And as with the waste minimization hierarchy, there is a need to use what is most appropriate to serve a given purpose at a given time, with an eye toward improvement.

Conclusion

Public interest in many aspects of facility operations will no doubt be piqued by disclosure of the RMP information. Questions regarding the presence and use of regulated chemicals—and about source reduction and pollution prevention—should be natural and expected consequences of making RMP information public. As CMA's Wood observes, facilities need to be prepared to discuss a variety of issues with their communities in conjunction with RMPs—including their pollution prevention activities.

As this article has discussed, primary accident prevention may be immediately viable in some cases. However, in many others it will have to be phased in carefully and thoughtfully. Some processes or substances will remain inherently risky. In such cases, the public will have to come to terms with the presence of inherently risky substances or processes necessary to provide the standard of living deemed desirable by the majority of Americans. As in the case of pollution control and waste treatment and disposal, secondary accident prevention, mitigation, and emergency response must be used to reduce risk to the public and the environment.

The TRI caused industry to focus on their emissions and look at their processes in a way that set the stage for many of the gains that have been made in pollution prevention. RMP will likely have a similar effect by causing facility management to look at the potential off-site consequences of accidental release scenarios and consider what they can say to their neighbors about the safety of their operations.

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As in the case of the TRI data (where the public wants to see that emissions are declining) neighbors will want to see that the "death zone" is shrinking. If RMP runs on anything like a parallel track with TRI, such progress is likely to be made. Although the ensuing dialogue on RMPs may, at times, be a bit loud and contentious—as it is in the case of discussions surrounding TRI reporting—facilities, the public, and the environment have much to gain.

Notes

1. 61 Fed. Reg. 31669-31670 (June 20, 1996).
2. 61 Fed. Reg. 31685 (June 20, 1996).
3. N.A. Ashford, J.V. Gobbel, J. Lachman, M. Matthiesen, A. Minzner, and R.F. Stone, *The Encouragement of Technological Change for Preventing Chemical Accidents: Moving Firms from Secondary Prevention and Mitigation to Primary Prevention* (Cambridge, MA: Center for Technology, Policy, and Industrial Development, Massachusetts Institute of Technology, July 1993).
4. N.A. Ashford, "Policies for the Promotion of Inherent Safety: The United States Experience," from D. Wallace and T. Tomiyama (eds.), *Environmentally Conscious Design and Manufacturing: European, Japanese and North American Perspectives* (MIT Press, Cambridge, MA, 1997).
5. Id.

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