

Safety & Health News

AIChE

AMERICAN INSTITUTE OF
CHEMICAL ENGINEERS

SAFETY AND HEALTH
DIVISION
www.shdiv.aiche.org



FALL 2004

SAFETY FORUM

SAFETY AND HEALTH DIVISION IN THE FUTURE?

The Safety and Health Division is now the third largest Division in AICHe (Facts and Figures on page 4). Is this something to cheer about? Yes and no. Certainly the fact that the Division has, to some extent, held its own, at least on a percentage basis during a general decline in Institute membership, is good news. Survival for 25 years is also good news, indicating that a useful service is provided. But the decrease in the number of chemical engineers opting for Division membership in general is troublesome.

Discipline-oriented societies, such as AICHe, have a primary objective to advance the underlying science and technology of a specific branch of knowledge. Loss of membership and financial stress have been particularly significant among such engineering organizations. On the other hand, engineering organizations that focus on a job function or a specific industry seem to maintain membership levels, advertising income, and meeting attendance, apparently because the focus is relatively specific.

The job-function Divisions (e.g., Safety and Health, Fuels and Petrochemicals, and Environmental) all have this type of specific focus. All are heavily committed to technical programming as the primary objective. But such Divisions could have an increased role that could provide more service to the members and could be attractive for new members. In short, job-oriented Divisions could serve as mini-societies within AICHe.

The question then arises as to what can be done at the Safety and Health Division level, not only to improve membership numbers, but also to increase the value of membership. These are obviously related matters and shouldn't be treated in a separate manner. How can programming be improved? What are the cutting technologies in chemical plant and process safety? What can be

done to make membership in the Division more attractive? In fact, what can be done to make membership in the Division an essential element for lifetime career development of process engineers? How can more types of process industries, e.g., biochemical, be represented?

Process safety is a dynamic field. Innovation and creativity should not be stifled. Companies with strong process safety programs should strive to benefit from the latest advances in process safety technology and to keep abreast of technological advances through active participation in professional and trade organizations. The enhancement of process safety technology also provides additional benefits. Improved process safety knowledge and understanding can produce a competitive edge, for example, through increased yields, better quality products, and improved productivity.

How can the activities of the Division become absolutely critical for process engineers to get involved to improve their job skills and to enhance their careers? A number of useful liaison arrangements could be made with other "job function" Divisions, such as the Environmental Division and the Process Development Division. Liaison arrangements with specific groups within other societies having a strong safety interest could be of value. Such organizations include the American Chemical Society, the American Society of Mechanical Engineers, and the American Society of Safety Engineers. The purpose here would be perhaps joint programming, joint preparation of position papers, joint publications, and the establishment of safety standards.

Sure, it means more work and more volunteerism, but the effort should pay off! Start by getting a new member - see page 12.

Sam West

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SAFETY AND HEALTH DIVISION UPDATE

SCOTT OSTROWSKI, CHAIR

Welcome to the initial all-electronic version of *Safety & Health News*. In an effort to control expenses and to allocate your Safety and Health Division dues appropriately, the Division Executive Committee endorsed a decision to issue the quarterly Newsletter exclusively on-line. From here forward, the Newsletter will be issued and be available to read, download, and/or print via the Division web site (www.shdiv.aiche.org). A notice of the availability of each Newsletter along with a brief summary of the contents will be included in future editions of *Process Safety Progress (PSP)*. Other techniques for notifying Division members are now under consideration.

As pressure on membership expenses grow with inflation, I want to assure you that the Officers of the Division will continue to do their part to control or even lower these expenses without losing focus on the objectives of the Division. We must continually remember that we are a service organization in business to provide a service to 1,100+ members of the Division.

As a reminder, the objectives of the Safety and Health Division are to: (1) further the application of chemical engineering to the broad field of safety and health; (2) provide a communication medium for chemical engineers and others to exchange information concerning all facets of safety and health; (3) act as a source of information for chemical engineers not actively engaged in safety and health and to alert them to the importance of this field; and (4) address the problems of safety and health, and of the protection of property in the manufacture and use of chemicals.

I want to point out some facts that help demonstrate the value of your Safety and Health Division membership. Please consider the following:

- actual Division annual dues are only \$3.00, which is less than half of the dues of any other Division (3 Divisions charge \$7.00, most are \$10.00, and a few are as high as \$20.00);
- the remaining \$36.00 of your annual dues of \$39.00 is the annual charge for your subscription to *Process Safety Progress*.

Membership in the Division is a bargain, but we want to be sure it is a valuable bargain to you.

Here is a reminder that the next Division event is the 49th Annual Safety in Ammonia Plants and Related Facilities organized by Program Area 11c scheduled for **September 20-23, 2004**, at the Hyatt Regency Denver Hotel, Denver, CO. These well-attended symposiums are dedicated to safety

in plants that manufacture ammonia and related chemicals such as urea, nitric acid, ammonium nitrate, and methanol. Subjects include hazardous incidents, safety developments, design issues, technological advancements, and maintenance improvements. For further information, see www.aiche.org/conferences.

The Case for Chemical Process Safety Performance Metrics: Cost, as discussed above, is one metric that provides a measure of performance. As professionals in the safety and health field, we are often concerned by the fact that the better we do our job, the less there is to count, and the harder it is to justify funding to eliminate or control risks further. Personnel safety performance is much easier to measure than process safety performance because of metrics commonly used in industry such as Total Recordable Incident Rate (TRIR). TRIR is a benchmark for injury prevention performance in an industrial setting established by the U.S. Department of Labor and administered by the Occupational Safety and Health Administration. TRIR correlates recordable injuries, average worker hours of a standard manufacturing facility in a year, and the actual worker hours of the site under evaluation for a particular year.

Unfortunately, there is no universally agreed upon measure of process safety performance that is accepted and tracked like the personnel safety based TRIR. The American Chemistry Council has established a process safety performance metric. The ACC considers a process safety incident to be reportable if it results in: (1) a fire or explosion causing more than \$25,000 in property damage; (2) a release of a chemical greater than the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) reportable quantity for extremely hazardous substances, or a release of 5,000 pounds of a flammable or combustible material, or (3) a serious injury or fatality arising from a fire, explosion, chemical release, or a release of energy or material from a process. According to the ACC, process safety incidents have declined 35 % (531 to 349) since 1995 among member companies that participate in their Responsible Care Program. During this period, continuous improvement efforts have led to the development and implementation of numerous process safety systems and procedures that have contributed to this positive result.

(continued on page 4 - see Metrics)

METRICS (continued from page 3)

The ACC process safety metric is sound but it is midway up the accident pyramid. What is truly needed is a metric that measures the incidents at the bottom of the pyramid as well as those at the middle and at the top. Even better, let's develop a process safety performance metric that takes into account the potential consequences of an incident and the barriers that prevented the actual consequences from being the potential consequences.

Remember, if we can count it, we can track it, and if we can track it, we will always be driven to improve it. In this case, the "it" is process safety performance.

Your comments about any aspects of the Safety and Health Division are indeed welcome at: scott.w.ostrowski@exxonmobil.com

Scott Ostrowski

LODAL AND MURPHY ELECTED TO FELLOW GRADE

Pete Lodal and **John Murphy**, two active members of the Safety and Health Division, were recently elected to the grade of **Fellow** of the AIChE. Fellows are recognized for professional attainment and significant accomplishments in chemical engineering. Professional attainment includes contributions to the professional advancement of chemical engineering and valuable service to AIChE. Practice in chemical engineering for a minimum of 25 years is required.

John Murphy is a Chemical Incident Investigator with the U.S. Chemical Safety Board. He was formerly a Senior Engineer with Wilfred Baker Engineering Company. He obtained a BS degree in chemical engineering from Tufts University and an MBA from Central Michigan University. John served as Chair of the Safety and Health Division in 2001 following many years of Division activity including serving as a Director, 1996-1998.

Pete Lodal is a Senior Technical Associate with Eastman Chemicals in Kingsport, TN. He obtained both BS and MS degrees in chemical engineering from Purdue University. Long active in Safety and Health Division affairs, he is currently a Director, having been elected for the three-year term of 2004-2006.

This is a unique honor for John and for Pete. The number of Fellows is limited to 10% of the total number of Fellows and Members who meet the minimum criteria of ten years at Member grade. ■

OBITUARY

Ephraim Andrew Scheier died of cancer on July 25, 2004, at the age of 42. Active in the Safety and Health Division affairs, he was particularly valuable in the programming efforts. He was a Division Program Coordinator, 2002-2003, and served as the Vice-Chair of the 6th Biennial Process Plant Safety Symposium held in New Orleans in April 2003.

Ephraim earned a BS degree at Rutgers University and an MS degree at Worcester Polytechnic Institute, both in chemical engineering. He was most recently the HSSE Manager for BP America in Houston, TX.

He was a bright, energetic, outgoing individual who made significant contributions to the Safety and Health Division, especially the work of the Program Area 11a Committee.

FACTS AND FIGURES

Membership in AIChE has dropped during the past ten years from about 55,000 members to the current level of about 43,000. Expectations are that membership is now relatively stable and, in fact, should show some growth in future years.

Total Division membership has also declined during the same period, but the changes have not been the same for each Division. In 1995, the Environmental Division was the largest with 3,233 members. The Safety and Health Division had 1,396 members at that time, and was the fifth largest Division behind Environmental; Food/Pharmaceutical/Biological; Computing and Systems Technology; and Fuels and Petrochemicals.

In 2004, the Safety and Health Division has 1,113 members which places it third in size behind Food/Pharmaceutical/Biological with 1,317 members and Environmental with 1,180 members. Of interest, in 1995, 2.5% of AIChE members were members of the Safety and Health Division. This percentage has been relatively constant over the past ten years, currently being about 2.6% of AIChE membership.

No Division that existed ten years ago has shown an increase in membership during the period. Some have shown precipitous declines as work interests change. Some, like the Safety and Health Division, have been relatively steady in participation, particularly when measured as a percentage of AIChE membership. Do we need new members? YES - see coupon on page 12. ■

THE CCPS PAGE CENTER FOR CHEMICAL PROCESS SAFETY

2004 CCPS INTERNATIONAL CONFERENCE

The 2004 CCPS International Conference in Orlando, FL, that concluded July 1, covered Emergency Planning: Preparedness, Prevention, and Response. With attendance well over 200, the conference drew a large international audience and included presentations that literally spanned the globe. The keynote speaker for 2004 was Jan Mares, the Business Liaison Director of the Private Sector Office of the Department of Homeland Security. He explained the structure of DHS as well as the coordination procedures with the private sector. This was indeed helpful to conference attendees working within the chemical process industries.

Other featured speakers were Commander Tom Marian, CO Vessel Traffic System, U.S. Coast Guard; Carolyn Merritt, Chair and CEO of the US Chemical Safety Board; and Debbie Dietrich, Director, Chemical Emergency Preparedness and Prevention Office (CEPPO) of the US Environmental Protection Agency.

Many excellent papers were presented in the areas of emergency response, community involvement, international issues, consequence assessment, transportation and value chain, liquified natural gas, layer of protection analysis, and legal and regulatory issues.

The 2004 Conference Proceedings may be purchased by going to: www.aiche.org/pubcat/. A Call-for-Papers for the 2005 Conference appears on page 6 of this Newsletter. ■

CSB COMMENDATION

Carolyn Merritt, Chair and CEO of the US Chemical Safety and Hazard Investigation Board, announced at the CCPS Annual Conference, that the Board conferred unprecedented recognition on CCPS for having gone far beyond safety recommendations presented to them two years ago. In 2002, CSB completed a two-year reactive hazard investigation. The report recommended that CCPS produce safety information materials and programs, and promote increased awareness of chemical reactivity hazards.

CCPS developed comprehensive good-practice guidelines on how to manage reactive chemicals throughout the life cycle of a chemical manufacturing process. Going further, CCPS formed a partnership with government and industry

to offer for free internet access the book *Essential Practices for Managing Chemical Reactivity Hazards*. In addition, CCPS held meetings among its members to discuss the CSB two-year report.

A Reactivity Management Roundtable has now become a special project of CCPS. ■

ACTIVE CCPS PROJECTS

There are many active projects as well as upcoming opportunities at CCPS. The Vent System Design Project subcommittee is developing a Concept Series book to aid engineers in designing safe process vent systems. Also underway is the Process Control Design project, the purpose of which is to develop a new Guidelines Series book to describe the principles of designing control systems for process safety.

In May, the Reactivity Management Roundtable (RMR) officially became a special project of CCPS. The RMR brings together large and small companies, labor, government, and others interested in advancing the practice of chemical reactivity hazard management, reaching out to operations that "don't know what they don't know," and facilitating the sharing of reactivity knowledge. CCPS also has several Areas of Interest committees that are preparing project proposals for future consideration. Proposals include a newly coined LNG Modeling Committee that is currently studying past work and identifying information gaps and areas for improvement. Other proposals include a Process Safety Culture: Learning from the Columbia Incident Investigating Committee, and a new and updated Inherently Safer Processes project.

Special Project opportunities are currently available through CCPS, for example, the Process Equipment Reliability Database, the Process Safety Incident Database, and the Reactivity Management Roundtable. It is not necessary to be a CCPS sponsor to participate in these special projects. ■

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CALL-FOR-PAPERS
20TH ANNUAL CCPS INTERNATIONAL CONFERENCE
AND WORKSHOP
APRIL 11-13, 2005
HYATT REGENCY HOTEL, ATLANTA, GA
THEME - RISK MANAGEMENT: THE PATH FORWARD

Looking backward over the past three decades, much has transpired. Mergers, acquisitions, and globalization have transformed the industry. Security has become a watchword and a major government agency has been created to address the issues. Regulatory oversight has increased significantly. Process monitoring capability (i.e., data acquisition and storage) has increased exponentially. CCPS has become a vibrant organization with broad industry and government support.

From the perspective of April 2005, what has been accomplished? Have process safety incidents been reduced? Do regulations address the right issues and are they cost effective? Is security sufficient to prevent successful terrorist acts, and have the right scenarios been addressed? Has enhanced process monitoring led to superior process control? Are we better now, and can we prove it?

The Conference Theme involves looking forward and recognizing that resources, both financial and human, are limited. Therefore, there should be a specific focus for both government and industry.

Call-for-Papers

With this background, papers are solicited for the following proposed session titles and topics:

- Practical measurement of performance - what is the slope?
- Managing for better results with 21st Century tools and resources;
- Case histories and lessons learned (joint with the Loss Prevention Symposium and the Process Plant Safety Symposium);
- Issues on LNG transportation and modeling;
- Risk analysis - how risk is quantified considering estimates of consequences and frequencies;
- Risk assessment - the process by which the results of risk analysis are used to make decisions;
- Risk management - the systematic application of management practices to the task of controlling risk to protect employees, the public, the environment, and the company assets;

- Building process safety culture;
 - Human factors;
 - Inherently safer technology;
 - Process/equipment integrity; and
 - Enhanced process measurement and control.
- Note that for the first time, the Annual CCPS Conference is being held in conjunction with the AIChE Spring Meeting as part of the Global Congress on Process Safety. Two other key process safety symposiums are also scheduled - the 39th Annual Loss Prevention Symposium, and the 7th Biennial Process Plant Safety Symposium. This should result in an historic gathering of process safety experts from around the world.

For more information about the CCPS Conference, call Karen Person at **212-591-7319** or e-mail karep@aiiche.org.

Abstracts for the CCPS Conference must be received no later than **October 1, 2004**. To submit your abstract, e-mail ccpsicw@aiiche.org. ■

SAFETY MESSAGES

The CCPS *Process Safety Beacon* program, started in 2001, is designed to provide one-page safety messages for manufacturing personnel each month. These color messages have been available free to CCPS sponsor organizations through monthly e-mails. In order to promote process safety awareness across the industry, CCPS will distribute them free on request by registering at:

www.aiiche.org/ccps/safetybeacon.htm

The document is delivered by e-mail in a language of choice (English, French, German, or Spanish).

Companies, organizations, and individuals are invited to sponsor an upcoming issue. Volunteers fluent in other languages are sought to make the *Process Safety Beacon* available to even a wider audience.

For further information about any aspects of this program, contact Karen Person at **212-591-7319** or karep@aiiche.org.

SAFETY NOTES

- OSHA renewed for two additional years its Alliance with Dow Chemical Company, continuing to focus on process safety management (PSM), ergonomics issues, and improving overall workplace safety and health programs. Since the original Alliance was signed in January 2003, OSHA and Dow have presented workshops on the PSM Standard, and on reactive chemicals. Dow Chemical has also been working with the agency to develop case studies on ergonomics and motor vehicle safety.
- The Board of Certified Safety Professionals (BCSP) celebrates its 35th anniversary in 2004. The purpose of BCSP is to certify practitioners in the safety profession. More than 10,000 individuals currently hold the Certified Safety Professional® (CSP®) designation. The American Society of Safety Engineers played a significant role in the foundation of BCSP. The independent certification board was established in 1969.
- The National Institute for Occupational Safety and Health (NIOSH) has produced a new training and educational DVD on preventing workplace violence. The 27-minute video, in two separate programs, discusses practical measures to identify risk factors for violence at work, and offers recommendations and resources to help keep workers safe.
- A Summary Report on the Peer Review Workshop on the Neurotoxicity of Tetrachloroethylene (Perchloroethylene) has been published by the National Center for Environmental Assessment (NCEA) of EPA. It is available at the NCEA web site: www.epa.gov/ncea.
- Safety bulletins concerning the removal of hazardous materials from chemical processing pipelines and on the proper handling of sodium hydrosulfide (NaHS) were issued by the U.S. Chemical Safety Board. The two bulletins grew out of the lessons learned during accident investigations by the CSB. The piping bulletin points out the need to ensure that materials are completely purged



from the process piping before any maintenance activities start. The second bulletin examines accidents in which liquid sodium hydrosulfide is exposed to acid or heat, producing large quantities of hazardous hydrogen sulfide gas. The bulletins are available at: www.csb.gov.

- The OSHA Office of Training and Education (OTE) is offering two new training courses for workers who respond to disaster site operations. The four-day "train-the-trainer" course and the two-day "disaster site worker" course are available at OSHA Education Training centers throughout the country. The courses were developed for workers who provide skilled support in emergency response and recovery operations at man-made and natural disaster sites. A list of course offerings, dates, and locations is available on the OTE web site.
- A Northeastern University research team has created a simulator that will test a driver's road skills and could one day greatly reduce the risks associated with driving. The simulator, which provides an authentic car setting complete with driver's seat, gas and brake pedals, and a steering wheel, combines virtual reality with a minivan. The device takes advantage of developments in virtual reality technology in the visual and audio displays to form a compelling illusion of an actual on-road experience. Software and sensors record and evaluate drivers' reactions in various challenging scenarios. The research has been funded by the National Institutes of Health.
- OSHA has developed a new publication to assist employers, safety and health professionals, training directors, and others in ensuring they are aware of the requirements for emergency action plans. *Principal Emergency Response and Preparedness* is a detailed publication that provides an overview of OSHA standards for emergencies. The publication includes requirements under the Process Safety Management (PSM) and other OSHA standards. ■

SAFETY AND HEALTH ADD VALUE PER OSHA

John L. Henshaw, Director of OSHA, in a speech at the Governor's Pacific-Rim Safety and Health Conference in April, indicated that safety and health add value to your business, your workplace, and your life. For example, strong safety and health management systems provide a triple win: (1) lives are saved; (2) businesses save money and maximize returns on investments; and (3) safe workplaces are productive workplaces where workers with high morale and high motivation produce high quality products and services.

Progress has been made during the past decade with workplace fatalities down 10%, and work-related injuries and illnesses showing a downward trend.

In 2003, OSHA established a five-year management plan. It's not about measuring activities and racking up citations and penalties. It's about safer workplaces and fewer injuries, illnesses, and deaths on the job.

Strategies include a strong, fair, and effective enforcement. Enforcement serves as the underpinning. It must be strong and effective and must produce change where necessary. This is done by effectively zeroing in on the right workplaces that need enforcement to produce a safe workplace. The enforcement activities must produce the necessary change toward compliance and a safe workplace that is sustained.

Outreach, education, and compliance assistance are critical components of the OSHA strategy. About 50 million visitors to the web site are expected this year. In 2003, more than 30,000 employers took advantage of the free on-site consultation program for small businesses. The number of OSHA Education Centers has increased.

The Hazard Communication Initiative continues to be a vital part of the strategy. More than 30 million workers in the US at 3 million work sites have potential exposure to one or more of the 650,000 hazardous chemical products covered by the OSHA Hazard Communication Standard. As part of the Alliance with the Society for Chemical Hazard Communication, a course is being developed for small businesses on preparing MSDSs. A guide is being developed to the Globally Harmonized System of Classification and Labeling of Chemicals.

Director Henshaw concluded that OSHA is not just a regulatory agency anymore, it is a safety and health agency. ■

LOW DOSE EFFECTS OF CHEMICAL SUBSTANCES

Laboratory toxicity tests usually involve relatively high doses of chemicals so that the study will produce measurable effects that have a statistical significance within a small group of test animals. Running tests on lower doses would require significantly more animals raising issues of animal welfare and costs.

One of two methods are usually used to extrapolate health effects to levels likely to represent potential exposure for humans. In one, called the linear dose-response model, a line is fitted through the data from high-dose experiments so that the response becomes zero only when the dose equals zero.

A second method, called the threshold model, extrapolates the animal test data to a point at which there is no observable adverse effect. This approach assumes that there is an exposure concentration for the chemical that is considered safe.

Interest is now growing over a third model for extrapolating the effects of high doses of a chemical to low doses. This model uses the concept of hormesis. One of the major proponents of this approach is Edward J. Calabrese, a professor of toxicology at the University of Massachusetts, School of Public Health, Amherst. This concept states that low doses of some chemical substances could actually be beneficial to health even though these substances are demonstrably toxic at higher doses. If this approach were adopted by federal agencies, there would be a significant change in which chemicals would be regulated based on low dosage exposure potential.

According to Calabrese, hormesis involves the stimulation of an effect, such as growth or cognitive function, at low doses and an inhibition of that same effect at high doses. This theory describes how the effect changes with dose level, but does not make a judgment about whether or not the change is beneficial. The low-dose stimulation of hormesis is relatively subtle.

The National Academy of Science recently created the Committee on the Future Toxicity Testing and Assessment in response to EPA. Its mission is to assess and advance current approaches to testing of chemicals and how data from these studies are assessed. Meanwhile, the debate continues among toxicologists over the best way or ways to use high-dose data to extrapolate effects from low doses. ■

CHEMICAL PROCESS SAFETY AT CROSSROADS

Carolyn W. Merritt, Chair and CEO of the U.S. Chemical Safety and Hazard Investigation Board, stated in a Guest Editorial in the May 2004 *Environmental Health Perspectives*, that chemical process safety is at a crossroads. December 2004 will mark the 20th Anniversary of the worst chemical accident in history, the chemical plant disaster in Bhopal, India. This event changed forever the path of the chemical process industries.

The Clean Air Act Amendments of 1990 authorized the creation of the U.S. Chemical Safety Board (CSB) to investigate the root causes of serious chemical accidents that harm workers or the public. About a dozen major chemical accidents are now investigated each year with the findings reported to Congress and to the public.

About one-third of the major accidents investigated by CSB involve reactive chemical incidents, where a sudden, uncontrolled chemical reaction causes serious damage resulting in deaths and injuries. This issue is why chemical process safety is at a crossroads.

As diverse as these events were, they shared many common features. All the reactive chemical accidents involved known chemistry. In several of the cases, the chemical processes were not included in either the OSHA or EPA process safety regulations.

Chair Merritt concluded that it was time to raise the standards for all businesses that have reactive hazards. For companies that already have strong safety programs, recommended changes will add little burden. For companies that do not, the recommendations will save lives of workers and protect owners from financial ruin.

■

HOME USE OF DIAZINON TO BE PHASED OUT

EPA has cancelled registrations for dozens of popular residential lawn care and garden products containing the organophosphate insecticide diazinon. The move does not affect agricultural and commercial uses. The cancellation implements an agreement that EPA made with manufacturers to phase out the products. EPA concluded that diazinon poses risks to children and residential applicators. The manufacture of diazinon for residential use is now prohibited, but stores may sell existing stock until December 31.

OSHA ORDERED TO RELEASE INJURY INFORMATION

OSHA must disclose the names of the companies with the worst safety records together with the injury rates according to a federal judge. A 2002 Freedom of Information Act request submitted by the *New York Times* seeking a list of the 13,000 companies identified by OSHA as having injury and illness rates greater than the national average was initially denied. A federal judge in New York ordered OSHA to provide the information. This information would essentially provide a ranking of the most hazardous work places in the U.S. OSHA has until mid-September to decide whether or not to appeal the ruling. ■

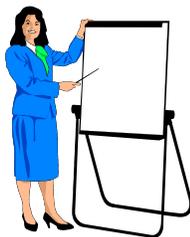
TERRORISTS AND INDUSTRIAL CHEMICALS

Industrial chemicals may well be the substances of choice for terrorists because of the availability and toxicity of many relatively common substances. Such chemicals would be easier for terrorists to obtain and use than chemical and biological warfare (CBW) agents to cause mass casualties and wide spread destruction. Historically, industrial chemicals have been the weapon of choice. The use of CBW agents can immediately incapacitate civilians in a relatively small area, but that is not the usual objective. The goal is usually to terrorize and cause mass suffering over a period of time.

The federal government continues to consider more regulations for the chemical industry in an attempt to protect the public against a terrorist attack. The chemicals most likely to be used as terrorist weapons, according to experts, are ammonia, chlorine, fluorine, formaldehyde, hydrogen bromide, hydrogen cyanide, nitric acid, phosgene, and sulfur dioxide. ■

BHOPAL - 20 YEARS LATER

A Chief Judicial Magistrate ordered the Bombay representative of Dow Chemical to appear before him in July regarding environmental damages and compensation to the victims of the methyl isocyanate leak in central India nearly 20 years ago. This is the first time that Dow Chemical has been asked to appear in court regarding the incident. A spokesman for Dow indicated that Union Carbide settled its responsibilities when it entered into a settlement with the government of India in 1989 and that environmental remediation was not the responsibility of Union Carbide but rather by a Union Carbide subsidiary. ■



PAPERS PAPERS PAPERS

"The Mini-Closed Pressure Vessel Test (MCPVT) as a Screening Classification Test for Explosive Properties of Organic Peroxides," K.D.Wehtstedt, A.Knorr, and P.Schuurman, *J.Loss Prev.Process Ind.* **16**, No.6, 523-531 (November 2003).

Tests according to the UN Recommendation on the Transport of Dangerous Goods for the determination of explosive properties of organic peroxides have been compared with screening criteria for explosivity based on measurements in a closed mini-autoclave (MCPVT). This additional screening test may be helpful, but the information obtained from the UN tests are more important to characterize the specific properties of a substance under different conditions.

"Calorimetric Behaviors of Hydroxylamine and its Salts Caused by Fe (III)," M.Kumasaki, Y.Fujimoto, and T.Ando, *J.Loss Prev. Process Ind.* **16**, No.6, 507-512 (November 2003).

Information was obtained on the calorimetric behaviors of aqueous solutions of hydroxylamine, hydroxylchloride, and hydroxylnitrate caused by different Fe(III) states. The calorimetric data were obtained in a small-scale reaction calorimeter Super-CRC. Hydroxylamine showed the highest reactivity among the three in mixing with Fe(III). A method is suggested to inhibit a violent exothermic reaction of HA.

"Emergency Relief System Design: In Case of Fire, Break Assumptions," D.K.Das, *Chem.Eng.* **111**, No.2, 34-40 (February 2004).

The current practice of estimating heat load due to fire per NFPA-30 is outlined and the shortcomings are indicated. The code should be supplemented, if necessary, for calculating fire heat load. The NFPA-30 heat load falls low for fires involving hexane and lighter hydrocarbons. Calculation of fundamental variables such as flame temperature, flame height, and hence the fire load, are compared to the head load predicted by NFPA-30.

"Journey Towards Sustainable Development: A Role for Chemical Engineers," S.K.Sikdar, *Env.Progress* **22**, No. 4, 227-232 (December 2003).

With the increasing use of non-renewable

resources to support an increasing population an unsustainable situation has been created. The practice of chemical engineering, perhaps more than any other technical discipline, involves the use of natural material and energy resources for the production of value-added articles and services of commerce. It is critical that chemical engineers incorporate the ideas of sustainability into process and product design, manufacturing, and value chain management.

"The Overall Activation Energy of the Exothermic Reactions of Thermally Unstable Materials," M.Malow and U.Krause, *J.Loss Prev.Process Ind.* **17**, No.1, 51-58 (January 2004).

The exothermic reactions of thermally unstable materials have been studied using self-heating methods in a wire-mesh-reactor as well as temperature programmed methods utilizing a Differential Scanning Calorimeter (DSC). Samples of lignite coal dust, cork dust, detergent powder, and vitamin B2 were investigated. The overall activation energy E could be determined by each method. Explanations are given where there were differences in the two methods.

"Conducting a Process Plant Safety Audit," I.M.Duguid, *Chem.Eng.* **111**, No.4, 46-54 (April 2004).

Analysis suggests that the most likely causes of major past incidents will probably remain the most likely causes of future incidents. A small proportion of causes produces a large proportion of results. The process safety audit provides data on major process related incidents. This paper provides specific questions to be answered in a process safety audit and includes 41 specific useful checklists.

"Hazard Versus Risk," J.A.Singley, *Chem.Health and Safety* **11**, No.1, 14-16 (January/February 2004).

The general public has trouble differentiating between the terms hazard and risk. Sometimes there is confusion among professionals regarding the terms. Through the use of the simple equation: $H + R = A$, explanations become easier. There are only two ways that the H term can be mitigated - remove the hazard or stop the work. The most common method of preventing an accident is reducing the probability of the R term occurring.

AND MORE PAPERS**"Learning from Reactive Chemistry Incidents,"**

J.K.Carpenter, D.C.Hendershot, and S.J.Watts, *Chem.Health and Safety* **11**, No. 4, 10-16 (July/August 2004).

Understanding the causes of past reactive chemistry incidents is an important tool for preventing future incidents. The details of a particular incident are specific to the process and chemistry in which it occurred. However, all incidents provide general lessons that are useful for preventing future events, regardless of the technology and chemistry. Three reactive chemistry incidents are reviewed, focusing on general lessons which are applicable to a wide range of processes and technologies. The three incidents detailed all could have been prevented with knowledge of the chemistry, process, and the potential hazards. Open communication among all levels of the organization is crucial to the safety and success of production.

"Different Scale Experimental Techniques to Approach the Problem of Substances Generated in the Loss of Control of Chemical Systems: A Study on Ethyl Diazoacetate Decomposition," K.Marsanich et al, *J.Loss Prev. Process Ind.* **17**, No.1, 9-22 (January 2004).

The present study was directed to the development and assessment of procedures for the identification of products formed in the loss of control of chemical systems caused by exothermic decomposition reactions. The specific aim was the comparison of results in four different scale experimental devices when testing ethyl diazoacetate. The results indicated that sufficient agreement was present in the data obtained for the thermal effects and for the apparent kinetic parameters of the thermal decomposition. However, the analysis of the decomposition products showed important differences both from the qualitative and quantitative aspects.

"Obtaining More and Better Information from Simple Ramped Temperature Screening Tests," R.D.McIntosh, and S.P.Waldrum, *J.Thermal Analysis and Calorimetry* **73**, 35-52 (2003).

Thermal screening of materials is a vital part of hazard assessment. Several screening methods are presented, and the subject of ramped temperature screening tests is studied in detail.

Data obtained using the Thermal Screening Unit (TSU) are compared to the results from other types of apparatus. Heats of reaction and kinetic data have been calculated and compare well with data obtained using much more sophisticated adiabatic calorimeters.

"Methods for Incorporating Uncertainty into Dispersion and Deposition Models,"

D.K.Williamson, A.J.Graettinger, and A.Yegnan, *Env. Progress* **23**, No.2, 158-167 (July 2004).

Dispersion and deposition models are critical components of risk assessments for airborne discharge from industrial facilities. The probabilistic nature of risk assessment, the complexities of dispersion and deposition models, and the natural variability of input parameters all support the need for probabilistic output. A series of relatively simple case studies demonstrate that the Taylor series is a flexible and computationally efficient method for incorporating input uncertainty in air transport models.

"Protect Workers and the Environment: Choosing Fixed-point Gas Detection Sensors,"

A.Austin, *Chem.Eng.* **111**, No.5, 46-51 (May 2004).

Throughout the chemical process industries employees and facilities face potential exposure to toxic and combustible gases and vapors, and oxygen deficiency situations. The primary line of defense is the use of fixed-point gas detection systems. By combining analog technology with newer digital protocols, greater reliability and operational flexibility can be obtained, there will be more rapid response and recovery, the access to process data and recordkeeping can be simplified, and installation, calibration, and maintenance requirements are reduced.

"Getting the Most Out of HAZOP Analysis,"

A.Wong, P.Guillard, and N.Hyatt, *Chem.Eng.* **111**, No.8, 55-58 (August 2004).

Streamlining the preparation of a plant-wide HAZOP analysis to make the process more time- and cost-effective can provide both safety and efficiency dividends. Numerous techniques that are discussed in this paper have evolved over the years to streamline the HAZOP analysis process. Auditing the final document by an experienced person is important. ■



LOSS PREVENTION ON CD-ROM II

The Second Edition of the Loss Prevention Symposium CD-ROM is now available. This set of 2 CD-ROMs includes all of the papers presented at the Loss Prevention Symposiums from 1967 through 2003, and the CCPS Annual Conferences and Workshops from 1987 through 2003. The discs contain well over 1000 papers and 20,000 pages of process safety information, including papers that were presented but not published at the time. It includes, of course, all of the papers that were in the First Edition. The CD-ROMs are fully indexed for ease in searching the literature.

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This is a joint project of CCPS and the Safety and Health Division so that sales benefit both organizations. The list price is \$199.00. Division members who own the First Edition (Publication G-49) should clip the \$20 coupon from inside of the CD case cover and use it for a discount on the Second Edition, which is Publication G-77 (ISBN 08169-0871-0).

An order form with the correct mailing address, together with additional information, can be found at: www.aiche.org/pdflibrary/pubs/book02.pdf. This new CD-ROM product is a must-have item as an invaluable aid for all engineers involved in process safety activities. ■

ANNUAL SYMPOSIUM ON AMMONIA PLANT SAFETY

The 49th Annual Safety in Ammonia Plants and Related Facilities Symposium is scheduled for **September 20-23, 2004**, at the Hyatt Regency Denver Hotel, Denver, CO. These annual symposiums are dedicated to safety in plants that manufacture ammonia and related chemicals, such as urea, nitric acid, ammonium nitrate, and methanol. Subjects include hazardous incidents, safety developments, design issues, technological advancements, and maintenance improvements.

Highlights of the 49th Annual Conference include a keynote address by John Bresland, a member of the U.S. Chemical Safety and Investigation Board; over 25 high-quality research and practice papers by international experts; and a roundtable workshop that will involve attendees in a problem solving session. Each of the roundtable topics will include brief, unrecorded presentations by panel experts followed by a moderated panel discussion and an audience question-and-answer period.

For further information see:

www.aiche.org/ammonia/. ■

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