

SACHE News



Safety and Chemical Engineering Education - Spring 2001

Status of SACHE

J. F. LOUVAR, CHAIR

CCPS UNDERGRADUATE EDUCATION COMMITTEE

General: SACHE had 111 university members in the year 2000; this is great participation. We are currently reminding the universities to join again in 2001. The SACHE application form is available via the AIChE Homepage (then search for SACHE). For those who have not yet joined, please recall that you will receive products worth over \$1000 for a membership fee of \$300. Our excellent university participation indicates that this expense is justified.

Workshop: We have another workshop scheduled (Sept. 16-19) in Detroit. The workshop is for university professors. The workshop's title is Chemical Process Safety and it covers how safety is integrated into the entire life cycle of a process. Topics include business objectives, process conceptualization, detailed design, plant construction, and the operation and maintenance of chemical plants. Based on the very positive feedback that we received from last year's participants, this is a great educational experience for professors teaching kinetics, design, unit operations, and the UO laboratory courses. Notice that university SACHE members are placed on the top of our potential attendance list. The workshop teachers are industrial experts in design, operation and maintenance of plants, safety, and experimental safety.

Companies and organizations that especially recognize the value and significance of this educational experience financially support these workshops. The supporters include:

BASF Corporation
Center for Chemical Process Safety (of AIChE)
The Dow Chemical Company
E. I. duPont de Nemours and Company
Merck & Company, Inc.

Rohm and Haas Company

Shell Chemical Company

U. S. Chemical Safety and Hazard Investigation Board

A special thank you to these sponsors. This support covers all the expenses for the hotel, meals, and local transportation for all of the university professor attendees. The participants are only responsible for their transportation to and from Detroit.

Those interested, please contact D. Crowl (Crowl@mtu.edu). Dan Crowl (MTU) and Jack Wehman (BASF) are the directors of this educational experience; it is designed for educators. They do an outstanding job facilitating the many activities of this workshop.

Awards: Professors, please alert your students to these potential awards:

Essay Award: There are two awards (\$500 each) for the best two essays on chemical process safety. Topics may include: safety in the UO laboratory, should safety be a required course, should safety be an elective course, the most important principles covered in a safety course, etc. Send your essays to

J. F. Louvar
Chem. Eng. and Mat. Sc. Dept.
Wayne State University
5050 Anthony Wayne Drive
Detroit, MI 48202-9988

Or send them by e-mail: jlouvar@che.eng.wayne.edu.

AIChE's Student Design Award: SACHE has two awards for the student AIChE Design problem:

- 1) A team design with the best application of the principles of chemical process safety will receive \$300 for the team.
- 2) An individual's design with the best application

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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.

SACHE News is published two times annually by the Undergraduate Education Committee of the AIChE Center for Chemical Process Safety. All original material is copyrighted by the AIChE Center for Chemical Process Safety.

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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SACHE Workshop 2001

Daniel A. Crowl, Michigan Technological University
Jack Wehman, BASF

This is a specially designed workshop for university faculty. The participants are provided a fundamental understanding of "Chemical Process Safety and Design" as practiced in industry. In addition, faculty leave the workshop with a package of information that they can immediately use in their university courses. Plant and laboratory tours are a part of this program.

The SACHE Workshop 2001 is scheduled for September 16-19, at BASF in Wyandotte, Michigan. SACHE pays for the hotel and other workshop expenses. The attendee must provide travel to and from the Detroit area.

The SACHE workshop will repeat the highly successful workshop held last year. This workshop, open to all faculty and a few graduate students, will demonstrate the advanced application of safety principles in the chemical process industries. The workshop will continue the practice of the past five workshops for combining safety technical theory with practical examples using lectures and plant tours.

The workshop participant will be given the engineering assignment of working through the design of a new polyether manufacturing facility dealing with the business considerations, scope development, problem definitions, solution approaches and issue explanations. Participants will have exposure to issues on chemical reactivity, relief systems, thermodynamic characterization, toxicology, emergency response, heat transfer, process safety management (PSM) and many other critical safety elements.

Based on the level of participation by attendees in previous workshops and their evaluations, the 2001 Workshop will be a significant experience for all participants. Learning from and interacting with industrial specialists is especially rewarding.

There are currently 18 participants registered for this SACHE Workshop. There is a maximum number of 25 participants, so if you are interested in attending the SACHE Workshop, please contact Dr. Dan Crowl at crowl@mtu.edu as soon as possible.

Status of SACHE *Continued from page 1*

of the principles of chemical process safety will receive \$200.

SACHE awards may be granted for solutions that do not receive the "best" design awards.

Products: The year 2001 products that are planned for all SACHE university members include:

- 1) Free CCPS book (be sure to request one via Shami Nayak, shamn@aiche.org).
- 2) One half-price enrollment in an AIChE safety and health course.
- 3) Two-part video - Fire Behavior and Fire Protection (R. Welker).
- 4) Slide lecture on dispersion modeling (Darby and Welker).
- 5) Case history - Methacrylic Acid Tankcar Explosion (Willey).
- 6) Electrostatics (Maurer and Wehman).

These products are all reviewed and improved by our SACHE Committee (the ultimate peer review).

Also, membership allows you to attend our workshop but you need to register as soon as possible. This workshop alone is worth approximately \$1000. Clearly the return on the membership investment is significant.

Summary: SACHE is delighted to develop these products for universities. Your return on investment exceeds 3 to 1, 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.

SACHE Web Page

SACHE has a page on the AIChE web site (www.aiche.org). Recent issues of SACHE News, announcements and information, and links to member universities can be found at www.aiche.org/sache/.

Wiley Elected Director of Safety and Health Division

Ronald J. Willey, Professor of Chemical Engineering at Northeastern University has been elected to the Board of Directors of the Safety and Health Division of the American Institute of Chemical Engineers for the 2001-2003 term. Ron is an active committee member of SACHE. He has authored 7 case studies and problem sets for SACHE and co-directed the 1999 SACHE Workshop. We offer our congratulations and wish him well in his tenure.

Student Essay Award

The SACHE essay contest for undergraduate chemical engineering students will continue. Students should prepare a 1500 word essay on one of the following or closely related topics:

- Safety in the unit operations laboratory
- Integration of safety into undergraduate education
- Safety relevance in undergraduate education
- Most important safety concepts taught in the university
- How industry can help universities add safety to their courses

Entries should be sent to

Dr. J. F. Louvar
Department of Chemical Engineering
and Materials Science
Wayne State University
5050 Anthony Wayne Drive
Detroit, MI 48202-9988

Deadline for entries is June 1, 2001. The authors of the two winning essays will each receive \$500.

The two winning entries of the 2000 SACHE Essay Contest have been published in *Process Safety Progress*:

Kriegemeier, C. "Importance of Process Safety Instruction in Undergraduate Chemical Engineering Curriculum." *Process Safety Progress*, 19 (4), (Winter 2000-01) W6-W7.

LaClair, D. "Encouraging Safety Awareness at the College Level." *Process Safety Progress*, 19 (4), (Winter 2000-01) W7-W8.

Campus Consortium for Environmental Excellence

The Campus Consortium for Environmental Excellence, or C2E2, is a not-for-profit corporation formed by several New England colleges and universities interested in developing new ways to manage and regulate the environmental impacts of laboratories. The membership now includes institutions of higher education from across the country and serves a forum for professional networking on environmental safety issues. These issues include elements of general safety, laboratory safety, emergency response, and fire protection, as well as environmental health and impacts.

New SACHE Module Piper Alpha Video

Ron Willey
Northeastern University

The Piper Alpha video, produced for the BBC, is a recreation of the events that led to a deadly disaster on the Piper Alpha oil rig located in the North Sea in 1988. It was first shown to U.S. chemical engineering faculty at a SACHE faculty workshop in Freeport, Texas in 1999. Those who saw this video felt that it had substantial substance to warrant purchase by the SACHE committee and distribution as a SACHE product. This video is intended for use in chemical engineering classroom environments. The video tape runs for about 29 minutes.

There were 167 men killed in this incident. Many messages are available including the root cause being traced back to management. The video tape is ideal for a process safety or design course where proper hazard analyses are discussed, or management of change is explained, or permitting systems are discussed (e.g.: lock-tag-try). Another place in the curriculum where the video can be shown are freshman introductory courses where decision making may be discussed.

This is a very easy SACHE product to use. Simply arrange for a VCR playback machine and a television monitor. Place the tape in the machine. Press play. The message, however, is not so simple. The information that students gain in 29 minutes cannot be covered in any more efficient manner. Paraphrasing Dr. Tony Barrell's last statements near the end of the video, "the desired outcome from viewing this tape is the prevention of future events like this."

One of C2E2's projects is Environmental Management Systems (EMS) in Higher Education. An EMS is an organized approach to managing the environmental impacts of an organization's operations. To help college and university campuses move their EMS programs forward, C2E2 has developed an EMS self-assessment tool. The 33-part questionnaire is designed to help a campus identify strengths and weaknesses in its current EMS. The consortium has also developed presentations geared to different audiences that explain the concepts and intent of EMS and the assessment tool. These resources and information on other C2E2 projects can be found at www.c2e2.org.

EDITORS NOTE: The following essay is the second of two winning entries in the 2000 SACHE Student Essay Contest. The first essay by Corey Kriegermeier, University of Iowa, was published in the Fall, 2000, issue of SACHE News. Each student received a \$500 award and a certificate at the AIChE Annual Meeting in Los Angeles.

Encouraging Safety Awareness at the College Level

Darcy LaClair

Northeastern University

“All things are poison, there is none which is not a poison. The dose distinguishes between a poison and a remedy” -Paracelsus

This simple statement articulates several essential factors of safety. The assertion that all things are poison reminds us that there is no completely safe activity, and that we must always be cognizant of what we are doing and how to do it safely. The second part of Paracelsus' statement elucidates the idea that we must strive to understand the dangers we work with to avoid them. In this arena, it is only knowledge and preparedness which can fight hazards in the workplace and in our lives. The question, then, is if we can become safer, eliminate hazards, and prevent injuries, what will that process entail and who will be responsible for it.

This question has no simple answer. The truest answer is that each and every person is responsible for their safety and the safety of those around them. However, the knowledge and understanding of safety principles is something that should and must be shared and taught. Although they are tragic and unfortunate, accidents must serve as examples of what can happen, as well as show steps that might have prevented or lessened the accident. There are also many members of industry, who have years of experience and vast amounts of knowledge, available to help others establish and maintain safe workspaces. There are certainly resources available, yet the critical step is transferring this information to all members of a work force, and more importantly, transferring this information to those who will be working as the managers, engineers, and decision makers. Without top-level buy in, safety is extremely difficult to establish, and any policies adopted will fade quickly or achieve minimal compliance.

The best place to contact these people and instill in them appreciation for safety is when they are in college or

younger; students provide an earlier audience for what should be an integral part of day-to-day operations in industry. One benefit of addressing college students is the fact that they have chosen their major. By being in a major, they have declared their interest in and dedication to a particular field. This interest means that they will have more of a personal stake in learning. At this time, students are also hungry for knowledge, particularly that which has a real connection with their future career. Many classes seem, initially, to have no application to real world affairs. By providing safety classes, especially focused on case study analysis and industry standards, students could feel more connected to their industry. This early interest and connection is something that students could be likely to carry with them throughout a career.

I have had wonderful opportunities to learn about safety while I have been at my school. Much of this was provided through coops. They have been both good and bad experiences, all very educational. Some of the more dangerous experiences have been the result of an older generation operating on the assumptions that were in practice when they began industry. These experiences helped me learn what is dangerous, and understand how damaging a severe chemical accident could be. I think the worst experience I have had working in industry was cleaning an air-pressured spray gun with methyl-ethyl-ketone. Because one of the components of the gun was not assembled properly, it fired backwards towards my face and got under my goggles. While I was able to go to an eyewash quickly and there was no real damage, the experience demonstrated to me first hand how important it was to have eyewashes available and in good working order and how important the correct PPE can be. Truly, there is no replacement for first hand experience.

The safest experience I had while on coop was at a large multi-national company that takes safety extremely seriously. In order to enter the plant for an interview, I was required to view a video that detailed hazards, watch points, and the safety policy of the company. When I accepted the position, I was immediately entered into the safety-training program. This is quite intense for the first two months, and is then ongoing for the remainder of an employee's time at the company. Safety meetings are also held monthly to discuss dangers in the plant, improvements that could be made, and accidents that have occurred both in the company and in other companies or institutions. Even as a coop student, I was required to participate actively in this meeting, and even to perform one monthly safety inspection.

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Call for Papers

36th Annual Loss Prevention Symposium AIChE 2002 Spring National Meeting New Orleans, Louisiana March 10-13, 2002

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 36th Symposium will consist of six sessions of five to six papers each. The session topics are described below.

- 1. Reducing Reactivity and Runaway Hazards** – This session encourages the sharing of new research on chemical reactivity hazards, improved methods of characterizing reactive materials, and improved methods of managing the risks associated with reactive chemicals, with special emphasis on inherently safer approaches.

Chair Robert W. Johnson
 Unwin Company
 1920 Northwest Boulevard, Suite 201
 Columbus, OH 43212-1147
 614-486-2245
 614-486-2141 (FAX)
 rjohnson@unwin-co.com

Vice-Chair Robert W. Ormsby
 Air Products & Chemicals, Inc.
 7201 Hamilton Boulevard
 Allentown, PA 18195-1501
 610-481-6715
 610-481-8051 (FAX)
 ormsbyrw@apci.com

- 2. Static Electricity & Ignition Control Strategies** – In investigating fires or explosions, the search for the ignition source is often one of the most troublesome tasks. Rightly or wrongly, static electricity often receives the blame after all other credible sources have been ruled out... even though, or perhaps because, it is a phenomenon not well understood by most. This session will primarily focus on practical, proven strategies for controlling static electricity hazards in the process environment. We also invite papers addressing the control of other unique ignition source hazards.

Chair Walter L. Frank
 EQE International
 North Broom Street – Unit 3
 Wilmington, DE 19806
 302-661-0720
 302-661-0721 (FAX)
 wlf@eqe.com

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 jlouvar@eng.wayne.edu

- 3. Fire/Explosion Hazards Protection** – Despite advances in technology, fires and explosions continue to constitute the majority of losses to the chemical process industry. This session invites papers that identify, analyze, or offer design guidance on fire or explosion hazards with a view toward the prevention or mitigation of those hazards. Novel or original approaches are encouraged.

Chair William A. Thornberg
 HSB Industrial Risk Insurers
 85 Woodland Street
 Hartford, CT 06102-5010
 860-520-6090
 860-520-6135 (FAX)
 william.thornberg@industrialrisk.com

Vice-Chair Erdem A. Ural
 Fenwal Safety Systems
 90 Brook Street
 Holliston, MA 01746
 508-429-3190
 508-429-2990 (FAX)
 erdem@world.std.com

4. **Flammable and Combustible Liquids Storage** – Papers are invited on loss prevention issues associated with the operation and maintenance of storage vessels and facilities of all sizes and services. Mitigation methods for pressurized vessels and equipment under fire conditions and related topics are especially encouraged.

Chair Kris Chatrathi
 Fike Corporation
 704 South Tenth St.
 Blue Springs, MO 64015
 816-229-3405, Ext. 503
 816-228-9277 (FAX)
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Vice-Chair Scott W. Ostrowski
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 P.O. Box 241
 Baton Rouge, LA 70821-0241
 225-777-7400
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 swo@exxon.com

5. **Loss Prevention Issues with Vapor Control Systems** - This session will address safety and loss prevention issues that arise due to the need to control vapor emissions from process plant equipment because of EPA regulations. These topics could include design and operating considerations for the following: vapor collection (vent manifold) systems; activated carbon systems; vent scrubbers for flammable and toxic vapors; flare systems; thermal and catalytic oxidizers; refrigerated vent condensers, etc.

Chair Stanley S. Grossel
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Vice-Chair Gary C. Phillips
 Dow Chemical Company
 2020 Dow Center
 Midland, MI 48674
 517-636-1372
 517-636-0350 (FAX)
 gphillips@dow.com

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.
 Session co-sponsored by Group 12d – Manufacturing Area of the Process Development Group

Chair Michael L. Griffin
 46 Imbler Drive
 Cincinnati, OH 45218-1131
 513-851-6070
 mlgriffin11a@aol.com

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 susan.r.cyganiak@pharmacia.com

To Present a Paper

Please contact the appropriate session chair and submit a typed abstract of 150-200 words by June 1, 2001. 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, 2001. Authors of selected papers will need to complete a Proposal to Present (PTP) on the AIChE Worldwide web site by August 1, 2001. 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, 2001.

Symposium Chair

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Encouraging Safety Awareness

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It is these experiences which lead me to believe that providing students with real life experiences in their field will help them to develop an awareness of safety and its importance. Another way that coop experiences have helped me, personally, to be more aware of safety is through speaking with other students. By providing a forum for discussion between students about coop positions, safety can be addressed. When I returned from coop, I told other students, both at my school and at others, about my experiences with the spray gun. Because of that, many younger students will be more careful when using spray guns and select splash goggles rather than safety glasses for that type of work. Several times, there have been required discussion sessions following coop. These have provided great opportunities for exchange among students. At this point, there is no specific impetus to discuss safety, however this is a topic that should be added to the discussions among returning students. This can be accomplished by the coop coordinator as a routine part of the coop process.

Another way for industry to be involved in establishing safety as a focus in the minds of undergraduates is to increase interaction on the university level beyond coop alone. Most large companies have safety departments. These representatives could easily make trips to local colleges and universities to speak on what they do and why safety is important. Even high school science classes could benefit from this type of visitor. Companies could also work together to create programs on campus for students. These could cover a broad range of industries and safety philosophies. Finally, an important learning experience for students would be presentations from companies who have had major accidents. By teaching students about these accidents, and how they proceeded, the devastation of the accident can begin to have some meaning in future prevention. This is probably the most difficult suggestion to achieve because speaking about the accident makes information about the accident itself and the mistakes that led to it more publicly available. Initially, this may seem like a detriment to the company and their public image, however it speaks to their commitment to preventing similar accidents in the future. By looking for opportunities such as these, industry can lead its future workers and leaders to safety awareness.

Finally, there are improvements that can be made in academic curriculums at individual schools, and by the

expectations of the Accreditation Board of Engineering and Technology (ABET). In my institution, there is a safety class offered, and it provides a thorough survey of chemical industry accidents and of safety and planning concepts in industry. This class, however, is only offered in senior year, and it is only an elective. Although the school is ABET certified, there is no required class dealing with safety. Currently there is an introduction to engineering class that touches briefly on safety along with many other topics of engineering, and the unit operations class covers safety related to the equipment used. Although this is a step in the right direction, it is in no way complete. The first step in improving the curriculum is to add required classes on safety, starting in freshman year. A more long-term goal is to incorporate safety into the standard courses offered. This would provide information to students on how safety relates to a particular topic. For example, thermodynamics could cover burn safety and pressure mitigation, and fluid dynamics could cover pipe sizing and installation for both small and large pipes. A class of this sort may have prevented the Flixborough accident, for example. By making these types of classes mandatory for certification, it would put pressure on schools to move quickly in adding these classes. Pressure and expectation by industry leaders would also provide an impetus.

Improvement in safety awareness is not an easy task, nor is it one that can be accomplished by working alone. Industry, institutions, and accreditation agencies must work together to create a comprehensive effort towards safety. Industry leaders must become more involved with schools and young people, and must be forthright about their safety policies and accidents. Schools and their watchers must make efforts to bring safety into the curriculum, both in special programs and in the regular classes students take. By working together, safety can be achieved.

National Safety Council Web Site

The National Safety Council's Crossroads web site is a safety, health, and environmental (SHE) search engine and news network. Features include a dedicated SHE search engine, *Injury Facts* online publication, online columns developed by subject area experts, and organization contacts. The Chemical Process Safety Section contains overview articles related to best practices in safety, mechanical integrity programs, and management of change. These articles could be useful in introducing students to elements of process safety management and the relationships between these elements.