AIChE® **The Pipeline**

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NEWSLETTER OF THE EAST TENNESSEE SECTION OF AIChE

Local section website http://www.tnengineering.net/AICHE/

Local section mailing address PO Box 7448 Kingsport, TN 37664-7448

Upcoming January Program

"Chemical Plant Startup"

Joseph Bays
Acetyl Licensing Group Leader
Chemicals Development Division
Eastman Chemical Company

Tuesday January 17th, 2012 11:30AM to 1PM
B-150 Multimedia Room 201C
(Pizza will be served at 11:30)

Abstract

With renewed company and industry commitment to growth, it is not unreasonable to assume that a significant fraction of that growth requires new assets and technology. When breaking ground to implement these new assets and technology, there are several hurdles that must be crossed in order to achieve a successful chemical plant start-up. Throughout the presentation, the role that chemical engineers serve to achieve a safe and successful start-up and some tips for problem solving will be discussed as we review the speaker's experiences on past licensing projects, including CCP, and experiences being on an international assignment. It takes some footwork to solve problems across cultures.

About our Speaker

Joseph Bays is the Acetyl Licensing Group Leader in Chemicals Development Division at Eastman Chemical Company. He received his B.S. in Chemical Engineering from Virginia Polytechnic Institute and went on to obtain his M.S. in Chemical Engineering from The University of Tennessee. Joseph started working with Eastman prior to graduation in several different support roles and since 1988 has worked in both process engineering and development. Most recently, he has been involved in the startup of overseas licensing projects in Taiwan and Saudi Arabia.

Letter from the Chair

Patrice Riesenberg

I want to congratulate the 2012 East TN AIChE Officers:

Chair	Steve Miller
Vice-Chair	Noah McMillan
Directors	Lauren Moyer
	Mark Harrison
	Paul Fanning
Secretary	Lane Daley
Treasurer	Rebecca Glaspie

I also want to thank all the volunteers that helped out in the 2011 year. And also, thank you to everyone for allowing me to serve you this year! It has been an enjoyable learning experience.

East Tennessee Section Programming Series for Winter/Spring 2012
Challenges and Future Trends in Chemical Engineering

Steve Miller

In addition to advocating on behalf of the chemical engineering profession, one of the functions of AIChE is to provide chemical engineers with professional growth opportunities. In this time of rapidly changing technology and intense global competition, the 2011-2012 Program Committee focused on topics that highlight likely future trends for chemical engineers, with the goal of identifying some upcoming challenges and related opportunities for learning and growth. It is clear that some interesting trends lie before us, which should provide exciting openings for those within our section to shape and participate in that future.

This fall, we have covered topics ranging from water management challenges to methods for quantifying environmental sustainability of products and processes to the use of nuclear power to supply industrial heat and power. For the winter and spring, we have lined up a slate of engaging speakers to continue this series on future challenges and opportunities.

Whatever the future holds for the chemical engineer's workplace, safety will always be of paramount importance. To emphasize that fact, we will have an interesting and informative safety program in March.

Of course, life is not all about looking to the future; we must be open to learning from our past. In May, we will have a chance to learn from our very distant past through a joint event with ACS at the Gray Fossil Site. More to come on that, but it should be considerable fun.

Date confirmation, location, and more information about each program will be communicated through subsequent emails and newsletters, but the plan is summarized below:

Date*	Topic	Speakers
January 17	Chemical Plant Startups…And Other Cultural Challenges	Joe Bays Eastman Chemical Company
February 14	Scale-up / Piloting Visions for the Future	Brad Duckworth Eastman Chemical Company
March 7	Dust Explosions	Wayne Chastain and Pete Lodal Eastman Chemical Company
April 3	Future Trends in Chemical Process Control	Jim Downs Eastman Chemical Company
May	AIChE/ACS Family Night at Gray Fossil Site	

*Please note that these dates are tentative; subsequent newsletters and meeting notices will be used to confirm.

We hope you will be able to participate throughout the remainder of our 2011-2012 program year.

-- Submitted by your 2011-2012 Program Committee:

John Aycock *John Franjione* *Matthew Hedlund* *Craig Hoyme*
Laci Kemp *Noah McMillan* *Steve Miller* *Ashfaq Shaikh*
Jaclyn Shuman *Nate Tilton*

November Program Recap

"Small Modular Reactors and the Second Nuclear Era"
Dan Ingersoll, Oak Ridge National Laboratory

Dr. Daniel Ingersoll has degrees in physics and nuclear engineering, he has been in leadership positions at Oak Ridge National Laboratory for 34 years, and he is currently the Senior Program Manager in the Reactors and Nuclear Systems Division at ORNL. Through that lens of education and experience, Dr. Ingersoll provided a fascinating presentation on the rich and sometimes controversial history of nuclear power, and on a future that holds the potential for a safe and clean second nuclear era.

Driven by the joint desires to reduce greenhouse gas emissions and to safely establish greater energy independence, there has been a revival of interest in nuclear power. Dr. Ingersoll provided an overview of Small Modular Reactors (SMRs) and the role that they could play within a new nuclear era. Although approximately 20% of the United States' electricity is produced by nuclear energy, only a few nuclear power plants have been built in the past two decades; none have been built since 1996. SMR technology could play a large role in catalyzing a nuclear renaissance.

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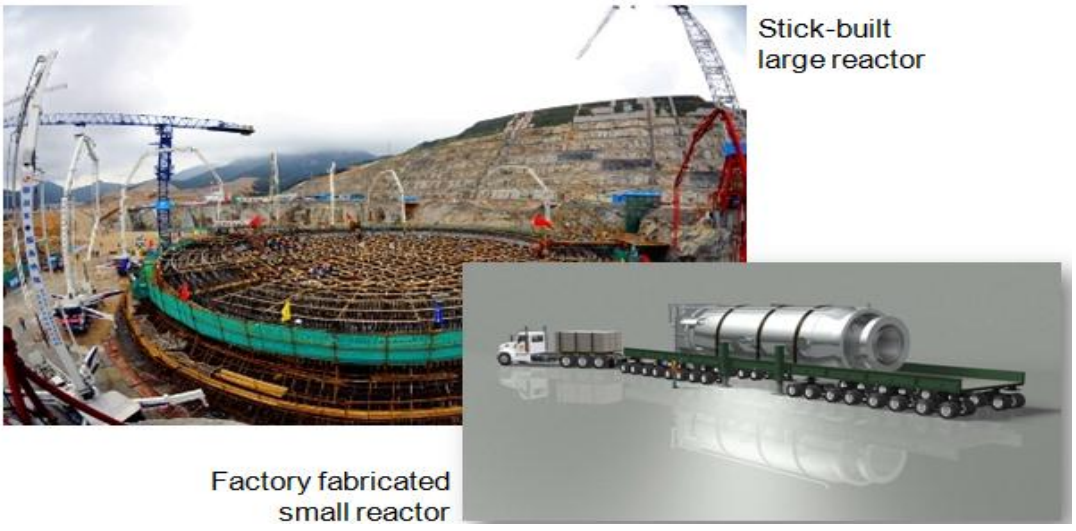
Certainly a small reactor concept is not new. In fact, the commercial nuclear power plants of the 1950s and 1960s were quite small – most with electrical output of less than 100 MWe (relative to ~1100 MWe plants that became the norm after the 1970s); and, of course, the United States has had a long and successful record of using small nuclear reactors for military applications. Nevertheless, it is only recently that interest in SMRs has reemerged.

In 1985, the Weinberg Study (Weinberg, et al., *The Second Nuclear Era*, 1985) explored the merits of smaller, simpler, safer reactors. This study highlighted the fact that large reactors are complex and difficult to operate and suggested that small inherently safe designs would be possible and could be an answer *if* they could be made economically. Small modular reactor design work, largely enabled by experience from the excellent performance of the existing fleet of large reactors, demonstrated the technical feasibility of SMRs. In addition to motivations related to carbon emission goals and energy security concerns, some of the key benefits that have led to the reemergence of interest in SMRs are:

- Enhanced safety and robustness from simplified designs
- Reduced capital cost
- Ability to add new capacity incrementally to match power demand and growth rate
- More flexible siting
- As highlighted by the images shown below, factory fabrication and modularization/standardization (relative to the stick-built nature of large reactors) have the potential to yield competitive power costs.



While SMRs offer the *potential* for enhanced safety and resilience against upset, Dr. Ingersoll emphasized that this must be proven, noting that the recent Fukushima disaster demonstrated the need to fully understand safety features of a design and the related risks. For instance, the following analyses should be performed and understood:

- Common-cause upset modes in multi-module plants (commercial power plants will be multi-module)
- Seismic response of below-grade construction
- Reliability of passive safety systems

In addition, the following anticipated economic advantages of SMRs are still unproven:

- Lower total project cost (lower sticker price and improved financing options/cost)

- Lower electricity cost, with other economic factors more than compensating for the economy-of-scale "hit" of smaller plant
- Lower investment risk (maximum cash outlay more predictable).

And demonstration of the full "Modular" nature of "Small Modular Rectors" will be a key to establishing economic viability.

There are several U.S.-based light water reactor SMR designs vying for acceptance: Westinghouse's SMR (225 MWe), Hotec's HI-SMUR (140 MWe), B&W's mPower (125 MWe), and NuScale (45 MWe). There are also several gas-cooled designs: General Atomic's MHR (280 MWe), Westinghouse's PBMR (250 MWe), and Areva's ANTARES (275 MWe). This level of activity should spur innovation in engineering techniques, materials, fuels, and control & instrumentation, all of which could reduce capital and operating costs. On the other hand, in such a necessarily heavily-regulated industry, too many competing designs can create institutional challenges – in addition to the inherent institutional challenges of a requisite mindset change and the fear of first-of-a-kind.

Much of the focus was on generation of electricity, but it was noted that the gas-cooled reactor designs can provide high-temperature process heat. This capability and the scale of such SMRs could eventually prove to be a carbon-emission-eliminating fit for the petrochemical industry.

Those of us in the East Tennessee Section of AIChE may have the opportunity to follow the construction of a SMR facility relatively closely. TVA and DOE are working together to pursue the design and construction of a nuclear power facility based on B&W's mPower technology. The construction permit work will begin in 2012, though start-up would not occur until 2019. Several technical and institutional challenges lie ahead for that project, but Oak Ridge could again be a pioneer in nuclear energy.

December Program Recap

"Integrated Water Management"

John Barber
Superintendent of the Waste Disposal Services Department
Eastman Chemical Company

John Barber from Eastman Chemical Company addressed the topic of "Integrated Water Management" at the December meeting. Water is a scarce resource globally without any acceptable substitutes for many applications (e.g. drinking). Only 2.5% of the world's water is fresh, and two thirds of that is frozen and therefore inaccessible. This scarcity has led some to speculate that future wars may be fought over water rights. The speaker suggested that this view is overly pessimistic while at the same time making the point that water is a valuable resource that should be conserved.

Integrated water management refers to a strategy to reduce demand for fresh water by increasing water recycling and reuse and matching water quality to the needs of the user. An example might be piping a residence with a second plumbing system for "gray water" that could be collected and used for flushing toilets. Another example is the use of captured rainwater runoff as a water source for washing vehicles.

At this time, many of the latest technologies and concepts of water management have not been widely adopted by the chemical industry. Especially in East Tennessee, we are blessed to live in a region that has plentiful fresh water and sufficient water treatment infrastructure to meet the needs of the near future. To be sure, water management is a concern just like management of any utility, and there will always be an incentive to conserve, however this could be accomplished by something as simple as identifying and repairing water leaks. Ultimately the degree to which new water management practices and technologies are adopted will be a function of economics and regulation.

Project Benjamin

Rebecca Glaspie

Project Benjamin is back and better than ever! The East Tennessee Section wants to help you become a national AIChE member. As a board, we have decided to make membership one of our goals for 2012. To help you become a member, the board will assist you in paying your national dues in 2012. Project Benjamin was a program that targeted non-members that were new to the area – now it is being expanded to anyone who is not a member who would like to join the national organization. All you have to do is email Rebecca Glaspie at rglaspie@eastman.com and ask to be considered. Priority will be given to those who regularly attend program meetings.

Benefits of being a national member:

- You can vote for local section and national leadership (non members cannot vote)
- National AIChE provides PDH eligible webinars for members – Some free of charge (you also get a few credits to use toward webinars that cost)
- National membership greatly reduces your cost to attend AIChE conferences
- Chemical Engineering Progress magazine is included with your dues.

Volunteer Opportunities during National Engineers Week

Paul Fanning

National Engineers Week, also known as EWeek, is scheduled for February 19-25, 2012. This is a great opportunity to share your (chemical) engineering experiences with middle school and high school students. The EWeek Committee has begun its solicitation and sign-up process. If you would like to volunteer, please click this link, which takes you to the EWeek sign-up application, and choose a school or other activity such as the "ASCE Boy/Girl Scouts EWeek Program" that is being offered in partnership with the Holston Branch of the American Society of Civil Engineers (ASCE). Alternatively, feel free to send an email to the EWeek Committee at eweek@eastman.com and someone will contact you. Both activity leaders and supporting team members are needed. Let's join our engineering comrades in this worthy endeavor and bring a flavor of chemical engineering into the classrooms of our local school systems.

What's New at National AIChE

Steve Miller

Opportunities to Confer with Colleagues:
As is typically the case, AIChE will sponsor or co-sponsor several high-quality conferences in 2012, covering an array of interesting topics. The current schedule is given below.

2012 Conferences
Carbon Management Technology Conference Caribe Royale Hotel & Convention Center Orlando, Florida February 7-9, 2012
Sustainability in (Bio)Pharmaceuticals Sheraton Old San Juan San Juan, PR February 19-22, 2012
Spring Meeting and 8th Global Congress on Process Safety Houston Hilton and George Brown Convention Center Houston, TX April 1-5, 2012
3rd International Conference in Stem Cell Engineering Sheraton Seattle Seattle, WA April 29 - May 2, 2012
6th International Conference on Bioengineering and Nanotechnology University of California, Berkeley Campus Berkeley, CA June 24-27, 2012
2012 Annual Safety in Ammonia Plants And Related Facilities Symposium Hyatt Regency Chicago Chicago, IL September 9–13, 2012
2012 Annual Meeting Pittsburgh Convention Center Pittsburgh, PA October 28 - November 2, 2012

Webinars:
Don't have the time or budget for travel? No problem; AIChE offers a wide variety of live and on-line webinars. Check them out at: http://apps.aiche.org/chemeondemand/LiveWebinars.aspx

Just another example of the value of AIChE membership: Members are entitled to as many as 6 FREE ChemE on Demand credits each year, good on all webinars (live and archived) as well as other content. That's over $700 worth of content for only $199. Non-Members pay $179 for each. Join today.

Upcoming live webinars:

AIChE's Leadership Webinars: Chemical Engineering Essentials from Academic Authors - Session Ten: Chemical Reaction Engineering Part Two: Non-Isothermal Design and Analysis

Presented by Dr. H. Scott Fogler

Wednesday, January 4, 2012

Chemical Reaction Engineering (CRE) is a subject that is readily adapted to solving problems through algorithms rather than memorization of the numerous equations for each reactor type. In this webinar, an algorithm is presented for the design of chemical reactors with heat effects. User-friendly forms of the energy balance equations for single reactions are given for Batch Reactors (BRs), Plug Flow Reactors (PFRs) and Continuous Stirred Tank Reactors (CSTRs).

The application of these equations to reactors operating adiabatically and also with heat exchange is discussed along with a case study of a runaway reaction and explosion.

Isothermal Reactor Design is discussed in Chemical Reaction Engineering Part One.

Attending Part One is suggested, but not required, for attending Part Two. To access the web page for Part One, please click here.

Maintenance and Reliability for Chemical Engineers, Part Three-The Tools of Reliability

Presented by David A. Rosenthal

Wednesday, January 11, 2012

To compete in the marketplace, manufacturers require a greater return on their assets by having them produce the most, for the longest time, and for the lowest cost. Asset management methods, tools, and practices are applied throughout an asset's life in order to achieve availability and operating cost goals. The strategies employed to achieve these goals are based on our understanding of machine failure mechanisms. With its origins, in the airline industry, the understanding of machine failure made significant advances. Reliability-centered maintenance has allowed us to design and to apply the appropriate maintenance care. Reliability engineers have many other tools to determine failure causes, understand how to deploy resources, and determine the best approach to reliability improvement that impacts their business.

"Maintenance and Reliability for Chemical Engineers, Part Three—The Tools of Reliability" covers root cause analysis, defect elimination (five why's), failure modes and effects analysis (FMEA), criticality, reliability-centered maintenance, and bad actor management.

The first and second sessions can be viewed in the ChemE on Demand archive. The first session explores the evolution of maintenance, its intended function, value of reliability, and the components of asset management. The second session focuses on machine failure and the application of preventative and predictive care.

Outcomes of the EPA/NSP/AIChE Center for Sustainable Technology Practices Sustainable Supply Chain Design Scientific Workshop
Presented by Professor Ignacio E. Grossmann, moderated by Dr. Darlene Schuster
Wednesday, January 18, 2012

The Sustainable Supply Chain Design (SSCD) Scientific Workshop, Sponsored by EPA, NSF and the AIChE Center for Sustainable Technology Practices was held in mid-September of 2011. This webinar presents an overview of the outcomes of the Workshop.

The purpose of the Workshop was to foster collaboration and promote the development of a research community focused on sustainability and supply chains. This was accomplished by bringing together a diverse group of researchers and other professionals with experience relevant to sustainable supply chain design.

From experts with experience working within a broad, systems perspective, an understanding of the key shortcomings of current practices was elicited. The Workshop also identified practical ways in which new or repurposed approaches could be integrated within existing frameworks.

In the case of experts with experience working within a narrower focus, the participants worked together to understand how these approaches could be integrated within existing frameworks or larger-scale models.

The Workshop also explored opportunities for applying discipline-specific approaches to other problems related to the design of sustainable supply chains.

SEF Webinar: Green Design, Green Energy, and Sustainability
Presented by Dr. Urmila M. Diwekar
Wednesday, January 25, 2012

This webinar presents a systems analysis perspective that extends the traditional design framework to green design, green energy and industrial ecology leading to sustainability. For green design this involves starting the design decisions as early as material selection stage on one end, and managing and planning decisions at the other end. However, uncertainties and conflicting objectives are inherent in such a design process - which leads to multi-objective optimization problems.

Uncertainties increase further in industrial ecology. Optimal control methods and theories from financial literature can be useful in handling the time dependent uncertainties in this problem. Therefore, we discuss decision making at various stages, starting from green design and green

energy, to industrial ecology. Sustainability is illustrated for the mercury cycling. Power plant sector is a major source of mercury pollution, and so we explore how to circumvent the persistent, bioaccumulative effect of mercury, by taking decisions at various levels of the cycle starting with greener power systems, industrial symbiosis through trading, and controlling the toxic methyl mercury formation in water bodies and accumulation in aquatic biota.

The webinar is intended for a diversity of audience ranging from undergraduate and graduate students of chemical engineering, to researchers and academicians working in green process design and sustainability, and practicing chemical engineers interested in tackling problems encountered in actual operations.

Cheers! The Chemistry of Wine
Presented by Dr. Ariel Fenster
Wednesday, February 1, 2012

It is said that a meal without wine is like a day without sunshine. This webinar provides all the necessary information to fully appreciate this best companion of good food. It presents the history of wine as well as the chemical aspects of fermentation and of aging. Recent studies suggesting that moderate wine consumption is beneficial to health are also examined in a critical fashion. Informative and humorous, the webinar concludes with an introduction to the "science" of wine appreciation with particular reference to the understanding of wine labels and the proper technique of wine tasting. A pleasure for all, from the experienced oenophile, to the wine lover "in waiting."

Explosion Protection with In-line-flame Arresters
Presented by Dr. Michael Davies
Wednesday, February 29, 2012
This seminar educates participants on explosion protection concepts regarding in-line flame arresters. It begins by demonstrating flame arrester function with short video sequences. From there, it discusses limits of use and distinguishes between different types of arresters based on the explosion and combustion types for which they are tested. This new knowledge is applied so each participant understands how to choose the correct type of arrester based on vapor group and process conditions (e.g. temperature and pressure). Finally, the webinar provides a “layer of protection” concept to assure flashback protection from incinerators and other ignition sources and demonstrates sizing of devices, taking into account various process parameters.

Pressure Relief Valve Sizing Equations’ Basis
Presented by Aubry Shackelford
March 14, 2012

For sizing pressure relief valves, many turn to the guidelines and practices of ASME and API that present specific sizing equations given a required relief rate and basic fluid properties.

Continuing Education – Professional Development Hours Available

Eastman Employees Only: Are you a professional engineer seeking to meet state continuing education requirements for professional development hours (PDH's)? If so, please visit this website for a list of potentially eligible courses and more information: Continuing Education for Professionals

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Calendar of upcoming events

Several great programs are planned for the upcoming programming year. Topics include:

- Chemical Plant Startups, Joe Bays (Eastman Chemical Company) – January 17, 2012

Keep Up With the Local Section Online

Up-to-date information about the East Tennessee Section of the American Institute of Chemical Engineers can be found on our website (www.tnengineering.net/AICHE). The website includes the Local Section Bylaws, List of Officers from 1945 to present, and an archive of Pipeline Newsletters - to mention only a few aspects of the information covered. Photos from past events can be found, along with contact information for the Local Board. Review the site occasionally and keep up with the local section!

2012 Local Section Officers, Directors, & Support Staff

Chair:	Stephen Miller	224-7350
Chair-Elect and Program Committee Chair:	Noah McMillan	224-8114
Secretary:	Lane Daley	229-3064
Treasurer:	Rebecca Glaspie	229-6144
Directors:	Paul Fanning	229-8500
	Mark Harrison	229-6952
	Lauren Moyer	229-2208
Local Section Webmaster:	Tim Nolen	229-8287
Short-Course Coordinator:	Mark Shelton	229-4753
Professional Development Coordinator:	Joe Parker	229-3850
Corporate Relations Coordinator:	Braxton Sluder	578-6225
AIChE Pipeline Newsletter Co-Editors:	Mark Kettner/Bryan Kirkman	229-3907/1587
ETEAC Representative:	Lane Daley	229-3064

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