



MASS NOTIFICATION

PROPERLY DEALING WITH EMERGENCIES
DEMANDS INTEGRATION OF PLANT SYSTEMS

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EMERGENCY MASS notification at chemical plants traditionally has focused on audible and visual signaling devices such as sirens, horns, warning lights, beacons, public address and intercom systems. To alert anyone off site — including fire, police and medical first responders — communications often were limited exclusively to auto-dialing systems. Since September 11, 2001, the threat of terrorist attacks has prompted plant managers to re-evaluate their approach to both internal and external emergency mass notification. For obvious reasons, this need is particularly important for facilities that process, use, store and distribute hazardous chemicals.

Approximately 7,000 facilities — roughly half of the nation's chemical plants — are at high risk of a catastrophic accident or terrorist attack, according to an April 2007 report by the U.S. Department of Homeland Security (DHS). Just 101 of the most dangerous plants place more than 80 million Americans within range of a worst-case toxic gas leak, explosion or terrorist attack, according to "Chemical Security 101," a report issued in November 2008 by the Center for American Progress, Washington, D.C. (For more on that report, see: "How Should Industry Tackle Threats," www.ChemicalProcessing.com/articles/2008/250.html.)

Chemical facilities not vigilant about emergency planning and preparedness may find their procedures far lag "best practice," if not border on being inadequate. Despite the oversight of bodies such as the Occupational

Safety and Health Administration, Environmental Protection Agency and DHS, shortcomings have ranged from insufficient audible coverage for indoor plant warning systems, to confusing menus of tonal alerts, to inadequate contingency planning if key personnel are unavailable to initiate emergency plans. Employee and management training that's either insufficient or infrequent also has surfaced with disturbing regularity.

Compliance with government directives clearly is driving this comprehensive re-assessment of emergency mass notification planning, systems and resources. Proliferation of new software-driven technology riding on existing network topologies, and deployment of seamless multi-device interoperable communications both within and outside the facility also are at play. Additionally, there's the ongoing trend toward integrated systems, which in this instance means unifying disparate mass notification devices and systems to achieve the highest possible levels of monitoring, redundancy, reliability and operational simplicity.

SYSTEM INTEGRATION AND INTEROPERABILITY

Safety warning, communications and security requirements traditionally have been addressed through individual systems dedicated to specific needs. These systems have grown in complexity and expanded in number to encompass everything from public address, intercom, telecommunications, paging, text messaging, voice messaging, e-mail and general alarm, to

Scenario management systems



Figure 1. Software eases configuration of emergency procedures.

real-time Internet Protocol (IP)-based communications.

Integrating disparate components such as sirens, signaling beacons, fire/gas systems and public address now is critical for ensuring effective redundancy and monitoring for emergency communications and warning. This is because the automation that accompanies integration of audible, visual and digital systems significantly speeds incident response times while also providing decision-makers with invaluable up-to-the-minute data as emergency events unfold.

Redundancy remains a key priority of mass notification system design. The objective is to provide immediate and automatic system backup necessary to achieve maximum levels of fail-safe operation and monitoring. Decentralizing control of the system produces higher levels of redundancy as well as enhances intelligibility and ease of use.

Integrating disparate mass notification systems effectively automates hazardous monitoring and warning functions, thereby assuring fail-safe operation and accelerated response times.

While IP-based interoperable technology has had a powerful impact on emergency mass notification and continues to show substantial promise for the future, it does have possible limitations that should be considered. These deficiencies become evident in any discussion of the need for redundant system backup and monitoring, particularly as it relates to integration with more-traditional emergency warning systems and devices.

As recently illustrated by public safety emergencies like campus shootings and natural disasters, there remains a possibility infrastructure for local telecommunications and Internet access could become overtaxed during a catastrophic incident. At a chemical processing facility, either this or a similar deficiency could seriously impair the ability to initiate both conventional and automated telephone, text messaging, paging and

e-mail notification of employees as well as local officials and the general public. A fully integrated system that offers reliable backup of additional alert systems, i.e., sirens, horns, loudspeakers, signal beacons and warning lights, ensures redundancy is built in at all levels of emergency mass notification.

Interoperable communications is playing an increasingly important role in emergency mass notification. However, reliance on telecommunications and Internet infrastructures that recently have proven inadequate emphasize the need for automated backup by more traditional warning systems such as sirens and beacons.

KEEP IT SIMPLE

This is the formula for success in emergency mass notification. Complex warning alerts and messages or an excess number of scenarios and action plans could well add to the confusion of an emergency situation.

In laying out a strategic emergency plan, limiting the number and simplifying the complexity of warnings and alerts is critical. For example, at the world's largest liquefied natural gas production facility, a single alert tone is used for all emergency situations. Although the system can provide hundreds of different tones, relying on a single tone eliminates the need for employees to memorize, interpret and react to multiple tones and their associated meanings. Once the tone sounds it's immediately followed by more-detailed voice instruction broadcast over the public address system — but by that time the entire facility has been alerted to the need for immediate action.

An isomerization plant at a major Texas refinery employs a slightly more complex warning system — four warbler siren blasts: one for testing, two for work stoppage, three for evacuation of nonessential personnel and a continuous blast for total evacuation.

Limiting the number and complexity of emergency warning signals is an effective way to minimize confusion and assure immediate and effective response during a catastrophic incident involving hazardous chemical materials.

BEST PRACTICES

Considering human life may be at stake, a plant must strive to base its emergency mass notification strategy on best practices. So, let's look at how these are evolving.

The trend toward network management instead of discrete wires and relays stands out as a major improvement over past mass notification systems. Distributing data and information over a network is both faster and more efficient. It also provides cost savings by substantially reducing infrastructure requirements.

In planning a plant notification strategy, consider the increased speed, greater reliability and cost savings that

KEEP 10 GUIDELINES IN MIND

These practical pointers can improve your emergency planning and notification efforts:

1. Establish clearly defined objectives. Emergency preparedness begins with assessing risks and preparing for possible emergencies by evaluating all scenarios, threats and affected stakeholders. For example, a plant located close to a school, hospital or other potentially impacted public areas should ensure proper communication and planning before an event occurs.
2. Remember: Individual facilities present unique requirements. One plant may need to stress "when" and "who" needs to be notified while another may need to emphasize real-time bilingual emergency warnings or system-automated alert notifications. Assess employees' English comprehension by contacting the human resources dept. or conducting an internal survey to identify potential language barriers and ensure they're fully addressed during training and tests.
3. Test and evaluate plans and systems annually. Plants should designate at least one day each year for all employees to take part in refresh training and a test exercise. If changes occur with personnel, structures or dangerous chemicals on site, a facility should evaluate whether all technologies and scenarios are still relevant and efficient.
4. Integrate systems to achieve adaptable monitoring and failsafe performance. Technology continually creates new opportunities for efficiencies while raising standards for best practices. Assess all current communication technologies in use to identify and address gaps in system-wide integration for monitoring and redundant automated responses. Mass notification systems must be forward-looking and engineered to support new technologies.
5. Keep things simple. While hardly a revelation, this rule can get lost despite best intentions. Having too many instructions can confuse employees at all levels. For example, lengthy, complex foldout directions that employees must stow inside their hard hats may prove counter-productive to effective real-time response.
6. Leverage technology advancements for performance and cost advantages. Think about the future: The data-carrying ability of fiber optics alone enables the expansion of technologies to come. If not already in place, consider adding fiber optics to provide heightened standards of reliability and flexibility, as well as simplified less-costly maintenance.
7. Stay focused on user-friendly technologies. The human element of mass notification is critical for ensuring quick and instinctive emergency response. However, its value substantially diminishes when operators and employees aren't properly trained in how and when to use the system to activate the appropriate warnings and notifications for prescribed scenarios. Make certain operators and administrators are trained across departments to ensure necessary coverage 24/7.
8. Make interoperable communications part of a "total solution." IP based software-centric interoperable communications represent the gateway to intelligent mass notification by supporting real-time communications and urgent notification of multiple parties using multiple devices, networks and frequencies. This enables seamless multi-media communications with first responders, local authorities and citizens, as well as augmented incident response and emergency preparedness.
9. Map incident planning and execution chain of events. Use scenario management systems to enable incident events, related tasks, emergency procedures and command-and-control confirmations to be configured in step-by-step chains via graphical process maps. In the event of an explosion or toxic leak, multiple emergency steps then can be initiated with the touch of a single button to enable everyone to be notified regardless of location.
10. Achieve additional return on investment. Mass notification systems can be valuable assets for everyday non-emergency intra- and inter-plant communications (e.g., public address and intercom systems), enabling key personnel to become more familiar and comfortable with system capabilities. Encourage designated plant personnel to use tools to become more connected and integrated with plant floor operations or other priority business areas.

opting for network-managed systems instead of discrete wiring and relays may offer. Network-managed systems accommodate a broader range of media, such as audio and video, providing increased communications flexibility. Standard Network Management Protocol (SNMP), a proven and widely accepted methodology, supports continuous remote monitoring of individual mass notification system components for improved reliability and lower maintenance expenditures.

Standardized (non-critical) Windows-based system monitoring and configuration software represents another step forward for mass notification. These systems are easier to install, support simple routine modifications in the field and eliminate the need for custom factory software. With just a “point and click” users can program settings into nonvolatile memory.

Of course, a number of built-in protections prevent unauthorized users from making modifications. The increased use of fiber optics is another trend that’s paying dividends, especially for larger multifacility companies implementing or upgrading mass notification requirements. By linking sites in redundant, completely self-healing communication rings, fiber-optic transmission promotes heightened standards of reliability, enhanced flexibility and simplified less-costly maintenance.

Another promising development is use of satellite images. Such images now are being incorporated as overlays for site drawings to calculate theoretical sound coverage for audible alerts. This technology also can be accessed to take advantage of Geographic Information System (GIS)-based mapping for targeted public alerting on a local or regional basis.

Satellite imaging provides an effective tool for establishing effective audible warning sound coverage as well as mapping geographic areas for citizen alerts.

GATEWAY TO INTELLIGENT MASS NOTIFICATION

Mass notification covers both indoor- and outdoor requirements and calls for interface with the telephone/ PABX and plant intercommunications systems, public address, tones, voice messaging, etc. Through traditional loudspeakers and a variety of illumination signaling devices, these back-end systems actually produce the warnings and notifications. On the front end of emergency notification — performing the function of activating and integrating these backend systems — are the intelligent IP-based interoperable technologies that have evolved since 9/11.

Not to be confused with integrated communications, interoperable communications supports a facility’s capability for real-time communications and urgent notification of multiple parties using multiple devices.

The next step in providing a “total solution,” interoperable communications is key to establishing seamless multi-media communications with fire, police and medical first responders, local authorities and citizens in surrounding communities. Additionally, interoperability supports and augments a number of other incident response and emergency preparedness initiatives, including wide-area alerting and data sharing among multiple agencies.

An extension of alert notification and secure messaging software, integrated incident planning and execution tools support National Incident Management System/Unified Incident Command System (NIMS/UICS) and provide a method for defining “tiered response” plans to events initiated both internally and externally. Known as scenario management software, these applications integrate alerting, communications interoperability and collaboration tools to automatically activate multiple forms of communication.

Integrated incident planning and execution tools serve as a “nerve center” to trigger and coordinate response, communication, alert notification and collaborative efforts of employees and management, local officials and agencies, and first responders.

Deployed at a plant, scenario management systems enable incident events and related tasks, and emergency procedures and command- and-control confirmations to be configured in step-by-step chains via graphical process maps (Figure 1). In the event of an explosion or toxic leak the touch of a single button can initiate multiple emergency steps; all people who need to be notified will be notified, regardless of where they happen to be. Scenario management systems allow users to predefine automatic procedures for various events based on specific needs. Scenarios may be programmed to cover any series of actions, including broadcasting alerts, evaluating responses, pulling data from external systems, activating standby channels and more. Scenario management applications can be used to automate emergency incident procedures and contingency plans in much the same way flow charts are used to document a process. A new era in mass notification is beginning. In addition to likely further tightening of government regulations, demand for network-based systems, new interoperable communications technology and system integration undoubtedly will continue at an invigorating pace. Beyond possible loss of human life, the potential costs to the environment, damage to facilities, litigation, fines and an organization’s reputation make the consequences of inadequate mass notification simply too grim even to consider.

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