Safety & Health News

AIChE
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS

SAFETY AND HEALTH DIVISION
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SAFETY FORUM
HOMELAND SECURITY

Politicians posture, journalists ponder, think-tank experts pontificate, and the public is perplexed. But engineers, the "doers" and "fixers" in our society, get down to work, not for public acclaim, certainly not for stock options and company loans for yachts and mansions, but for the knowledge that the technical work they are doing will have significant benefits. What is the issue at stake? Homeland security.

Chemical and petrochemical plants, petroleum refineries, large tank farms, and other facilities that manufacture, store, use, transport, or handle hazardous chemicals are potential targets of intentional terrorist attacks. In November 2001, a Chemical Security Subcommittee was formed by CCPS to develop a strategy regarding technical and management practices for chemical security in such facilities. The Subcommittee included both security and process safety experts. The work of these experts resulted in a book entitled *Guidelines for Analyzing and Managing the Security Vulnerability of Fixed Chemical Sites*. This book is available free of charge in electronic format only, and may be accessed from the web site:

www.aiche.org/ccps.

The book includes a useful tool identified as Security Vulnerability Analysis (SVA) that can be used by any organization involved in the manufacture or use of chemicals at a fixed site. The book also provides tools and guidance on approaches to managing the risks.

In another action, AIChE is involved with other technical organizations such as ASME, IEEE, and ACS in a series of briefings on vulnerability and security. The attendees at these briefings learn about cutting-edge technologies to reduce the threats and to mitigate the damage and harm from terrorist acts.

Nuclear engineers are very heavily engaged in conducting top-to-bottom reviews of security measures and requirements at nuclear power plants, certainly vulnerable facilities. Structural and electronic security systems are being scrutinized and then enhanced to prevent infiltration and tampering. Engineers are also involved in developing community evacuation plans.

Potable water treatment systems are vulnerable perhaps not so much from introduction of chemical or biological agents into the water supply, which would require a very extensive operation to be effective as a terrorist action, but rather from the standpoint of significant damage to major pumping facilities. Visualize the horror of a major explosion and fire in a populated area that was suddenly also without the availablilty of any significant water supply. Civil, environmental, and other engineers are developing mapping tools to indicate potential areas of concern. Early warning and detection systems are being designed and installed as appropriate.

Structural engineers are examining construction of large buildings and are assessing capacity to resist abnormal loads from fires and explosions. Mass evacuation plans are critical for any large building and must be incorporated in the design of future buildings. These types of studies will be instrumental in establishing standards for construction of new buildings.

Electrical engineers are working to ensure continuous communications on a broad scale during emergency situations. Heating, ventilating, and air conditioning engineers are developing systems that will feature significant air cleaning components such as photocatalytic devices. And the list goes on!

Sam West

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SAFETY AND HEALTH DIVISION UPDATE
WALT FRANK, CHAIR

Jack Weaver Retires: As detailed later in this Newsletter, Jack Weaver has decided to retire from full-time employment with AIChE. I first met Jack in his role as Director of the Center for Chemical Process Safety and enjoyed working with him on a number of CCPS projects.

Jack wore a number of other hats at AIChE, and the Safety and Health Division owes him special thanks for the assistance he gave in one of his other roles. In the Spring Newsletter, I briefly discussed the frustrations that many of the Program Area 11a Committee members had at the conclusion of the 2001 Loss Prevention Symposium in Houston. We were concerned that logistical problems at that meeting location had detracted from the quality of the symposium. There were some of us who were determined that we were not going to return to that particular venue, even though we were scheduled back to the same convention center two years later.

Jack calmly listened to the complaints of us rabble rousers, and then arranged a series of conference calls between representatives of the Area 11a Committee and the AIChE Meetings Department. Over the next several months, with Jack's guidance, we resolved a number of issues that added to the success of the 2002 Loss Prevention Symposium in New Orleans and resulted in the relocation of the entire 2003 AIChE National Spring Meeting from Houston to New Orleans. I am confident that this was no easy task.

Jack's continued support of the Division has helped us ensure the continued quality of one of the most important services that we provide to the Division membership. Please join me in thanking Jack for his assistance and wishing him well in his future endeavors, which I am glad to hear include a part-time role at CCPS. Thank you, Jack!

Safety in Ammonia Plants: The 47th Annual Safety in Ammonia Plants & Related Facilities Symposium, organized by Program Area 11c, is scheduled for September 16-19, 2002, at the Loews Coronado Bay Resort, Coronado, CA, in the San Diego area. Over 25 high quality papers will be presented along with roundtable workshops.

2003 Spring National Meeting: The AIChE Spring National Meeting will be held in New Orleans from March 30 to April 3, 2003. The agenda will be a busy one for the Safety and Health Division. The Area 11a Committee is preparing the 37th Annual Loss Prevention Symposium and the Area 11b Committee is sponsoring the 6th Biennial Process Plant Safety Symposium (PPSS). There is still time to propose a paper for the PPSS since the deadline for abstracts is October 1; the planned sessions are listed in the Summer 2002 *Safety & Health News*. If you wish to present a paper, contact Randy Freeman, PPSS Chair, at **281-877-6407**, or go to **www.aiche.org/springapp/** where a Proposal-to-Present web page has recently been opened for the meeting.

The Annual Division Banquet and the Annual Meeting of the Division Executive Committee will also be held during the Spring National Meeting. This meeting is the primary forum for the Safety and Health Division. If you have never attended - or it has been a while - please consider planning to attend in 2003. I am confident that you will find the technical content worthwhile, the networking opportunities excellent, and the location enjoyable.

Safety and Health Division Web Site: Please find a moment and visit our Division web site at **www/shdiv/aiche.org**. The site contains information about the Division organization, programs, and publications, as well as a number of useful links to sources of health, safety, environment, and fire protection information. If you have some favorite links that you find useful, please submit them and we will add them to the site. Perhaps one of the most useful tools is the complete Table of Contents for all issues of *Process Safety Progress* (and its predecessor, *Plant/Operations Progress*). Created and maintained by Dennis Hendershot of Rohm and Haas, this database permits keyboard searches by author or article title, and is a valuable research tool.

Division Elections: Each year, we elect a Second Vice-Chair to start the path to Chair, and two new Directors, who will serve three-year terms. Past-Chair John Murphy serves as Chair of the Nominating Committee and would like to hear from Division members interested in running for election. **Division Membership:** Since you are reading this Newsletter, most likely you are a member of the Safety and Health Division - unless, of course, you lifted this from a co-worker's desk. If the latter is the case, aren't you ashamed? Join the Division! If you are a member, help us by convincing an associate or two to join. Your associates will get the benefits of membership and you will be able to keep your copy of *Process Safety Progress* on your desk where it belongs. (See page 12 for a membership coupon.)

Walt Frank, PE

37TH ANNUAL LOSS PREVENTION SYMPOSIUM

John Murphy, Chair of the 37th Annual Loss Prevention Symposium scheduled for **March 30-April 3, 2003** in New Orleans, reports that plans for the technical content of the sessions are approaching completion. There are several timely sessions that complement the more usual process safety topics.

One session is on "Engineering Issues in Security of High Hazard Facilities," a real concern since the 9/11 terrorist attacks. Presentations will include the work on chemical processing plant security being done by CCPS and by the American Chemistry Council. In addition, there will be a discussion on the Sandia National Elaborations recently issued report on "Vulnerability Assessment Methodology for Chemical Facilities."

Another session will address "Process Safety Legal/Liability Issues." This topic is of real concern for all process safety professionals. Presentations will be given from both the legal and the consultant point of view.

The "Case Histories and Lessons Learned" session, a favorite each year, will have presentations covering recent chemical plant incidents with what can be done to prevent future accidents. John says, "I believe we have a very exciting program that combines new process safety topics with the traditional ones. In addition, the meeting is in New Orleans, a city known for its hospitality. We expect a big crowd for this important event." ■

DIVISION DUES FOR 2003

The good news is that the basic Safety and Health Division dues for 2003 will not change. The annual dues will remain at **$39** which includes a subscription to *Process Safety Progress* and the Newsletter. Members can choose either a print version or an on-line version. For members selecting BOTH print and on-line versions, the dues will increase from $62 to **$65.** Postage for the print version for members outside of North America will increase from $39 to $**40**.

➜ Your comments, suggestions, and ideas about Division matters are always welcome. Page 2 contains a list of the officers and directors along with addresses, phone numbers, and e-mail addresses. ➜

SAFETY PEOPLE

Kris Chatrathi, 1st Vice-Chair of the Division and Chair for 2003, recently joined CRB Consulting Engineers in their Kansas City, MO, headquarters office as a senior process engineer. In this new position, Kris is actively working on the expansion of a biopharmaceutical manufacturing facility. CRB is a design firm primarily involved in facility and process design for high technology industries such as pharmaceuticals, specialty chemicals, and microelectronics.

Do you have an unusual fire/explosion challenge? **Dr. Erdem A. Ural**, long active in Safety and Health Division affairs, is now President of Loss Prevention Science and Technologies, Inc. (LPSTI) in Stoughton, MA. The organization specializes in loss prevention through cost effective utilization of science and modern technologies. Erdem was the principal investigator of numerous research projects on gas and dust explosions, aircraft fire/explosion protection, thermal environments produced by fire, heat, and smoke, fire and explosion suppression, and advanced fire protection agents.

Steven G. Schoolcraft, CSP, PE is now the Examination Director for the Board of Certified Safety Professionals (BCSP) in Savoy, IL. He is responsible for examination product development, maintenance, and delivery for BCSP and for programs administered by BCSP. He has had experience in diverse safety, risk, and reliability efforts and was involved with CCPS projects. ■

OBITUARY

Herbert ("Bert") A. Lawley, well known as one of the real pioneers of HAZOP, died in March 2002 at the age of 74. He joined ICI as a research chemist and then moved to process investigations. HAZOP was developed by the ICI Petrochemicals Division in 1963 in response to the needs of a specific project. The HAZOP process then gradually became somewhat degraded. Bert restored the program to its full rigor starting in 1970.

In 1973, he presented the seminal paper on HAZOP at the AIChE Loss Prevention Symposium. Its detailed example of a HAZOP has been quoted far more often than any other example.

THE CCPS PAGE
CENTER FOR CHEMICAL PROCESS SAFETY

JACK WEAVER RETIRES

Jack Weaver retired on July 1, 2002, as Senior Director of the AIChE Industry Technology Alliances (which includes CCPS), Meetings, Programming, and Educational Services. He joined the AIChE staff nine years ago following retirement as Executive Management Consultant and Vice President for Roy F. Weston, Inc., where he assisted corporate clients in establishing and assessing overall management systems for safety, health, and environmental affairs.

During the nine years of Jack's leadership, CCPS expanded corporate sponsorship, developed a business case for process safety, established process safety in undergraduate chemical engineering programs through SACHE, and most recently initiated programs on site security.

Prior to his work at Weston, Jack was a Vice President at Rohm and Haas Company where he was responsible for corporate engineering and environmental affairs, process safety, risk management, and occupational health and safety.

He holds a BS degree from Cornell and MS and PhD degrees from the University of Delaware, all in chemical engineering.

Jack will continue with CCPS as a Staff Consultant and will be active in other AIChE activities as a volunteer.

Scott Berger, Senior Manager of CCPS, will assume the leadership responsibilities for CCPS and DIERS, while Jo Rogers, Director of CWRT, will also become administrator of DIPPR. ■

BRESLAND NOMINATED TO US SAFETY BOARD

The White House has nominated John Bresland, a CCPS Staff Consultant and AIChE member, to serve a five-year term as a member of the US Chemical Safety and Hazard Investigation Board (CSB). This appointment is subject to Senate confirmation. The CSB is a technical agency charged with investigating major chemical accidents at fixed facilities. The goal is to determine the root causes of the accidents and to make key recommendations to various government agencies and to the organizations involved in the incidents. The long term goal is to promote prevention of major accidents.

Bresland is President of Environmental and Safety Risk Assessment, LLC, a New Jersey-based process safety consulting firm. From 1996 to 2000 he was with Honeywell International (formerly AlliedSignal). His most recent assignment there included responsibility for compliance with the EPA Risk Management Program. He became a Staff Consultant for CCPS in 2000.

He holds degrees in chemistry from Londonderry Technical College in Northern Ireland and Sanford University in England. ■

BEACONS LIGHT THE WAY

The CCPS *Process Safety Beacon* program, started late in 2001, has had wide acceptance and value. Each month, a one-page document is issued to deliver process safety messages to plant operators and other manufacturing personnel. Real-life accidents are described, lessons learned are discussed, and practical means to prevent the accidents in your plant are presented, all on one page. The following subjects have been covered:

Nov. 2001 Trace quantities cause problems
Dec. 2001 Snow and ice hazards
Jan. 2002 Explosions
Feb. 2002 Vacuum problems
Mar. 2002 Layers of Protection
Apr. 2002 Gas cylinders
May 2002 Battery hydrogen explosion
June 2002 Pipe mazes
July 2002 Seals

For further information about these useful data sheets, contact: Clare Bennett, **212-591-7319**, or **clarb@aiche.org**.

CCPS ON SECURITY

Because of the importance today of plant site security, a web site has recently been established to provide tools and approaches. The site is:

www.aiche.org/ccpssecurity. ■

For further information about CCPS, contact:

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MAINTENANCE AND MECHANICAL INTEGRITY

CCPS is now ready to launch a new project to develop a Guidelines book addressing the design, implementation, and management of effective maintenance and mechanical integrity (M&MI) systems in process plants. The objectives are to publish a book to aid in understanding and complying with M&MI requirements, to help fill the gap being created by the loss of experienced M&MI personnel, to communicate common sense lessons learned from the first three rounds of triennial PSM compliance audits, to provide an introduction to new approaches to M&MI such as risk-based inspection, and to provide an introduction for PSM practitioners needing a basic understanding of M&MI concepts in the implementation of other elements.

The benefits of this book include more effective M&MI programs and greater confidence of compliance with regulatory requirements.

The first step is to assemble a committee that has a diverse composition. Experts in the areas of maintenance and mechanical integrity, reliability, process safety, and plant operations are needed to have a successful conclusion to the project. If you are able to serve on this committee and work for a CCPS sponsoring organization, please contact: **ccps@aiche.org**. ■

PROJECT STATUS

The current status of a few key CCPS projects are noted here:

- Essential Practices to Managing Reactive Chemical Hazards: A ten-page document has been developed and published. A Concept Book is now being prepared with Bob Johnson of Unwin Corporation as the contractor. The meat of the book is the third chapter on screening tools. The targeted date for issue is October 2002.
- Retaining Corporate Memory During Organization Changes: A survey of CCPS sponsor organizations has been made to determine what companies are doing to retain corporate memory. Most companies (75%) are not doing anything specifically. Limited formal activity is conducted by 25%. A Concept Book is now out for peer review.
- Reactive and Flammable Particulate Solids: A Guidelines Book on handling hazardous solid materials is in preparation.
- Facility Siting and Layout: A Guidelines Book on safe siting/layout issues is in preparation. ■

RISK, RELIABILITY, AND SECURITY CONFERENCE

The 17th Annual International Conference and Workshop organized by CCPS is scheduled for **October 8-11, 2002,** at the Jacksonville, FL, Adam's Mark Hotel. The conference will address the related topics of risk, reliability, and security relevant to the world today. There are nine co-sponsor organizations. The conference Chair is Lisa Morrison of NOVA Chemicals.

The integrated processes of risk analysis, that is, identifying the underlying sources of risk, determining the pathways by which such risks can materialize, estimating the potential consequences of these risks, and providing means for mitigating these consequences, are critical technologies for responsible companies.

Reliability programs that prevent the release of hazardous materials, increase on-stream efficiency, and reduce active maintenance costs are drivers for improved profitability.

Although security is a component of traditional risk analysis, separate consideration of key issues is warranted in the climate of today. Both site and transportation security will be addressed.

The keynote address will be presented by Charles Jeffress, the recently appointed Chief Operating Officer of the US Chemical Safety and Hazard Investigation Board. There will also be two important luncheon addresses by key speakers.

Among the excellent papers to be presented regarding security are **"Consequence Modeling of Gas Explosion Scenarios in Traffic Tunnels,"** TNO Prins Maurits Laboratory, the Netherlands, **"Issues of Chemical Plant Security,"** BASF, and **"Transportation Security in the Face of Terrorism,"** Dow Chemical.

In addition to the several plenary sessions, five Workshops will provide an interactive environment for exchange of ideas and concepts with experts from CCPS sponsor companies.

For detailed information and registration procedures refer to:

www.aiche.org/ccps/icw/.

ENGINEERS AREN'T PROFESSIONALS

A new Internet domain reserved for professionals has been announced by RegistryPro Inc, through a contract with the Internet Corporation for Assigned Names and Numbers. This new ".pro" domain will be launched in late 2002 or early 2003. It was indicated that it will be reserved for physicians, attorneys, and accountants.

The National Society of Professional Engineers criticized the plan since it was not to be available to engineers. The organization pointed out that it was ironic that the very profession largely responsible for the development of the technology that has made, and continues to make, the Internet a reality is not among the professions included in the new domain. The decision to exclude Professional Engineers from use of the new domain fails to give proper recognition to the practice of engineering which is regulated under state laws and requires significant education, testing, and experience for practitioners.

The RegistryPro organization will establish an advisory board of professionals to help define eligibility requirements for the domain.

The ".pro" domain will be the first to require enhanced security. Registrants will need to certify their professional credentials and each will be issued a digital certificate. This will permit security measures such as encryption and digital signature services. ■

PRODUCT STEWARDSHIP IN DEVELOPING COUNTRIES

The Center for Waste Reduction Technologies (CWRT) of AIChE is starting a project to study the best product stewardship and waste disposal practices in developing countries. It is difficult for a single company to monitor the changing international regulatory climate, regional product stewardship and waste management practices, and commercial waste facility status. There is currently no global network for companies to exchange this type of information. The proposed study will draw on the experience and expertise of multinational corporations and other organizations to develop an international model and valid database.

At this time, there are 5 companies starting to participate in the project. Any members of the Safety and Health Division who have an interest in this project or who can identify persons within their organizations who could participate, please contact Dana Ponciroli at CWRT: **danap@aiche.org.** ■

REACTION TO REACTIVE CHEMICALS

Reactive chemical incidents pose a significant problem, and the relevant federal accident prevention regulations have serious gaps, according to preliminary report findings presented by the US Chemical Safety and Hazard Investigation Board (CSB) at a public meeting on May 30 in Paterson, NJ.

The CSB findings were based on an examination of 167 separate incidents that occurred since 1980 and that caused 108 deaths. More than half the incidents involved chemicals not covered by either the OSHA Process Safety Management (PSM) standard or the EPA Risk Management Program (RMP) rules.

Reactive chemicals may often appear relatively non-hazardous as such, but can undergo uncontrolled reactions when improperly processed or combined, resulting in fires, explosions, and toxic releases. Such incidents are not unique to the chemical processing industries, but also occur in many other industrial and commercial sectors where chemicals are stored, handled, or used.

The CSB further found that despite the existence of much information on chemical reactivity in the technical literature and elsewhere, industry is not utilizing the information sufficiently or effectively. According to the lead investigator John Murphy, "in at least 90% of the accidents we analyzed, information on the hazards was obtainable from publicly available literature. However, federal workplace safety regulations contain few specifics on the need to review reactive hazard information." Safety and Health Division members will recognize that John Murphy is the immediate Past-Chair of the Division.

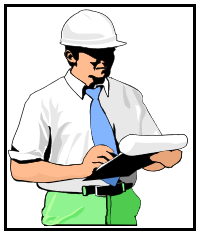
Following a fatal accident in Lodi, NJ, in 1995, several labor unions petitioned OSHA to toughen regulations on reactive chemicals, but recently OSHA dropped the issue from its annual regulatory agenda.

Editorial note: These reactive chemical issues were addressed in the *Safety & Health News* Safety Forum Sections in the Summer 1996 and the Fall 2000 issues. It was pointed out that the problem is not "reactive chemicals" but rather "chemical reactions" since essentially all chemicals are reactive to some degree. Defining reactive chemicals in a meaningful regulatory way is essentially not likely when control of chemical reactions is the real problem. It was indicated that developing regulations for such control was a daunting task if indeed possible. ■

SAFETY NOTES

- Sweden leads in sustainability in the first global assessment of sustainable development according to rankings of 180 countries by the World Conservation Union (IUCN). European Union countries dominated the top 10. Canada was 7th, Japan 24th, and the United States was 27th in the rankings. The Dominican Republic, Belize, Guyana, Uruguay, Suriname, and Peru - all developing countries - were in the top 20. The IUCN assessment includes a wider range of human and ecological factors than traditional yardsticks which are frequently based on Gross Domestic Product.

- Current typical human population exposures to **methanol** are unlikely to cause developmental problems according to a report recently issued by the Center for the Evaluation of Human Reproduction of the National Toxicity Program. According to the report, the dietary main exposure route in the USA leads to less than 10 mg/liter of methanol in blood, a level unlikely to cause problems. Methanol exposure could well increase if alcohol-based fuels for cars become prevalent since some methanol may be introduced in the blending.



- The Office of Hazardous Material Safety is a part of the Research and Special Programs Administration of the Department of Transportation. It deals with safety of hazardous materials (HAZMAT). The office is responsible for coordinating a national safety program for transporting hazardous materials by air, rail, highway, and water. The web site is useful for links to risk management, truck shipment accidents, and shipping incidents. The web site is:

  http://hazmat/dot.gov.

- The Department of Health and Human Services has released guidelines for protecting ventilation systems of commercial buildings from chemical, biological, and radiological attacks. The guidelines give recommendations that address the physical security of ventilation systems, airflow and filtration, systems maintenance, program administration, and maintenance staff training. Details are available at:

  www.cdc.gov/niosh/hhs-ventrel.html.

- The current problem in the USA with anthrax in the mail is far from the first incidents in history. Diseases, such as bubonic plague and smallpox, that struck Venice in the 1300s seemed to be coming from the trade routes from the Middle East and Far East. The Venetians knew that humans could spread disease, so they quarantined persons entering the city. Correspondence followed the same trade routes so the Venetians suspected it as well. Thus, incoming correspondence was treated with vinegar and perfume. From then until the 1920s, people tried periodically to disinfect mail during epidemics. The practice was widespread in Europe and was also used to some extent in the USA. The recent anthrax matter is an entirely new event, however, since the organism did not find its way into the mail in a natural way.

- The Department of Labor has developed an "Anthrax Matrix" to assist employers and employees dealing with possible workplace exposures to anthrax. There are links to useful information and practical guidance to aid in developing appropriate actions. There are also links to general information about anthrax as well as to detailed information from the CDC, the US Postal Service, the FBI, and other sources about biological and chemical hazards. These links are available through the main OSHA web site: **www.osha.gov**.

- A voluntary cooperative action between OSHA and the Council on Certification of Health, Environmental, and Safety Technologists (CCHEST) was signed in May 2002 recognizing the Safety Trained Supervisor in Construction certification. Implementation of this non-regulatory agreement should have an immediate, significant, and beneficial impact on achieving safe construction sites through recognition of the safety and health knowledge and the skills of certified individuals present. ■

CHEMICAL REACTIVITY WORKSHEET

Two agencies, the National Oceanic and Atmospheric Administration (NOAA) and the EPA, have jointly developed a system to aid in working with chemicals safely. The Computer-Aided Management of Emergency Operations (CAMEO) program provides information on about 6,000 industrial chemicals.

A Chemical Reactivity Worksheet has been developed by the CAMEO Team. This Worksheet has been revised and then released on July 1, 2002, as version 1.5. This version contains new case history information in the "Chemical Profile" field, some corrected formatting in the general description field, and updating of synonyms and Chemical Abstract Service Registry Numbers. It is a free program that can be used to determine the reactivity of substances or mixtures of substances. The Worksheet can be downloaded at:

http://response.restoration.noaa.gov/chemaids/react.html.

To use the Worksheet, select the appropriate chemicals from the database of 6,080 entries and add them together as a mixture. The Worksheet then predicts the reactivity of this mixture. The Worksheet also can be used to check the intrinsic reactive properties, such as peroxidizability, polymerizability, and radioactivity, of specific chemicals.

In brief, the Worksheet is used as follows. Each substance is assigned to one or more reactive groups based on its known chemistry. Reactive groups are defined as categories of chemicals that react in similar ways because of the similarity in their chemical structure. To predict the reactivity of a mixture of chemicals, the Worksheet first identifies the reactive groups to which the chemicals belong, and then predicts the kinds of chemical reactions likely to occur when members of these groups are mixed together.

The need for the Worksheet developed from activities at NOAA, particularly in the Office of Response and Restoration. This Office responds to dozens of spills of oils and other hazardous materials each year, helps emergency planners prepare for potential accidents, creates software and other tools to help responders to hazardous materials accidents, works to find remedies for environmental damage caused by waste sites in coastal areas, and assesses injuries to coastal resources from various incidents.

NOAA and EPA officials are currently meeting with various government leaders to discuss how CAMEO and related programs could be applied to homeland security. ■

HARMONIZED CHEMICAL HUMAN HEALTH HAZARDS

A report entitled "Harmonised Integrated Classification System for Human Health and Environmental Hazards of Chemical Substances and Mixtures" was issued by the chemical group of the Organization for Economic Cooperation and Development (OECD). This system will be of significant value in defining hazards of chemicals on an international scale. Various industrialized countries as well as the European Union have had different criteria and definitions for chemical hazard categories in the areas of acute toxicity, germ cell mutagenicity, carcinogenicity, reproductive toxicity, and aquatic toxicity. The recommendations in this report, which will gain acceptance in the industrialized world, will ease the burden in the preparation of such items in general as MSDSs and labels, and Premanufacturing/Premarketing Notices for new chemicals.

This 248-page document, as well as many other OECD Environmental, Health, and Safety publications, can be found at:

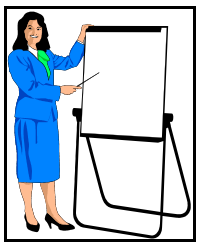
www.oecd.org/ehs/.

The working groups of OECD have been instrumental in harmonizing approaches to chemical regulations in many areas in the international scene. The authorities in the member nations have generally accepted the recommendations, although not necessarily in every detail.

A goal of international harmonization is to enhance the protection of people and the environment by providing an internationally comprehensive system for hazard communications while reducing the need for testing and evaluation.

Some of the important issues that have been harmonized include the following items.

- established OECD Guidelines for Testing of Chemicals in four broad subjects: (1) physical/chemical properties, (2) effects on biotic systems, (3) biodegradation and bioaccumulation effects, and (4) human effects;
- established OECD Principles of Good Laboratory Practice;
- established the mutual acceptance of data in the assessment of chemicals when the testing is run according to the OECD Guidelines under the OECD Good Laboratory Practices;
- defined a Minimum Premarket Data Set (MPD) of testing of new chemical substances (the United States has not accepted this MPD); and
- defined polymeric substances. ■



PAPERS PAPERS PAPERS

"Modeling Blowdown of Cylindrical Vessels Subject to Fire Attack," H.Mahgereftehe, G.B.O.Falope, and A.O.Oke, *AIChE Journal* **48**, No.2, 401-410 (February 2002).

Highly flammable pressurized hydrocarbons are often stored and transported in cylindrical vessels. This poses risks associated with the high pressure and the large quantity of flammable inventory. Blowdown, or rapid intentional depressurization, of such vessels is a common way of reducing the consequences associated with these risks in an emergency situation. However, the expansion process during blowdown leads to significant fluid, and hence vessel wall, temperature drops. If the wall temperature falls below the ductile-brittle transition temperature of the wall material, rupture is likely to occur. The modeling of blowdown is especially complex, requiring detailed consideration of several competing and often interacting heat transfer, mass transfer, and thermodynamic processes. This paper describes a numerical simulation for predicting the risk of rupture following blowdown of vessels containing multicomponent hydrocarbons under fire attack. The model determines the precise mode of vessel failure. It can also be used as an investigative tool.

"Safe Handling of Potent Compounds," T.Fay, N.Phillips, and J.Kraus, Part 1, *Chem.Eng.* **109**, No.4, 62-68 (April 2002) and Part 2, *Chem.Eng.* **109**, No.5, 68-72 (May 2002).

The trend in specialty chemicals and pharmaceuticals is toward the production of relatively small batches of high-potency active ingredients. Such substances impose risks of exposure to manufacturing personnel. Containment of a hazardous chemical requires the establishment of a protective barrier between the chemical and the operating employees. Containment of a hazardous chemical requires specialized equipment to protect employees and the public. In Part 1, the regulations, terminology, and philosophy are discussed. Designing facilities and procedures are covered, and a discussion of personal protective equipment is provided. In Part 2, containment production areas, liquid containment, and solids containment are reviewed in detail.

"The Multiple Runaway-Reaction Behavior Prediction of MEK-Oxidation Reactions," H-J Liaw, C-J Chen, and C-C Yur, *J. Loss Prev. Process Ind.,* **14**, No.5, 371-378 (September 2001).

The behavior of multiple runaway reactions is more complex and difficult to predict compared to more conventional single runaway reactions. A model is proposed here to predict the multiple runaway reactions associated with MEK oxidation. Prediction curves are compared to experimental data. The study includes a systematic procedure to determine the thermodynamic and kinetic parameters of individual reactions, and a kinetic model to describe multiple runaway reaction behaviors. The time-temperature profile is predicted precisely, and the temperature-self heat rate curve is predicted approximately.

"Properly Size Pressure-Relief Valves for Two-Phase Flow," R.Darby, F.E.Self, and V.H. Edwards, *Chem.Eng.* **109**, No.6, 68-74 (June 2002).

This paper describes several of the most common methods in use for sizing relief valves for two-phase flow, and discusses the factors that must be considered when applying each method. The models are compared for the case of ethylene under conditions in the general vicinity of its thermodynamic critical point. A sample calculation is given for the recommended direct-integration method under non-equilibrium conditions.

"Getting Serious About Sustainability," T.E.Graedel and R.J.Klee, *Env. Science & Tech.* **38**, No.4, 523-529 (February 15, 2002).

To get sustainability as a target for industrial society, targets or goals must be quantified. Four basic steps are proposed to begin this process for one aspect of sustainability, namely, the rate of use of resources. The available supply of the chosen resource must be established, the annual permissible supply must be allocated, the recaptureable resource must be established, and the sustainable limiting rate of use must be derived.

"Avoiding Runaway Reactions," B.Venugopal, *Chem.Eng.* **109**, No.6, 54-58 (June 2002).

Risk analysis is an essential tool to be used before the introduction of chemical process operations into a plant. Process safety issues should be considered at the research stage. ■

COST OF FEDERAL REGULATIONS

The Office of Management and Budget prepared a Report to Congress on "Costs and Benefits of Federal Regulations" that appeared as a draft at **67** *Federal Register* 15013-15045 (March 28, 2002). The total annual monetized costs and benefits of so-called social regulations, which include environmental, safety, and health issues, are summarized below in billions of 3rd Quarter 2001 dollars:

	$ Costs	$ Benefits
Environmental	120-203	120-1,783
Transportation	17-22	95-125
Labor	20-22	32-34
Other	24-30	61-66
Total	181-277	308-2,009

Another study by researchers at the Mercatus Center at George Mason University based on a survey conducted in conjunction with the National Association of Manufacturers indicated that manufacturers in the USA paid $28 billion in 2000 to comply with Federal workplace regulations, which was calculated to be about $1,700 per employee each year. This is equal to a 1.6% tax on products manufactured in the USA.

The study also showed that the regulatory burden falls disproportionally on small manufacturing firms that employ fewer than 100 workers. Here the total compliance cost is about $2,500 per employee.

The two most costly categories are related to worker health and safety regulations which account for one-third of the compliance costs.

More information about the George Mason University study can be found at:

www.mercatus.org and at **www.nam.org**. ■

ESTROGENIC MIXTURES

According to a report that appeared in the April 15 issue of *Environmental Science & Technology*, eight weak estrogenic chemicals, all below the levels at which they produce significant effects, were found to produce significant effects as measured by gene assay when combined. Although endocrine-disrupter chemical compounds have been shown to have interactive effects, this is the first report of estrogenic chemicals below their no-observed-adverse-effect level acting together to produce an effect.

The chemicals involved in the mixtures included hydroxylated-PCBs, benzophenones, parabenes, and bisphenol A. Toxicity testing in this area is extremely complex and methods are evolving. It now appears that consideration must be given to testing beyond single chemical effects to consider any mixtures that might be involved in the particular situation. ■

FIRE AT HIGH SCHOOL

On July 7, 2002, a major fire occurred in the chemical storeroom of a high school in Wichita, KS, that resulted in over $1 million in damage. The cause of the fire remains unknown. The chemicals had been segregated and boxed. No injuries were reported. (See a related story about high schools on page 12.)

MATHEMATICS

Teaching math in 1960:
A logger sells a truckload of lumber for $100. His cost of production is 4/5 the price. What is his profit?

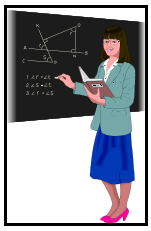
Teaching math in 1970:
A logger exchanges a set of "L" of lumber for a set of "M" of money. The cardinality of set "M" is 100. Each element is worth one dollar. Make 100 dots representing the elements of the set "M." The set "C," the cost of production, contains 20 fewer points than set "M." Represent the set "C" as a subset of set "M" and answer the following question: what is the cardinality of the set "P" of profits?

Teaching math in 1980:
A logger sells a truckload of lumber for $100. His cost of production is $80 and his profit is $20. Your assignment is to underline the number 20.

Teaching math in 1990:
By cutting down beautiful forest trees, the logger makes $20. What do you think of this way of making a living? How did the forest birds and squirrels feel as the logger cut down the trees? There are no wrong answers.

Teaching math in 2000:
A logger sells a truckload of lumber for $100. His cost of production is $120. How did the accountant determine that his profit margin is $20? ■

The 90th Annual National Safety Council Congress and Expo is scheduled for October 7-9, 2002, in San Diego, CA. For further information see: **www.nsc.org/expo02** or contact Gerri Defalco at: **defalcog@nsc.org**.



LAB ACCIDENTS IN HIGH SCHOOLS

According to a report on CNN.com and run by the Associated Press in early July, at least 150 high school students have been seriously injured in chemistry laboratory incidents in the past four years. The number is probably much higher since there is essentially no accident reporting obligations to a centralized authority. As schools try to meet new science education standards set by the National Academy of Science in 1996, students are spending more time in laboratories, which often are crowded. Some are old and not equipped for science in the 21st century. Chemistry teachers have essentially no safety training.

Experts say that almost all accidents and injuries could have been prevented with relatively simple safety measures. For example, face shields and safety goggles are frequently not used. Information about the hazardous nature of some of the chemicals being used is either not available or not understood.

OSHA Laboratory Safety Regulations, even if followed in a well-intentioned manner, do not really protect students. Safety inspections in high schools are essentially non-existent.

This issue provides an excellent opportunity for process safety engineers to provide a valuable service by interacting with chemistry teachers in their home area regarding safety matters. ■

PROCESS DEVELOPMENT DIVISION

A session entitled "PHA/HAZOPs for New Systems and Processes in Manufacturing" is scheduled for the AIChE Annual Meeting in Indianapolis, November 3-8, 2002. This session is sponsored by the recently formed Process Development Division and co-sponsored by the Safety and Health Division. Papers will cover identification of reactivity hazards early in process development and issues of making processes inherently safer through all cycles of research, development, and manufacturing.

This new division was formed in 2000 from Program Group 12, which in turn evolved from the Pilot Plant Group to the more inclusive Process Development Group. The division is still in a "probationary" status. It is expected that Bylaws will be presented for approval to the AIChE Chemical Engineering Technology Operating Council at the Indianapolis Meeting which should then lead to full Division status shortly thereafter.

The Division will promote programming in process research and innovation, scale-up, process design, construction and operation of pilot plants and laboratory units, technology transfer, and optimization of manufacturing processes.

The Division now has about 350 members. It is targeting a membership of 500 in 2003 and 700 in 2004. The annual dues are $10. A Division web site is active at the AIChE web site. An on-line Newsletter is available. ■

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Enclosed is a check payable to AIChE for the annual dues including a subscription to *Process Safety Progress*. Print version is **$39.00***, on-line version is **$39.00**, both versions are **$65.00***. (*If outside North America, add $40.00 for postage.)

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