

SACHE News



Safety and Chemical Engineering Education - Spring 2002

Status of SACHE

J. F. LOUVAR, CHAIR
CCPS UNDERGRADUATE EDUCATION COMMITTEE

General

- Great Workshop in 2002
- Planning 2003 Workshop
- New Products
- Vision

2002 Workshop

We had a three-day workshop on the BASF site in Wyandotte, MI. Twenty five professors attended and worked with 20 industrial folks with substantial experience and interest in chemical process safety.

This workshop emphasized how safety is embedded in all stages of the process definition and design. Many exercises and plant tours were especially designed to illustrate the importance of safety, and to give the professors information and materials that can be used immediately in their university courses. The professors were all delighted with the outcome of this unique experience.

This year we had members of CCPS, EPA, OSHA, and the Chemical Safety Board (CSB) attending our workshop; their interactions with the professors gave us a higher-level interest in process safety.

This was the fourth workshop that was conducted on the BASF Site. This was a tremendous contribution to our profession that the SACHE committee and the 100 attendees (professors) especially appreciated. Jack Wehman has been the unique leader of these four BASF workshops. He was unable to attend the actual workshop

this year because of a serious illness. Jack is continuing to work with us from his home. His continuing enthusiasm, direction, and support are inspiring the outcomes of this and our future workshop. Thanks Jack!

Companies and organizations that supported this workshop include:

BASF Corporation
Center for Chemical Process Safety (of AIChE)
The Dow Chemical Company
ExxonMobil
Merck & Company, Inc.
Rohm and Haas Company
Shell Chemical Company
U. S. Chemical Safety and Hazard Investigation Board

A special thanks to these sponsors. Their support covered all the expenses for the hotel, meals, and local transportation for all of the university attendees (25 professors). The participants were only responsible for their transportation to and from Detroit.

Planning for 2003 Workshop

Our next workshop is planned for April or May of 2003 at the ExxonMobil Plant in Baton Rouge, Louisiana. This is a huge facility that has knowledgeable engineers, and a great facility for relevant tours. Anyone interested in attending the 2003 workshop should contact Dan Crowl (Crowl@MTU.edu). The directors of this next workshop are Scott Ostrowski from ExxonMobil and Ralph Pike from Louisiana State University.

Awards

Professors, please alert your students about these potential awards:

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SACHE, or Safety and Chemical Engineering Education, is a project under the auspices of AIChE's Center for Chemical Process Safety (CCPS). SACHE's charter is to enhance the presentation of process safety in undergraduate education.

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The opinions expressed in the articles contained in the *SACHE News* are not necessarily the opinions of the Center for Chemical Process Safety or the American Institute of Chemical Engineers.

Articles related to any aspects of safety in the academic community are solicited from both the academic and industrial community for publication in *SACHE News*. Material should be sent directly to the editor for consideration.

Undergraduate Education Committee

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Crowl Receives Norton H. Walton/ Russell L. Miller Award



Dr. Daniel A. Crowl is the recipient of the 2002 Norton H. Walton/Russell L. Miller Award.

The Norton H. Walton/Russell L. Miller Award in Safety/Loss Prevention is given by the Safety and Health Division of AIChE in recognition of outstanding chemical engineering contributions and achievements in the Loss Prevention, Safety,

and Health fields.

For the past twenty years, Dr. Crowl's contributions have positively and significantly influenced the chemical engineering profession.

In the education area he is a) the principle author of the first and second editions of the widely used Prentice Hall textbook, *Chemical Process Safety*, b) the author of two CCPS books, *Consequence Analysis*, and *Understanding Explosions*, c) the author of six SACHE products for helping professors add safety to their courses, and d) the organizer and director of four workshops to help professors and their students understand the importance of chemical process safety.

In the professional area Dan has a) chaired the Safety and Health Division, b) chaired the Loss Prevention Committee, c) chaired a Loss Prevention Symposium, and d) been an active member of CCPS's Technical Steering Committee. Within CCPS Dan has written the two books mentioned above, and edited two books: *Layers of Protection*, and *Inherent Safety*. As a peer reviewer for CCPS since 1990, Dr. Crowl has shaped the content and quality of many of the CCPS Books and Guidelines.

The Safety and Health Division and the entire engineering community recognize and appreciate Dr. Daniel Crowl's energy, enthusiasm, and positive support that he continues to dedicate to our profession.

Status of SACHE

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Essay Awards. There are two awards (\$500 each) for the best two essays on chemical process safety. Send your essays before June 1 to

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Detroit, MI. 48202-9988

Or email them to jlouvar@che.eng.wayne.edu.

SACHE's Student Design Award. SACHE has two awards for the student AIChE Design problem: a) A team design with the best application of the principles of chemical process safety will receive \$300 for the team, and b) An individual's best design will receive \$200. The awards may be for designs that are not awarded for the "best" design.

The Safety and Health Division of AIChE Awards. The S & H Division of AIChE has four \$500 awards for individuals or teams that appropriately include the concepts of "inherent" safety in their design solutions. The purpose of these awards is to increase the safety culture within universities, and to encourage students to join AIChE and the Safety and Health Division when they enter the professional arena. These design solutions will be evaluated via the normal AIChE review process.

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RECIPIENTS OF THE NORTON H. WALTON/ RUSSELL L. MILLER AWARD

1987	Walter B. Howard
1988	Eugene S. DeHaven
1990	Stanley S. Grossel
1991	William J. Bradford
1993	T. A. Ventrone
1994	Gui LeGendre
1998	Robert Ormsby
1999	Richard F. Schwab
2000	John A. Davenport
2001	Joseph F. Louvar
2002	Daniel A. Crowl

New SACHE Modules

These SACHE Modules have been shipped to the member universities. Faculty and students should contact their SACHE representative for access to these and other SACHE products, including slide and PowerPoint presentations, videos, problem sets, NIOSH publications, and CCPS books. Recent SACHE deliverables are posted at <http://www.aiche.org/sache/sachedel.htm>.

Experiments for Runaway Reactions and Vent Sizing

Ron Darby
Texas A&M University

This module includes a CD with a Power Point presentation that contains 35 slides, a hard copy of the slides with comments included, and a 10 page write-up with User Directions and background information.

The module explains how a runaway reaction can be characterized experimentally using an adiabatic calorimeter (the Advanced Reactive System Screening Tool, or ARSST). This instrument is useful for screening chemicals for possible reactivity, obtaining data required to size relief vents for the reactor, and to illustrate relationships between runaway reaction kinetics and safety. The equipment and its capabilities are described, and test procedures are outlined for characterizing vapor (tempered), gassy, or hybrid systems.

The equations are also given for sizing a relief vent for each of these three systems, for both critical (choked) and subcritical (low pressure) conditions. An example is shown for the reaction of methanol and acetic anhydride to methyl acetate and acetic acid. Test data for temperature and pressure versus time obtained in an ARSST are shown, as well as the self-heat rate and pressure rise rate versus time. These data are used to illustrate the characteristics of the reaction and to provide the data required to size a relief vent for the reactor. Vent size calculations are shown based upon various methods of property data estimation.

The module can be used for instruction purposes in a class on process safety or kinetics, or can be used for the introduction to a unit operations laboratory experiment in which students use an actual ARSST to obtain and analyze data for a representative runaway reaction.

Risk Assessment A Self-Study Course

Melanie B. Mitchum and Ralph W. Pike
Louisiana State University

The purpose of this self-study course is to provide an overview of the methods used for risk assessment, management, and reduction. It includes descriptions of methods with examples and exercises. The material in the course is designed to aid chemical engineering faculty and students develop a working knowledge of risk assessment, management, and reduction as applied to chemical plants and petroleum refineries. The course requires about three hours to complete studying the material and working the exercises.

The self-study course can be assigned to students in the senior design course to provide the information needed in plant design, e.g. a HAZOP on the process flow diagram for the plant being designed. This self-study course can be assigned to students in the process safety course to provide background for methods that are discussed in more detail. Equally important it shows how methods for assessment, management, and reduction are related and function together. Also, an instructor can extract sections from the self-study course PowerPoint file and integrate this information into lectures on the topics.

This course is organized into fourteen sections beginning with an introduction section and one on risk management. These two sections are followed by twelve sections on detection, prevention, and mitigation of risks. These can be studied in any sequence, if the person has some background in this subject. There are links to move readily among topics. However, proceeding through the topics in order is recommended.

EDITORS NOTE: This is the second of two winning entries in the 2001 SACHE Student Essay contest. The first essay by Jenny Kauffman, University of Missouri - Rolla, was published in the Fall, 2001, issue of *SACHE News*. Each student received a \$500 award and a certificate at the AIChE Annual Meeting in Reno.

Industry's Stake in Undergraduate Safety Education

Bradley Peyton
University of Iowa

Over the past decade a multitude of preventable accidents have occurred at chemical manufacturing facilities worldwide. Ranging from the most simple of job related accidents, such as pulling a muscle, to the most deadly of explosions and chemical releases, the concern for safety is paramount for employees and employers alike. As a result of working with often dangerous materials during the chemical manufacturing process, the outcome of any accident can have dire consequences on the workers, the capital resources, and the environment. Chemical engineering students entering the workplace, however, often have limited exposure to an undergraduate education devoted to process safety. This inexperience can lead to costly mistakes which may have been avoidable had the proper training been administered. It is for this reason that it is of great benefit for industry to help add safety to the current academic courses.

The incentives for industry to invest time and money in undergraduate safety are numerous. Quite simply, the students of today will become the employees of tomorrow. Companies entrust chemical engineers to research and products, which can be sold at a profit. If an engineer makes a mistake, which causes damage to equipment, the environment, or more importantly, cost lives, it is the corporation that is held financially responsible for these actions. Therefore, it is in the firm's best interest to ensure that these employees have the proper training to properly protect their corporate investments. This is done by making certain that all employees have proper knowledge of safety practices and are able to identify safety hazards. The goal in undergraduate education is to teach students to learn from the knowledge and mistakes of others before a preventable accident is allowed to take place.

The first way that industry can help universities introduce the importance of safety is through hands-on training. In many cases, students are never exposed to a manufacturing plant environment until their junior year in

school when they may choose to take an internship or cooperative education learning experience with a company. Because involvement in such programs is often voluntary, there are other students who never see the inside of a plant until after they graduate and begin working. This inexperience and lack of exposure to the "real world" of engineering is an unfavorable situation, which could lead to costly mistakes. Industry helps to remedy this problem by offering such valuable learning experiences as internships and cooperative programs, but there are still students unable to take advantage of such opportunities due to lack of positions. Therefore, it would be beneficial to expand these programs so that all students can take advantage of the additional knowledge that industry can provide.

Industry can also help to expose students to an actual working environment early in their academic careers. This can be accomplished in a variety of ways, but none is more effective than actually seeing the facility first hand. Inviting students to take a tour of a chemical plant can help to make the information presented in classes more meaningful. As students are able to see actual production equipment, the identification of hazards can be accomplished with greater understanding.

Exposure to chemical process safety can also be obtained in the academic environment by sharing information learned in the chemical manufacturing environment. This is easily accomplished through the use of guest speakers who can share their experiences in industry. These speakers are able to provide a different perspective from that presented by professors who are often forced to focus more on formulas and equations rather than on specific examples and illustrations. It is important, however, to have a guest speaker who is not afraid to admit his/her mistakes and how s/he learned from them. It is more important that the same mistakes are not be made twice.

Safety also goes beyond worker safety and protecting the capital investments of the company. It also involves environmental safety, including waste and emissions. Industry can also help universities incorporate environmental safety into their curriculum. This could involve the introduction of simple problems, which were faced by a particular company and several proposed solutions. Such examples could be the reduction of harmful emissions or reducing the amount of waste from a production process through effective resource

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Call for Papers

37th Annual Loss Prevention Symposium AIChE 2003 Spring National Meeting New Orleans, Louisiana March 31-April 2, 2003

Overview of the Symposium

The Loss Prevention Symposium, organized by the American Institute of Chemical Engineers Safety and Health Division, Group 11A, has been held annually since 1967. The objective of the symposium is to promote safety in the chemical process and allied industries by providing a forum for practitioners from industry, academia, and government to share experiences, technological advances, and new ideas.

Original, unpublished material is preferred. Authors are encouraged to submit an Abstract. Accepted papers will be published in the Symposium Proceedings and may also be chosen for publication in the Division journal, *Process Safety Progress*. The 37th Symposium will consist of six sessions of five to six papers each. The session topics are described below.

1. Engineering Issues in Security of High Hazard Facilities

This session focuses on the engineering methods used to improve the security, reduce the facility vulnerability to terrorist attack, or reduce the consequences of a hazardous chemical release by improvements in the design, layout, and operation of equipment handling hazardous chemicals.

Chair	Randy Freeman ABS Consulting 16855 Northchase Drive Houston, TX 77060-6008 281-877-6407 281-877-6508 (FAX) rfreeman@absconsulting.com	Vice-Chair	Richard D. Siegel Foster Wheeler Environmental Corp. 133 Federal Street Boston, MA 02110 617-457-8283 617-457-8498 or 8499 (FAX) dsiegel@fwenc.com
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2. Process Safety Legal/Liability Issues

Civil litigation and criminal prosecution may result from process safety incidents. Preventing and minimizing losses that can result from these liability issues for corporations (and individuals within those organizations) will be discussed.

Chair	David G. Clark E.I. du Pont de Nemours & Co., Inc. 1007 Market Street Wilmington, DE 19898 302-774-8044 302-774-8038 (FAX) david.g.clark@usa.dupont.com	Vice-Chair	Walter L. Frank ABS Consulting 5301 Limestone Road, Suite 210 Wilmington, DE 19808 302-239-0496 302-239-0306 (FAX) wfrank@absconsulting.com
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3. Fire, Explosion and Reactivity Hazards

The analysis, prevention and mitigation of fire and explosion hazards continue to be important issues to the Loss Prevention community. We invite papers that identify, analyze or offer design guidance on fire, explosion, and reactivity hazards.

Chair	Ephraim A. Scheier BP America 200 Westlake Park Blvd. Houston, TX 77079 281-366-2573 281-366-7969 (FAX) ephraim.scheier@bp.com	Vice-Chair	Christopher Hanauska Hughes Associates, Inc. 3610 Commerce Drive, Suite 817 Baltimore, MD 21227-1652 410-737-8677 Ext. 242 410-737-8688 (FAX) chanauska@haifire.com
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4. Integration of Safety and Environmental Concepts

There is often a conflict between engineering and design activities associated with implementation of safety and environmental concepts. In fact, there have been instances where safety-related activities have led to environmental concerns or vice versa. This session invites papers dealing with integration of safety and environmental concepts during all phases of the plant's life cycle starting from conceptual design, design, engineering and construction, startup, operations and maintenance, shutdown/decommissioning, and demolition.

Chair	Sam Mannan Texas A&M University 337 Zachary Engineering Center Department of Chemical Engineering College Station, TX 77843-3122 979-862-3985 979-845-6446 (FAX) mannan@tamu.edu	Vice-Chair	Dennis C. Hendershot Rohm and Haas Company P.O. Box 584 State Road and Rt. 413 Bristol, PA 19007 215-785-7243 215-785-7077 (FAX) Dennis_C_Hendershot@rohmmaas.com
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5. Incorporating Process Safety in Maintenance and Non-Routine Operations

This session invites papers on recommended strategies for identification, evaluation, and control of process related hazards when the unit is in, or is being prepared for a non-routine operating mode, including maintenance operations. Papers on a variety of topics including abnormal situation management, risk based inspection, confined space entry, fire risks associated with packed columns, pyrophoric material risk management approaches, planning for higher risk operations, and hazard analysis approaches to non-routine operations are invited.

Chair	Scott W. Ostrowski ExxonMobil Chemical Company P.O. Box 241 Baton Rouge, LA 70821-0241 225-977-7400 225-977-4045 (FAX) scott.w.ostrowski@exxonmobil.com	Vice-Chair	Stanley S. Grossel Process Safety & Design, Inc. 41 Sussex Road Clifton, NJ 07012-2017 973-779-8579 973-779-8579 (FAX) psadi28@aol.com
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6. Case Histories and Lessons Learned

Reviews of Process Safety Incidents and near misses provide valuable learning opportunities. Papers detailing incidents, near misses and lessons learned are requested.

Chair	Erdem A. Ural Fenwal Safety Systems 90 Brook Street Holliston, MA 01746 508-429-3190 508-429-2990 (FAX) erdem@world.std.com	Vice-Chair	Henry L. Febo FM Global 1151 Boston-Providence Tpke. Norwood, MA 02062 781-255-4771 781-762-9375 (FAX) henry.febo@fmglobal.com
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To Present a Paper

Please contact the appropriate session chair and submit a typed abstract of 150-200 words by June 1, 2002. Include the names, addresses, telephone numbers and affiliations of the authors with the abstract. Electronic submissions by e-mail or computer disk are encouraged. Contact the session chair for the preferred electronic file format for diskettes. Session chairs will select papers to be presented and contact the authors by July 1, 2002. Authors of selected papers will need to complete a Proposal to Present (PTP) on the AIChE Worldwide web site by August 1, 2002. Contact the session chair to make other arrangements if you are unable to submit an electronic PTP. Final manuscripts for publication in the Symposium Proceedings are due to the session chairs by November 6, 2002.

Symposium Chair

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Undergraduate Safety Education

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management. Simple problems could be introduced for a one lecture or a small group project while more complicated problems could be used as the basis for a senior design project including a comprehensive list of solutions and supporting reasons for the option chosen. In such instances, it would be possible for students to apply their academic knowledge to a possible problem, which could be faced once they reached the workplace.

It is also crucial that industry keep universities abreast of important technological advancements being used in production. This is particularly important as it relates to the current computer software being used. With such a great deal of a facilities' production being controlled by computer, it is important that chemical engineers understand not only how to operate the software, but what to do should a problem arise where manual operation is required. It is essential to have a basic understanding of how the computer control system works as well as how to override the computer for manual operation in case of emergency.

Chemical engineering is a constantly changing field where it is necessary that individuals have a firm grasp of the problems faced on a daily basis. In order that companies are able to focus on reaching their goals of producing a useful and economically feasible product safely, it is necessary that the engineers entering the workplace have all of the tools needed to do their job effectively. Process safety is a subject which although can be studied at an introductory level in the academic setting, requires a more rigorous training program since more complete comprehension is required. It is also a subject, which requires lifelong learning in order that one is able to keep abreast of the changing technologies and governmental requirements to be met. Industry and academic institutions must work together to ensure that the required safety standards are upheld. Industry can help universities through hands-on training as well as by providing experienced engineers to enlighten students as to the realities of the engineering profession outside the classroom. Industry can also help promote safety education by helping universities incorporate these types of industrial problems into an academic curriculum. Also, industry can keep academia up to date on new procedures, technologies, and operating methods. Cooperation between universities and industry can result in the development of talented chemical engineers that are able to carry the chemical industry through the 21st century and beyond.

Status of SACHE

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New Products

The year 2002 products for all SACHE university members include:

- 1) Free CCPS book (be sure to request one via AIChE or Owen Kubias).
- 2) One half-price enrollment in an AIChE safety and health course.
- 3) Risk Assessment (CD ROM by R. Pike).
- 4) Experiments on Runaway Reactions and Vent Sizing (R. Darby).
- 5) Case History - Hixson Pharma Co. (Birtwistle).
- 6) Case History - Methylacrylic Acid Tankcar Explosion (Willey).
- 7) Dispersion Modeling (CD ROM by T. Spicer and R. Welker).
- 8) Attendance at the annual SACHE Workshop.

These are all excellent products with a total value far exceeding the \$300 membership fee.

Summary

SACHE is delighted to develop these products for universities. They help professors, but the real benefit is to your students and industry. I guarantee that someday your students will return and thank you for your guidance in this area of chemical process safety.

Vision

The SACHE Committee has initiated discussions concerning the SACHE Products on the Web. Wouldn't it be great to make these products available on the Web and worldwide?

Safety Alert: Reactive Material Hazards

The CCPS Reactive Hazards Subcommittee has developed a Safety Alert on "Reactive Material Hazards and made it available at <http://www.iche.org/ccps/pdf/reactmat.pdf>. It is an excellent resource for introduction of reactive material issues in chemistry laboratories, unit operations laboratories, process safety and design courses, and graduate research laboratories.