

# SACHE News



## Safety and Chemical Engineering Education - Fall 2008

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Editor's Note: This article is the text of the after-dinner presentation on September 16, 2008, to the participants of the 2008 SACHE Faculty Workshop at the Franklin Institute, Philadelphia, Pennsylvania.

### **The Value of an Environmental, Health, and Safety Education**

Philip G. Lewis  
Vice President, Director of Global  
Environmental, Health and Safety  
Rohm and Haas Company  
Croydon, Pennsylvania

Looking at the program grid, I congratulate you on the time you've spent in understanding more about how to advance process safety.

I have been asked to talk about the value of an EHS education and I realized this morning how difficult that is for me. Because I am so convinced of the need for such, that it is difficult for me to see it all from the vantage point of the unconvinced.

Not that you are the unconvinced, but—here we go.

Whether it's looking at the disasters of BP or Arco or Phillips, or even the problems of Merrill Lynch and AIG, the advantage of an EHS education should be clear.

Let me explain.

The impact of a Texas City disaster or Bhopal is immediate and far reaching.

First, imagine yourself as the victim of a chemical process accident. Consider your pain and anguish in having lost a son, daughter, brother, sister, mother or father to fire,

explosion or toxic release from a chemical process. How would you feel? Whom would you blame? What would you be tempted to do?

Additionally then there is the pain of being the one to have to call a family member to tell them you are responsible for the death of their loved one.

While forgiveness is possible and you can generally recover from such a thing, I guarantee you it's something you will never want to do. And every one of your students will thank you for having given them the knowledge to spare them such an experience.

In terms of effect on an enterprise, consider the billions BP will spend to deal with Texas City or the reasonable conclusion that, in the end, it was Bhopal that brought down Union Carbide and the value of an EHS education should be clear.

Now let's talk about what any of this has to do with AIG.

There are fewer enterprises than there should be who are going to look at an applicant's resume for signs that they have a good basic EHS education.

So it is important to remind students and ourselves that the most important value of anything is that it allows us to better perceive and act on truth.

AIG, Merrill Lynch, Bear Stearns, Lehman Brothers all seemed to have gotten into trouble by allowing the fads of the moment to dissuade them from acting on the truth they knew.

The idea that housing prices would always rise should have been seen as false no matter what the fashion of the moment. Just as building and operating safe robust

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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 twice 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.

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

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## **AIChE Design Problem Awards for the Application of Process Safety and Inherent Safety**

Awards were presented at the Student Awards Brunch on Sunday, November 4 at the Annual Student Conference in Salt Lake City.

### **Safety & Health Division Awards for Inherent Safety**

The Safety & Health Divisions Awards are granted to the teams or individuals who apply one or more of the following concepts of inherent safety in their designs: (a) design the plant for easier and effective maintainability, (b) design the plant with less waste, (c) design the plant with special features that demonstrate inherent safety, or (d) include design concepts regarding the entire life cycle.

#### **T. Ventrone Award - \$600**

Megan Benyshek, Kelsey Casad, Archie Meiseman  
Oklahoma State University  
Advisors: Rob Whiteley and Jan Wagner

#### **Walt Silowka Award - \$ 600**

Marklee C. Lockie, Craig A. Wiley  
Tri-State University  
Advisor: Majid Salim

#### **Ephraim Scheier Award - \$600**

Kaitlyn Kelly  
University of Kansas  
Advisor: Colin Howat

### **SACHE Awards**

The SACHE Awards are presented to team and individuals for designs that apply appropriate principles of chemical process safety.

#### **Walt Howard Award for an Individual Solution - \$200**

Kaitlyn Kelly  
University of Kansas  
Advisor: Colin Howat

#### **Jack Wehman Award for a Team Solution - \$300**

Wesley Biddle, Andrew Kemmerling, Edward Ralph Soliz, Jr.  
Lamar University  
Advisor: Carl Yaws

## The Value of an Environmental, Health, and Safety Education

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processes should never be sacrificed on the altar of the race for profits.

The value of an EHS education is allowing us to understand the truths of how businesses and processes are to operate and to have the knowledge and courage to leave if the enterprise begins to stray; allowing us to understand that all the value of an enterprise cannot be immediately monetized.

I teach a module on environmental medicine to medical residents and one of the things I point out is you have to always be prepared to leave an enterprise when it persists in following a path that while legal is unsafe and unwise.

Because staying around while short term profits are realized at the expense of health, safety and environmental performance, performance which can not be immediately monetized, will get you when you least expect it and in ways that you least want.

These inherent and metaphysical aspects of an EHS education are played out in the connections with sustainable development and the next evolution of capitalism.

As many of you know Rohm and Haas has been a champion of sustainable development since the mid 80's and we have done more than most in moving toward a sustainable state.

Most recently, we have engaged with The Natural Step from Sweden to move sustainable development to the next level of strategic focus in the company.

Within the four system conditions that are the basis of The Natural Step approach the value of an EHS education is seen again.

System condition #4 is about not doing things that will prevent people from being able to satisfy their own needs. Blowing up their house or killing their children would certainly seem to qualify as preventing people from being able to satisfy their own needs.

More positively, within the 110 to 120 years of life that our bodies are built for, success needs to happen on many dimensions. Not to make too much of being in the Franklin Institute, I think we would agree we want to be healthy, wealthy and wise.

Health is in part determined by our genes, but is more determined by the choices we make every day—to exercise or not, to eat too many or the wrong calories or not, to smoke or not.

Wisdom is determined by our ability and willingness to learn and live in truth.

And wealth is determined by the will of God or what you might call luck and the decisions we make that will allow us to sustain enterprises that bring value to society over the long haul.

EHS is the blocking and tackling, the basic requirement of sustainable wealth production. It is the vantage point from which processes that continually produce high value products may continue to do so time, after time, after time.

If you were unconvinced a moment ago, I hope you are convinced now about the value of an EHS education in protecting the lives and livelihoods of you, me, your students our families and society.

So continue in the good work you have started and know that it will be helpful and valuable to you and your students now and forever.



Philip G. Lewis joined Rohm and Haas Company in 1983 as associate corporate medical director. He was promoted to corporate medical director in 1988. Dr. Lewis was named director of Safety, Health and Environmental Affairs in 1989. In 1993, he was given responsibility for Product Integrity and elected a vice president. Prior to joining the company, he served as

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## Philip G. Lewis

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Chief of Preventive Medical Activity and Epidemiologist for the III Corps and Darnall Army Hospital in Fort Hood, Texas. Dr. Lewis received a bachelor of science degree in Chemistry from Widener University in 1972; a master of public health in epidemiology from the Johns Hopkins University Bloomberg School of Public Health, and a doctor of medicine from the Johns Hopkins University School of Medicine both in 1976. He finished his residency in general preventive medicine in 1978 at Walter Reed Army Institute of Research in Washington, D.C., and his clinical fellowship in dermatology, occupational and environmental medicine at Johns Hopkins Medical Institutions in 1983. Dr. Lewis is an adjunct faculty member in the Division of Occupational and Environmental Medicine at the University of Pennsylvania School of Medicine and at the Division of Occupational Medicine in the Department of Environmental Health Services at the Johns Hopkins University Bloomberg School of Public Health. He was a Clinton Presidential appointee to the Board of Directors of the Mickey Leland Urban Air Toxics Research Center; and is a Fellow of both the American College of Preventive Medicine and the American College of Occupational and Environmental Medicine. Dr. Lewis has won many awards over the years, including the George M. Sternberg Medal for Excellence in Preventive Medicine and Epidemiology. He is widely published and has lectured extensively on preventive, occupational and environmental medicine, public health and risk assessment and risk management.



## SACHE Products for 2009

The following 2009 SACHE educational resources are available to member universities through the SACHE website (<http://www.sache.org>):

### Fundamentals of Explosions

Reed Welker  
University of Arkansas

This SACHE product covers the fundamentals of explosions and some practices necessary for preventing explosions. The 35 minute video includes:

- Pictures showing the consequences of explosions.
- Discussion of definitions, such as auto-ignition temperature (AIT), lower and upper flammability limits (LFL/UFL), minimum ignition energy (MIE), limiting oxygen concentration (LOC), flash point (FP), etc.
- The distinction between physical and chemical explosions.
- Detailed discussions covering boiling liquid expanding vapor explosions (BLEVES), Dust Explosions, Deflagrations, and Detonations.

The video can be used as an introduction to a lecture on explosions, or given to students for self study prior to a more detailed discussion in a classroom setting. This product can be used in universities or industrial training sessions. In the university, it can be used in various courses such as design, thermodynamics, kinetics, or a safety course. In industry, it can be used for new engineers as an introduction to chemical process safety.

The recommended practices and related references include:

- Explosion prevention technology, such as reliefs, venting devices, etc.
- Codes and Standards – NFPA, ASME, and API.
- Textbooks, CCPS Guidelines, Periodicals, Short Courses, and SACHE materials.

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Pictured at the left are the participants of the 2008 Faculty Workshop at Sunoco's Frankford Plant in Philadelphia.

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## **Process Hazard Analysis: An Introduction**

David Mody  
Queen's University at Kingston

This is an introduction to Process Hazard Analysis that discusses the definition of PHA, why PHAs are important, what is a hazard, general safety concepts, and fire concepts including jet fires, pool fires, vapor cloud explosions, BLEVEs, physical explosions, chemical explosions, deflagrations, detonations, LFL/UFL, etc. Pictures of fires and explosions are also included

The PowerPoint presentation can be used as a presentation to a group or as a self directed study (or homework). The product could be used in a university (in a design or safety course, for example) or in an industrial training setting as an orientation session for new engineers. Further information regarding PHAs can be found in the accompanying 2009 SaChE product "Process Hazard Analysis: Process and Examples."

## **Process Hazard Analysis: Process and Examples**

David Mody  
Queen's University at Kingston

This discussion of Process Hazard Analysis focuses on the process, tools, and documentation required to complete a PHA. This product uses examples to illustrate the process and checklist methods typically used in a PHA, but details of the techniques for hazard review by HAZOP's, FMEA's, and FTA's are not included (these are well documented in other resources). At the end of this module, participants should have a good grasp of how Hazard Identification, Hazard Evaluation, and Risk Analysis all combine into a process for documenting and performing a PHA. Liberal use of examples provides students with the experience necessary to apply these skills in new situations.

The presentation can be made to a group or as a self directed study (or homework). The product could be used in a university (in a design or safety course, for example) or in an industrial training setting as an orientation session for new engineers. An introduction to PHAs can be found in the accompanying 2009 SaChE product "Process Hazard Analysis: An Introduction". This Introduction includes several files (material balance, P&ID, plant 3D model) that can be used as a project for students to apply the knowledge outlined here.

## **Project Risk Analysis (PRA): Unit Operations Lab Applications**

Vruce Vaugen  
Rose-Hulman Institute of Technology

Project Risk Analysis (PRA) is part of the OSHA Process Safety Management standard that considers both process-related hazards (e.g., fire, explosion, and toxic release) as well as other personnel safety-related hazards (e.g., noise, utilities, etc.). This SaChE product helps a lab instructor apply PRA in an undergraduate unit operations laboratory setting. Based on an industrial risk analysis approach, students document that they understand the potential hazardous events related to their project before experimental work begins based on an area tour; blank PRA check lists are provided. Whether students continue on to graduate school or begin their careers at an industrial site, this risk-based approach teaches tools that enhance students' awareness of hazards to help ensure their safety when working in new and potentially hazardous environments.

This SaChE product includes:

- An overview of the information and its application (PRADescription.rtf),
- A detailed description of a risk analysis approach with applications to typical unit ops labs (PRAManual.doc, PRA Table 13.pdf, and PRA Table 14.pdf),
- Blank (Excel) tables that are used for each unit operations experiment considered (also available to students after logging into this site), and
- A PowerPoint presentation to introduce students to the concepts of PRA

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## Seminar on Fire

Reed Welker and Charles Springer  
University of Arkansas

This Powerpoint presentation (with notes) covers fundamentals of fires and explosions and is recommended as an introduction to the subject including such topics as:

- technical definition of fires and explosions,
- physical characteristics of various fires,
- necessary conditions for fires and explosions, and
- elementary properties, such as flammability limits (LFL and UFL), minimum oxygen concentration (MOC), minimum ignition energy (MIE), flame speeds, burning rates, etc.

The limiting factor in burning most liquids and solids is

the rate of evaporation (liquid) and pyrolysis (solid), and so the burning rates of liquids and solids are dependent on the heat transfer back to the fuel and are functions of the radiant properties of the flame, the energy absorbing properties of the fuel, and the flame temperature. The burning rate of gas is dependent on the fuel release rate. Gases are easy to ignite and solids are relatively difficult to ignite, but dusts are a special class of solids that are easily ignited. Pictures are included of pool fires, BLEVEs, and extinguishing pool fires.

This product helps prepare engineers to design systems that reduce the probability of fires and explosions. Some coverage also discusses the design methods used to mitigate fires (venting, fire proofing, fire suppression, etc.), and provides references for safe designs (NFPA, CCPS. etc.).

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## Topical 6: AIChE Centennial: Chemical Engineering Education, Past and Future (T6)

**Monday, November 17, 2008: 8:30 AM-11:00 AM Room 113-A (Pennsylvania Convention Center)**

#8 - A Century of Process Safety (Co-sponsored by CCPS and the Safety and Health Division) (T6008) This session will bring together noted AIChE process safety professionals to review the history of process safety at AIChE and to highlight the technical and educational accomplishments achieved. This will include a history of the Loss Prevention Symposium, the Safety and Health Division, the Center for Chemical Process Safety, and the Safety And Chemical Engineering Education (SACHE) Program. A historical perspective on recent industrial progress, aided by AIChE efforts, will summarize the impact of OSHA's Process Safety Management (PSM) Standard, EPA's Risk Management Program (RMP) Rule, and the Vulnerability Assessments (initiated after the 9/11 terrorist attacks) on the safety programs in the chemical process industry.

Chair: Daniel A.Crowl CoChair: Bruce K. Vaughen

CoSponsor(s): Education (04) and Pharmaceuticals (15b)

8:30 AM Two Centuries of Process Safety at DuPont **James A. Klein**

8:55 AM The Process Safety Journey at Air Products **Shakeel Kadri**

9:20 AM Process Safety at OSHA **Lisa Long**

9:45 AM History of Process Safety and Loss Prevention in the American Institute of Chemical Engineers  
**Dennis C. Hendershot**

10:10 AM Preventing Accidents through Experience Based Learning **Scott Berger**

10:35 AM Safety and Chemical Engineering Education - History and Results **Joseph F. Louvar**



## 2nd Annual CCPS Latin American Process Safety Conference and Expo

Palácio das Convenções do Anhembi  
São Paulo, Brazil  
June 8-10, 2009

**CALL FOR PAPERS** | Abstract Deadline February 15, 2009  
Decision on Papers February 23, 2009

The Center for Chemical Process Safety (CCPS), the Brazilian Chemical Industry Association (ABIQUIM), and the Brazilian Association of Chemical Engineering (ABEQ), are coordinating to present the 2nd CCPS Latin American Process Safety Conference and Expo. This annual event is the major forum in Latin America for practitioners from the chemical and allied industries, academia, and government to share practical and technological advances in all aspects of process safety. This year's conference will take place in São Paulo, Brazil on June 8-10, 2009 and will be in conjunction with ABIQUIM's Responsible Care® conference.

The conference will consist of oral presentations in each of the topical sessions listed below as well as poster presentations on any process safety topic. If you wish to present a paper, please submit an abstract on the conference website [www.ccpslatinamerica.org](http://www.ccpslatinamerica.org) by **February 15, 2009**. Abstracts will be selected on **February 23, 2009**, so don't delay. Please note that while final papers and presentations may be in English, Portuguese, or Spanish, it is asked that all abstracts be submitted in English.

If you have any questions regarding the conference or if you have any difficulty submitting an abstract, please contact Roxy Schneider at [roxys@aiiche.org](mailto:roxys@aiiche.org) or by phone at +1.646.495.1372. Please also contact Roxy if you are interested in sponsorship or exhibition opportunities.

### Topical Sessions Include:

- [Training and Qualification for the Process Safety Professional](#)
- [Fire and Explosion Prevention](#)
- [Mechanical Integrity](#)
- [Indicators and Metrics in Process Safety](#)
- [Inherent Safety](#)
- [Risk Management](#)
- [Safety Instrumented Systems](#)
- [Transportation Risk Assessment](#)
- [Auditing Process Safety](#)
- [Process Safety Culture](#)

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