

Safety & Health News

AIChE
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CHEMICAL ENGINEERS

**SAFETY AND
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PROCESS SAFETY, THE NEXT GENERATION

John F. Murphy, PE

The following is an edited version of the opening remarks that I made as the Chair of the Global Congress on Process Safety held as a part of the AIChE Spring Meeting this past April in Tampa.

This is the fifth year we have combined the 43rd Loss Prevention Symposium (LPS), the 24th Center for Chemical Process Safety Conference (CCPS), and the 11th Process Plant Safety Symposium (PPSS) into the Global Congress for Process Safety. The PPSS was originally organized by the South Texas section of AIChE in 1992, and today continues to focus on process safety and risk issues and solutions for immediate application at process plants and throughout industry. The CCPS Conference has been held since 1985 and focuses on process safety management issues. The LPS is the oldest symposium on process safety, then called loss prevention, and focuses more on the technical aspects of process safety and loss prevention.

We believe the synergism of combining these three major conferences has resulted in the premier international conference on Process Safety. This event has truly become global in scope. We have over fifteen countries represented by registrants and many international speakers. I would like to give my thoughts on the theme of this Congress, "Process Safety, the Next Generation". I will draw on a paper that Dennis Hendershot and I presented to acknowledge the anniversary of the 40th Loss Prevention Symposium in 2006 entitled "The Expanding Role of the Loss Prevention Professional: Past, Present, and Future"¹.

To predict the future, you must first look at the past. During my generation, process safety has been largely shaped by major chemical plant accidents. Before 1966 who had heard of process hazard analysis, quantitative risk assessment, or process safety? To illustrate my point I will draw on four well known process safety incidents. There are many more I could have also cited.

The first incident occurred in Flixborough, England on June 1, 1974 (35 years ago), and involved a vapor cloud explosion that killed twenty eight people. Flixborough resulted in more process safety involvement in process design, stimulated interest in management systems, spurred the development of Vapor Cloud Explosion models, and began the development of inherently safer design concepts.

The incident that occurred in Bhopal India on December 3, 1984 (25 years ago) involved the release of a toxic gas that killed over 2000 people. As a result of this incident, acute toxic release became an issue in loss of containment reviews, facility siting for toxics became an issue, the importance of management of change, mechanical integrity, and other management systems was recognized,

¹ Dennis C. Hendershot and John F. Murphy. "Expanding Role of the Loss Prevention Professional: Past, Present, and Future." *Process Safety Progress* **26** (1) 18-26 (March 2007).

reactive chemicals became more of a concern, and the importance of inherently safer design was reemphasized.

In 1989, a vapor cloud explosion in Pasadena Texas resulted in 28 fatalities. The immediate cause of the incident was inadequate isolation procedures during maintenance. At the time of this incident I had just move to the Dow plant in Freeport, Texas to serve as the site process safety manager. This incident would significantly change my role in process safety for Dow. Some of the lessons learned from this incident were the need for improved management of major hazard installations, the need for better hazard assessment of major hazard installations, the appropriate location of control rooms, and proper isolation procedures for maintenance. This incident was a major driver toward the OSHA Process Safety Management regulation, and resulted in involving me and other loss prevention professionals in process safety management both from a regulatory standpoint and non-regulatory standpoint.

In 2005, a vapor cloud explosion in Texas City, Texas resulted in fifteen fatalities. Because of this incident safety culture and its part in the prevention of major incidents has become an issue.

But these incidents were in the past. What will be the issues of process safety, the next generation? Some of the future issues that Dennis and I see are extensions of existing issues.

- Sharing knowledge – how does the individual know what the engineering community knows? We are doomed to relive the incidents of the past if we do not remember and apply the lessons learn from these incidents. As an investigator of chemical processing incidents, I have observed that this is often a root cause. Incidents seldom involve new hazards.
- Making the business case for process safety – companies have to recognize how good process safety management systems affect the bottom line.
- The challenge of process safety in a global economy – risk based process safety management needs to be embraced and implemented in emerging economies. The same process safety management systems must apply throughout the world, although the details of how to implement PSM should be risk based.
- Complacency – we must maintain a sense of vulnerability. Major chemical plant accidents are rare and it is easy to become complacent and think it cannot happen here. Constant attention to the details of process safety management is mandatory to prevent future incidents.

One thing that is certain – the next generation of process safety will also be largely shaped by future process safety incidents. We owe it to those operating chemical processes now and in the future to help them remember what we have learned from past incidents to prevent future incidents.

– John Murphy, P. E.
Editor, *Safety and Health News*

AIChE SAFETY & HEALTH DIVISION UPDATE

By Dennis Hendershot, Editor, *Safety and Health News*

The planning committee for the 6th Global Congress on Process Safety is working on the program for the Congress, scheduled for March 21-24, 2010, in San Antonio, Texas at the Spring 2010 AIChE meeting. Safety and Health Division Chair Kathy Pearson chairs the Global Congress, and is working with the following symposium chairs to develop a great technical program:

- 25th CCPS International Conference Chair Don Connolley, with help on conference oversight from Roxy Schneider of CCPS
- 44th LPS Chair Ronald J. Willey, and Vice-Chair Delmar "Trey" Morrison
- 12th PPSS Chair Colin S. Howat, and Vice-Chair Steven D. Emerson

At this time, the "Call for Papers" is officially closed, and the session organizers are reviewing submitted paper proposals and finalizing the program. If you have submitted an abstract for consideration, you should hear from the Congress organizers in the next couple of weeks.

It is not too early to start making plans to attend the Global Congress. San Antonio is a great place for a conference, and, for those of us in the northern US, it will be nice to get away from a long winter of cold weather. Registration for the 2010 Global Congress on Process Safety will open in December 2009. Check the internet at <http://www.aiche.org/Conferences/Specialty/GCPS.aspx> for up to date information on the technical program and registration information.

As the end of the year approaches, it is time to think about volunteering to help with Division leadership positions for next year. First Vice Chair Pete Lodal will automatically move up to Division Chair, and Second Vice Chair Cheryl Grounds will become First Vice Chair. We will be looking for candidates for 2010 Second Vice Chair (who will move up to First Vice Chair in 2011, and Chair in 2012), Secretary-Treasurer, as well as two Division Director positions (3 year terms, from 2010 through 2012). If you are interested in running for one of these positions in the Division elections, please contact Past Chair Bob Johnson (rjohnson@unwin-co.com) and let him know that you are interested. And, be sure to vote in the Division election when you get the email with ballot information.

As I finished this note, I received a telephone call from Dick Schwab informing me that Bill Bradford, long time Safety and Health Division leader and Treasurer, process safety and loss prevention pioneer, and good friend to all, had passed away during the second week of October 2009. We offer our condolences to Bill's family and friends. We will publish a complete obituary in the next issue of *Safety and Health News*.

PROCESS SAFETY IN LABORATORIES: CHEMICAL SAFETY LEVELS?

Russell Phifer, 2009 Chair, ACS Division of Chemical Health & Safety

An idea which has emerged from the ACS Division of Chemical Safety was the subject of a paper by Ralph Stuart of the University of Vermont at the recent ACS National Meeting in Washington DC. The establishment of chemical safety levels (CSLs) was first proposed several years ago; the concept has gotten more attention lately in light of numerous accidents in academic laboratories. Several of these accidents have resulted in significant property damage and injuries; one, at UCLA in December 2008 resulted in the death of a research assistant. If one goes by the theory that all accidents can be prevented, it seems logical to assume that establishing specific criteria for the use of safety levels could help prevent accidents and thus save lives. The concept, based on the idea of biosafety levels, is essentially control banding with levels 1 to 4 for laboratory activities. The result would be a general guideline for appropriate protections. The factors to be considered in establishing the level are the traditional chemical safety hazards – flammability, corrosivity, toxicity and reactivity. Borrowing from Ralph's paper in Washington:

- CSL-1: no ventilation (e.g. cold rooms and warm rooms)
Chemical uses similar to residential settings (kitchens and cleaning products)
- CSL-2: general ventilation (X air changes/hour)
Chemical uses similar to cars (gallons of flammables and assorted other chemicals)
- CSL-3: local ventilation (i.e. hoods)
Chemicals similar to hardware stores – emergency concern is unexpected reactions
- CSL-4: high hazard storage or processes that require specialized procedures

There are other factors to be considered in any risk assessment, including building design, availability of resources, and the level of expertise of the experimenter. All of these contribute to the risk assessment tools that might be utilized to establish the appropriate level in a particular workplace for a specific procedure. Each CSL would address the four basic chemical hazards, establishing guidelines based on what are necessarily somewhat arbitrary degrees of concern. In other words, toxicity would be based in most cases on PELs or TLVs, which do not take into account personal risk factors. Likewise, flammability needs to consider both the flashpoint of a chemical and flashpoint as a percentage of the lower explosive limit. Other hazards need to be quantified as well, and it may be advisable in the long run to also consider pressure and radioactivity as determining factors in establishing CSLs.

Would implementing such as risk assessment policy save lives? That would be the hope. Certainly, any effort to increase awareness of the inherent risks in chemical procedures is a positive. The hope here is that the system will be further developed, vetted by the stakeholders, and adopted.

Like many recent papers from DivCHAS sessions at ACS meetings, slides from Ralph Stuart's talk are available online. The URL is:

http://membership.acs.org/c/chas/techarchive/lab_vent/stuart09_csls.pdf

JAY YOUNG HONORED IN INAUGURAL CLASS OF ACS FELLOWS

The ACS Fellows Program was created by the ACS Board of Directors in December 2008 "to recognize members of the American Chemical Society for outstanding achievements in and contributions to Science, the Profession, and the Society." Unlike ACS national awards, the distinguished honor of a Fellows designation will go to those who have distinguished themselves in multiple areas, including promoting the science, the profession, and service to the American Chemical Society. Ultimately, the body of Fellows is intended to reach approximately 1-2% of ACS membership². Jay A. Young, long time active member of the ACS Division of Chemical Health and Safety was among the 162 people honored in the inaugural class of ACS Fellows at the ACS National Meeting in Washington, DC in August 2009. At right, Jay is pictured with DCHAS Chair Russ Phifer at the Washington meeting.



² portal.acs.org/portal/Navigate?nodeid=2246

PROCESS SAFETY SHORT COURSE AT CHEM SHOW

AICHE and CCPS will present a short course "Process Safety Practices in the Chemical Processing Industry" on Tuesday November 17, 2009 from 12:30 PM to 3:30 PM at the Chem Show in New York. The course is part of "AIChE Day" at the Chem Show, a one day conference organized by AIChE including a number of short courses on various chemical engineering topics. More information can be found at:

http://chemshow.com/forvisitors/education_aiche.php

NEW CCPS BOOK: GUIDELINES FOR DEVELOPING QUANTITATIVE SAFETY RISK CRITERIA

CCPS has published a new book, *Guidelines for Developing Quantitative Safety Risk Criteria*. The book describes a process for developing risk criteria as a risk management tool. It also summarizes various criteria which have been used in the process and other industries and technologies throughout the world, valuable information in developing criteria for risk decision making. More information can be found at:

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470261404.html>

CCPS LATIN AMERICAN CONFERENCE POSTPONED TO JUNE 2010

The CCPS Latin American Conference has been rescheduled to June 2010. The decision to postpone the conference was made by Abiquim, the organization co-hosting the event. While CCPS regrets the late notice on the change in date, we look forward to a successful conference in Sao Paulo in June, 2010. If you have any questions/comments about the conference, please contact Roxy Schneider at roxys@aiche.org or at 646-495-1372.

US CSB RECOMMENDATIONS FROM T2 LABORATORIES EXPLOSION

On September 15, 2009, the US Chemical Safety and Hazard Investigation Board (CSB) issued its report on a runaway reaction, explosion, and fire at T2 Laboratories in Jacksonville, Florida in December 2007³. Quoting from the CSB press release,

"The CSB found that although the two owners of the company had undergraduate degrees in chemistry and chemical engineering, they were nonetheless likely unaware of the potential or the consequences of a runaway chemical reaction. The CSB noted that most baccalaureate chemical engineering curricula in the U.S. do not specifically address reactive hazard recognition or management."

Some of the CSB recommendations are specifically addressed to AIChE. Specifically:

³ <http://www.csb.gov/newsroom/detail.aspx?nid=281>

- 2008-03-I-FL-R1, to the American Institute of Chemical Engineers - Work with the Accreditation Board for Engineering and Technology, Inc. (ABET) to add reactive hazard awareness to baccalaureate chemical engineering curricula requirements.
- 2008-03-I-FL-R2, to the American Institute of Chemical Engineers - Inform all student members about the Process Safety Certificate Program and encourage program participation.

Safety and Health Division members should become familiar with the Process Safety Certificate Program for chemical engineering students currently being offered and further developed by the CCPS Safety and Chemical Engineering Education (SACHE) Committee (discussed below). If you have the opportunity to interact with chemical engineering students, either as a teacher or guest lecturer at a local university, as an active alumnus at your alma mater, or as you visit universities for recruiting, to present seminars, speak to student AIChE chapters, or other activities, take the opportunity to promote the program to students.

SACHE STUDENT SAFETY CERTIFICATE PROGRAM

A Certificate of Safety Achievement is presented by SACHE and AIChE to students who demonstrate proficiency in process safety training modules developed for SACHE. The program allows students to receive recognition for their efforts provided they are members of AIChE. Student application for AIChE membership is available at <http://www.aiche.org/students>. The following modules are presently included in the program:

- Inherently Safer Design - Provides information for understanding inherently safer design of chemical processes and plants.
- Safety in the Process Industries - Video series that introduces the application of chemical process safety technology in an actual chemical facility.
- Risk Assessment - Browser-based SACHE product that provides an overview of the methods used for risk assessment, management, and reduction with examples and exercises.
- Runaway Reactions - CSB video and SACHE products that demonstrate the potential hazards and methods for controlling runaway reactions.
- Chemical Reactivity Hazards - Web-based SACHE product that provides an overview of the basic understanding of chemical reactivity hazards; supplemented with selected issues of the Process Safety Beacon from the SACHE archive.

To obtain the certificate, students must complete an on line study module on the topic. After students have completed a module, they must successfully complete an on-line questionnaire to receive recognition. Lists of students who successfully complete a module will be sent to their SACHE contact school or department in addition to companies who are supporting the program.

You can find more information about the SACHE Safety Certificate Program for chemical engineering students at the following web sites:

http://sache.org/student_certificate_program.asp

http://www.aiche.org/SACHE_Questions.aspx

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Visit the DCHAS web site at <http://membership.acs.org/C/chas/default.htm>.

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