Mega Disasters: Toxic Cloud
Aired Monday July 22 on The History Channel
Mannan interviewed for History Channel Program

M. Sam Mannan was interviewed for the History Channel program “Mega Disasters: Toxic Cloud.” The program, which analyzed a mega disaster and then restaged it using state-of-the-art computer animation, aired Tuesday, July 22 2008 at 9 p.m. on the History Channel. Mannan was interviewed about what industry, research and academia are doing to prevent such events from happening again. See Director’s Corner on page 2 for full story.

Pasman Joins Center

Dr. Hans J. Pasman, emeritus professor of the Delft University of Technology in the Netherlands and a member of the Dutch ministerial Council of Hazardous Substances, has joined Texas A&M University’s Artie McFerrin Department of Chemical Engineering as a research professor for the Mary Kay O’Connor Safety Process Center. See article on page 7.

Symposium is Around the Corner

The 2008 Annual International Symposium of the Mary Kay O’Connor Process Safety Center will be held at the Hilton Hotel in College Station, Texas, home of Texas A&M University on October 28-29, 2008. This year’s symposium will be held in conjunction with the 2nd World Conference on Safety of Oil and Gas Industry. The event is packed with state-of-the-art presentations on many different aspects of process safety and loss prevention. You can find more information about these important events on our web site at http://psc.tamu.edu/symposia/2008 and beginning on page 15 of this newsletter.
In late Spring, I was contacted by the History Channel to be interviewed as part of the series they were in the process of filming entitled “Mega Disasters.” The particular segment I was to be a participant in was called “Toxic Cloud.” Because of the fact that this topic is one that is important to all stakeholders—industry, the public, federal and state legislators, academia—I decided that I should, as Center Director, provide the academic, research based opinion.

So, one Sunday afternoon the crew filming this segment arrived at the Center. During the interview, I discussed major catastrophic incidents that have occurred in the past, but also the strides we as a society and in academia have made since these disasters have happened. All the students and many staff members showed up to help provide a well-rounded picture of our work in the Center—the library, the laboratories, the research equipment. We spent several hours filming the students in the library, research discussions, laboratory operations and then a formal interview.

I spent quite some time discussing the previous disasters and lessons learned. The interviewer was also interested in current plants that have large quantities of toxic chemicals such as hydrogen fluoride and chlorine. I pointed out that inherent safety options can and should be considered; however, we must be aware of the differences in implementing inherent safety options for existing plants, as compared to new plants. Also, in some cases, a seemingly clear choice with regard to inherent safety may create some undesired and unintended consequences. Issues such as risk migration, reduction of overall risk, and practical risk reduction should be evaluated whenever an inherent safety option is considered. Implementation of inherent safety options should not be allowed to create other unintended consequences. An example I quoted in this context is the substitution of hydrogen fluoride (HF) with sulfuric acid (H₂SO₄) for refinery alkylation processes. While it is true that HF is more toxic than H₂SO₄, the amount of H₂SO₄ needed to do the same amount of processing is 25 times or more than HF. Thus, changing from HF to H₂SO₄ would require large storage facilities and more transportation. In fact, changing from HF to H₂SO₄ may provide more opportunities for incidents (intentional or unintentional). On the other hand, a well-managed plant with a smaller amount of HF and appropriate safety protective systems may represent a lower overall risk.

I believe it is important to continue to participate in forums like The History Channel documentary to provide a balanced science-based perspective. As the old adage goes, “If you don’t speak for science, somebody else will.”

M. Sam Mannan
In Memoriam

Carolyn Merritt

On August 29, 2008, Carolyn Merritt, who served as chairman of the US Chemical Safety Board (CSB) from August 2002 until August 2007, died in St. Louis after a long and characteristically tough fight against metastatic breast cancer. Those who knew about her work knew about her untiring work towards improving workplace safety as well as environmental performance. During her 5-year term at the CSB, she committed the fledgling agency to build on a new legacy. She brought great vision and energy to the CSB. When the agency was struggling to find its own image and identity, she provided great leadership in righting the ship and establishing the CSB as a respected federal agency producing quality incident investigations and disseminating lessons learned. There is no question that she has left an indelible mark and her legacy at the CSB.

Carolyn was ideally suited to the role of CSB Chairman when she was appointed by President George W. Bush in 2002. Prior to becoming the chairman, Carolyn had served for many years in executive roles in major corporations with responsibility for health, safety, and environmental issues. But she brought more than her experience and expertise to the agency. Carolyn believed passionately in the CSB’s mission. She worked tirelessly to save lives of workers and the public through chemical accident prevention, insisting on thorough investigations and meaningful safety recommendations.

Starting in 2002, she led a great renewal of the agency, establishing it as a highly respected institution in the field of chemical process safety. She greatly increased the CSB’s productivity and its impact on safety. She worked hard to recruit new staff and build bridges with colleagues worldwide.

Words cannot begin to express the extent of everything she accomplished. The safety community has lost a remarkable woman and a trailblazer.
Recent Publications


2008 Membership

**Partners**
- BP
- Celerity 3
- Dow Chemical Co.
- ExxonMobil Chemical
- Huntsman Corporation
- Ineos
- Invista
- Shell International E&P
- Siemens OGM

**Advisors**
- ABS
- Albemarle Corp.
- Atkins Americas
- Celanese
- Chevron
- Conoco Philips
- DNV
- Formosa Plastics
- Lloyds Register
- Luminant Energy
- PPG Industries
- RRS Engineering
- Syntex Management Systems
- Texas Petrochemicals
- Valero Refining

*Information about Center Membership can be found at: [http://process-safety.tamu.edu/membership/](http://process-safety.tamu.edu/membership/)*
FALL 2008

Distance Learning

The Mary Kay O’Connor Process Safety Center (MKOPSC) is offering the following safety education and process safety engineering courses in Fall 2008, via the Petroleum Engineering Department’s Distance Learning Program.

These distance learning courses are eligible for academic credit or Continuing Education Units (CEUs). To receive academic credit for the courses, you must be a currently enrolled student at Texas A&M University. The courses also apply towards the Safety Engineering Certificate.

Fall 2008 Offerings

**CHEN 455 - SENG 455: Chemical Process Safety** - Instructor: Dr. Sam Mannan
Applications of engineering principles to process safety and hazards analysis, mitigation, and prevention, with special emphasis on the chemical process industries. This course covers source modeling for leakage rates, dispersion analysis, relief valve sizing, fire and explosion damage analysis, hazards identification, risk analysis, and accident investigations.

**CHEN 430 - SENG 430: Risk Analysis Safety Engineering** - Instructor: Dr. Bill Rogers
Concepts of risk and risk assessment, which uses all available information to provide a foundation for risk-informed and cost-effective engineering practices; examples and exercises are drawn from a variety of engineering areas.

Previously Offered:

**SENG 489/689 - PETE 689-5: Quantitative Risk Analysis**
Following the growth in complexity of engineering systems, demands are increasing for health, safety, and environmental quality with more stringent requirements for reliability and increased engineering performance. This course presents the fundamentals of quantitative risk analysis for cost-effective engineering applications, risk criteria, and risk decisions.

To register for a course, contact:

Mary Lu Epps
Texas A&M Petroleum Engineering
3116 TAMU - 407 Richardson Building
College Station, TX 77843-3116
Phone: (979) 458-4297
E-mail: marylu.epps@pe.tamu.edu

*CEUs will be issued through the Mary Kay O’Connor Process Safety Center upon successful completion of the course.

Distance Learning Objectives

In the future, the Center plans to offer all courses online for the Safety Engineering Program and the Safety Engineering Certificate Program, to teach the knowledge and skills required for safety, health, and environmental engineering.

Also in future plans is the ability to offer the Masters of Engineering in Process Safety and Masters in Safety Engineering programs as distance education programs. The objective of the non-thesis Masters of Engineering in Process Safety (ME-PS) program is to teach the principles and practices of process safety engineering for leadership careers in the process safety. For more information on requirements and prerequisites, please see website at:

http://psc.tamu.edu/education/safety-engineering-program
New People

In July 2008, Dr. Dedy Ng joined the Center as an Assistant Research Scientist. Ng is originally from West Borneo, Indonesia and came to the US in August 1997 to pursue his undergraduate studies. He earned his bachelor’s degree from University of Texas at Austin in 2003, his master’s and PhD degrees from Texas A&M University in 2005 and 2007, respectively, all in mechanical engineering. Prior to joining the Center, Dr. Ng’s past research focused on tribological-electrochemical behavior in material interface, structural-property relationship, and theoretical modeling in the applications of micro/nano manufacturing. To date he has authored/coauthored 10 peer-reviewed journal papers and 9 conference papers.

In his new position with the Center, Dr. Ng said, “I’m very excited to pursue a new research direction under the supervision of Dr. Mannan and I’m committed to delivering excellence in working with the staff and students in the Center.” After a month of work, Dr. Ng said “I found that passion in research, professionalism, teamwork, and leadership are the driving forces of the Center’s activities. “ He enjoys working with Dr. Mannan, staff, and students on diverse projects and looks forward to the challenge and opportunity to grow and promote safety as a second nature.

Jiejia Wang joined the Center as a technician in May. She is working on database management and website maintenance. Wang received a Bachelor Degree in Public Administration with honors in 2004 from Zhejiang University, China and a Masters Degree in International Business in 2006 from Nottingham University Business School in England. She is currently a graduate student majoring in Management Information Systems and expects to receive a Masters Degree this December. Wang is interested in data mining techniques, exploring and analyzing a large sets of data to discover meaningful patterns and rules that can be applied to the basic research and to the real business world as well. She said, “I really enjoy working in the MKOPSC with so many diligent, passionate and talented people. I also deeply appreciate the opportunity the Center has offered me to apply my knowledge to real work.”

New Students

The Center welcomes several new graduate students this fall. Diana Castellanos and Carolina Herrera, have been working in the Center for a few months, but will now be graduate students in the group starting in the fall. New students also joining the graduate program and Center this Fall are Carmen Osorio and Mahdiyati. Finally, Carolina Morales, an undergraduate student from Venezuela will be working in the Center for six months on a research project.

Graduates

Lisa Veltman graduated in August 2008 with a MS degree. She has accepted a position with Chevron.

Also graduating in August with MS degrees are Linh Dinh, Fuman Zhao, and Yuan Lu. These students are staying on to earn their PhDs.

Zhang Joins DNV

Dr. Steven Zhang, MKOPSC assistant research scientist has taken a position with DNV in Katy, Texas, effective August 2008.

Dr. Zhang graduated from the Chemical Engineering Department of TAMU and then joined the Center in May, 2006. In the last two years, Zhang supervised graduate student’s research and taught five courses. Zhang also led Center graduate students in completion of several projects, such as LNG Spill Emergency Response, HAZOP study for a bio-ethanol facility, Quantitative Risk Analysis of supercritical water oxidation test facility, Propane incident database analysis, and safety and environmental protection for offshore petroleum operations for the Gulf of Mexico.
College Station, Texas, June 20, 2008 - Dr. Hans J. Pasman, emeritus professor of the Delft University of Technology in the Netherlands and a member of the Dutch ministerial Council of Hazardous Substances, has joined Texas A&M University’s Artie McFerrin Department of Chemical Engineering as a research professor for the Mary Kay O’Connor Safety Process Center.

A noted authority on chemical risk management, Pasman most recently has worked on improving explosion safety and efficiency of gas phase hydrocarbon oxidation processes as coordinator of the EU FP5 Project SAFEKINEX from 2003-2007. During that span, Pasman also served on the Dutch governmental Advisory Council on Hazardous Substances as chairman of the Committee for Knowledge Infrastructure and of the Committee for Explosive Substances and Items.

Prior to his time on those projects, Pasman served as director of marketing programs at TNO Defence, researching the broad field of defense technologies. There, he introduced a new integrated project management approach to improve both effectiveness and efficiency of research and helped to establish mechanisms for broad international cooperative efforts.

In addition, Pasman has served as chairman of various organizations throughout his career, including OECD International Group on Unstable Substances, the European Study Group on Risk Analysis, the NATO AC/310 Safety and Suitability for Service of Munitions and Explosives, Sub Group I Explosives, and the Working Party on Loss Prevention and Safety Promotion in the Process Industries of the European Federation of Chemical Engineering.

A decorated scholar, Pasman has been honored with numerous distinctions for his contributions, including receiving in 1991 a Royal Honour - Officier in de Orde van Oranje-Nassau. In 2005, he was a recipient of the Dieter Behrens Medal of the European Federation of Chemical Engineering.

Pasman completed his undergraduate degree at Delft University of Technology in 1961 before earning his doctorate in the technical sciences in 1964. After serving in the military, Pasman joined TNO.
Visitors to the Center

Dr. Simon Waldram visited the Center from June 2-26, 2008. Dr. Waldram is a visiting professor in the department of chemical engineering at Texas A&M University at Qatar (TAMUQ) and Honorary reader in the Department of Chemical Engineering at University College London (UCL). He is an active member and chairman of several committees at TAMUQ, such as the TAMUQ PSA committee and CHEN laboratory committee.

During his visit, he developed with Dr. Mannan, Dr. Zhang, Dr. Miao and graduate students, Fuman Zhao and Peng Lian, the QNRF (Qatar National Research Fund) national priorities research program grant proposal entitled “Prediction of flash points and flammability behavior for liquid mixtures and aerosols.” The proposal will be span a 3-year period for support of the flammability research. Also, Dr. Waldram attended a luncheon in celebration of the Center’s graduating students.

Dr. Maria Papadaki, a professor with the Department of Environmental and Natural Resources Management, University of Ioannina, Greece, and Visiting Reader at the University of Leeds, UK, visited the Center during June 25- July 18, 2008.

The purpose of this and previous visits by Dr. Papadaki was to work with graduate students as part of international collaboration among the Universities of Ioannina, Leeds, and the Center. During her visits, Dr. Papadaki has guided research to design safer, more efficient, and environmentally friendlier processes. As part of this research, a systematic study of runaway reaction is contributing to inherently safer designs of processes and reactors.

Richart Vazquez-Roman, professor with the Technical Institute of Celaya, Mexico visited the Center from June 26 through August 15. During his visit, Vazquez developed a paper based on research conducted by Karla Ruiz-Vazques for her MS thesis. Vazquez also worked with graduate student Seungho Jung advising him on his PhD research on facility siting; also, helped developed a proposal for the US Department of Homeland Security.

BP and and Qatar Petroleum in partnership with the Qatar Foundation and Texas A&M University and its affiliates, signed a memorandum of understanding to develop and run a world-class liquefied natural gas (LNG) safety research program in Qatar.

The program will extend and complement the existing BP-sponsored program in place at Texas A&M University in College Station, Texas, which will help in the advancement of the science and technical understanding of key safety issues impacting the LNG industry. The research will take place at Texas A&M Qatar in Doha. The research will also include practical testing at Qatar Petroleum’s Ras Laffan Emergency and Safety Training College, currently under construction.
Prem Interns at Luminant Power

By Katherine Prem - I have had the greatest opportunity to be working for LUMINANT Power which is part of the Energy Future Holdings (formerly TXU). I am developing procedures for management of change (MOC) and process hazard analysis (PHA) under Mr. Alok Maheshwari - the safety director. The procedures will be implemented throughout the corporation. To say that this internship is an opportunity of a lifetime, would truly be an understatement.

I have also had the opportunity to visit Comanche Peak, the nuclear power plant, to discuss our MOC and PHA procedures. I often meet with the lignite and gas plant personnel to explain the MOC and the PHA procedures and, to get feedback on how to best implement the MOC and PHA in the plants. I recently had the tremendous opportunity to present the MOC and PHA, to all the lignite plant directors and the VP of power generations. I have also had the opportunity to briefly discuss my work with the COO of Luminant. Coming from a Chemical engineering background, I have had to apply the process safety principles customizing them to be applicable to power plants. This experience has once again proved that the education we receive at the MKOPSC is of the highest quality. Having worked in LUMINANT for only a couple of months, I have grown in leaps and bounds, not only as a good engineer but also as an individual. The opportunities, the responsibilities and the faith given to me have been nothing short of incredible.

Yun Interns at Shell Oil

By Geunwoong Yun - During the summer, I joined Shell Oil Company as an intern and was assigned part of one project for offshore platforms. It was challenging, but I made it successfully. I received several lessons learned from the internship.

Number one is “Safety is a core value, not just primary thing.” For the business success of a company, the safety of employees or contractors is one of the key parameters. It may include process safety, occupational safety, transportation safety, and also safety management and risk communication. Number two is “‘Listening to others,’ opinions are a crucial factor for the success of work”. Nowadays, most projects or work need to be handled by a team or group in order to reduce errors in decision making and increase the probability of success. In teamwork, it is very important to listen to other team members’ opinions. Lesson number three is: “For the success of an internship, strategic thinking for problems or projects is very important”. In other words, it is essential to make a plan, apply it to the work, and try to keep to the timeline for the success of internship. Number four is the “Organization”. A well-organized plan is one of the key parameters for the success of work or internship. For example, managing a busy schedule, making a meeting plan and report, and keeping our word to coworkers helps organize many things well to achieve our target. Finally, an internship is very helpful not only for students to have industrial experiences and job opportunities, but also for the company to supply fresh blood and new ideas to the organization. Furthermore, the internship helps with knowledge exchange between the university and the company which may fill needs or gaps in communication between the two.

Patel Interns at Shell E&P

By Suhani Patel - As the summer semester approached, I was given the opportunity to intern at Shell Exploration and Production in Houston. The internship was beneficial to me in many ways. I was given exposure to the industry and it’s working by helping out on an offshore project and interacting with other employees at Shell. The objectives of my internship project were to understand the framework used in Shell for proper implementation of different project phases and perform a preliminary risk assessment on an offshore project. The advantage of performing a risk assessment earlier in a project is that areas with greater risk reduction

(Continued on next page)
Internships Cont’d

benefits can be recognized and efforts can be targeted in those areas for subsequent project phases. In order to achieve my internship objective, I applied a risk assessment methodology to calculate risk metrics for different offshore concepts. The risk metrics provide an indication of relative risk differences among the options and the region in which the risk lies depending on tolerability or intolerability criteria. Such an analysis enables the project team to make a decision based on risk estimations along with other considerations for technical, economic, operational and political implications. This internship instilled in me an appreciation for good communication skills and the importance of team work for projects and other aspects. I am grateful to Shell International Exploration and Production for giving me this opportunity and to Dr Mannan (and MKOPSC) for teaching us good work ethics.

Yang Interns at Siemens Energy and Automation

By Sarah Yang - Time flew by during my summer internship with Siemens Energy and Automation, Inc. It was a productive two and half months and a wonderful learning experience.

Yang Interns at Siemens Energy and Automation

As many people know, Siemens is the largest German-based company in the U.S and the largest company in electronics and electrical equipment globally. Siemens also does business in oil and gas. My Siemens experience started with a data-collection trip to Lafayette, LA. Afterward, I was assigned to the Process Safety Practice group, which is well known for pressure relief analysis in industry. I learned how to do calculations associated with pressure relief system design with an emphasis on quality of work produced and work efficiency. I also identified overpressure scenarios for various types of processing equipment, calculated relief loads for all types of overpressure scenarios and evaluated pressure relief device capacities. Meanwhile, I gained experience using Aspen HYSYS, which is widely used in the refinery industry. I also used PPM, software Siemens developed for pressure protection management, and QRA, software specified for flare quantitative risk analysis.

Another important thing I learned, which I cannot emphasize enough, is the importance of teamwork. Engineering is all about teamwork and we cannot achieve anything without it. Overall, this summer has been a fruitful and remarkable journey because of this priceless and enjoyable working experience.

Case Histories Presented by MKOPSC Graduate Students July 24th Steering Committee Meeting

Morshed Rana, a graduate student, presented “Barton Solvents Explosion: Lesson Learned” at the MKOPSC Steering Committee Meeting on July 24, 2008. This study was based on the recently released U.S. Chemical Safety and Hazard Investigation Board (CSB) investigation report on the July 2007 explosion and fire at the Barton Solvents distribution facility in Valley Center, Kansas. In the report, CSB identified the causes of the explosion and made several safety recommendations to the industry and government regulators.

Rana presented a brief background on the company and chemical involved before discussing in detail the cause and consequences of the explosion. His presentation contained part of the safety video produced by CSB to show how the incident actually happened. The incident initiated inside a storage tank of VM&P Naphtha which is both nonconductive and NFPA Class IB flammable liquid. A static electric spark from a measuring float inside the tank ignited the flammable vapor-air mixture produced during filling up the tank. The tank exploded and then set off a chain reaction of large explosions in other tanks. It was fortunate that no one died from this incident, it only required widespread evacuations.

Rana discussed about the hazards of nonconductive flammable liquids. He concluded his presentation outlining the CSB recommendations to the industries and regulatory bodies and added additional measures to prevent these types of incidents in the future.

(Continued on following page.)
Qingsheng Wang presented a case history about “Propane Explosion in Port Hudson, MO.”

**Background.** At 10:20 pm on Dec 9, 1970, Phillips Pipeline Company’s pipeline ruptured and liquid propane was released in a rural area of Port Hudson. After 24 minutes the propane-air mixture exploded. The fire burned until 11:00 am next day. Propane is heavier than air, so once released, it will mix with air and hug the ground. With any ignition source, a fire or explosion will happen.

The explosion destroyed the pump house, extensively damaged homes within a 2-mile radius, and smashed windows up to 12 miles away. Fortunately, there were no fatalities and only 10 people were injured. According to the calculation, the explosion was equivalent to about 50 tons of TNT. The overpressure calculation and damage estimation were consistent with the observation. This explosion was identified as detonation. As far as we know, it is the only example of a detonation that has occurred in open-air.

**Causes.** Three causes are identified in the presentation: pipeline corrosion, human error and external interference. The pipeline was constructed in 1931 and there were 12 major weld failures during 1965-1970. The operator had not been trained in how to “crash shutdown” the system. Once the pump was shutdown, it produced a high pressure up to 942 psig on the failed section. In addition, the topography and weather were perfect to form an air mixture.

**Lessons.** There are two lessons learned from this incident: pipeline safety and vapor cloud detonation in open-air. Since corrosion and mechanical defects are two common reasons causing pipeline failure, the maintenance is especially important. Gas cloud explosions happen quite often in the chemical industry. According to Garrison’s analysis, for the hundred largest losses in the process industry, 42% were caused by vapor cloud explosions. For those who may be interested, this is an excellent resource (http://www.gexcon.com).

Once the gas ignited and exploded inside the pump house, it triggered the unconfined gas cloud to detonate. It may be concluded that any confined space that has an ignition source can result in a relatively small explosion, which can then detonate an unconfined gas cloud. Therefore, it is better to make sure that everything within the range of a possible gas/liquid leak has to be explosion proof.

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**CHISA 2008**

The series of International Congresses CHISA started in 1962 in Brno, then continued in Mariánské Lázně, and since 1972 the Congresses are being held in Prague – the heart of Europe. However, it is worth mentioning that the name was used as a logo for the national event as early as 1956. The word CHISA originates from the Czech acronym for “Chemical Engineering, Chemical Equipment. Design and Automation” and has become later a “trade mark” for large meetings traditionally devoted to the entire area of chemical and process engineering topics, covering science, research, development and industrial production. CHISA 2008 held in Prague from August 24-28, 2008, was attended by over 1,200 participants from more than 60 countries. Dr. Sam Mannan attended the conference and presented three papers:

Infrared Camera Training, June 17-19, 2008

Anisa Safitri represented MKOPSC at the Infrared Training Center (ITC) where a class was held on Gas FindIR infrared camera training in Houston on June 17-19th 2008 at Holiday Inn Houston InterContinental Airport. A Gas FindIR infrared camera is used for detection and surveillance system of gas leaks which are invisible to the naked eyes or normal visual camera. Infrared camera can detect anomalies in gas pipelines that might infer an occurrence of a leak through a two-dimensional image of a scene called a thermogram that maps the thermal energy distribution in the object being observed.

The training provided information on camera setup and operation, thermal science fundamentals, heat transfer theory, infrared radiation theory, absorption characteristics of several volatile organic compounds, survey and reporting procedures, operator certification, as well as gave a hands-on experience on how to operate the Gas FindIR infrared camera in any environmental conditions with safety considerations. By the end of the training, the students were required to pass the written and field test to be a certified Gas FindIR operator. The Gas FindIR certification is valid for 5 years and can be extended every 5 year by providing sufficient proof of experience in using the infrared camera.

Data Acquisition System: Experience from LNG Experiment, July 25, 2008

A three hour workshop/training on data acquisition system entitled, “Data Acquisition System: Experience from LNG Experiment” was conducted by Jaffee Suardin on July 25, 2008. The purpose of this seminar was to train MKOPSC students and research scientists to identify all the requirements to develop data acquisition system for new research. Jaffee’s discussion focused on the data acquisition system developed for the LNG spill field tests by the LNG research group of MKOPSC.

At the beginning of the workshop, Jaffee made a brief introduction on PC based data acquisition and its importance. He talked about different types of sensors, their output signals and data acquisition hardware. Then he discussed how to built a data acquisition (DAQ) system and configure DAQ software to read sensor signals. During the training he showed the attendees different sensors and DAQ systems used by the LNG research group.

The session topics also included weather station equipment, information on its data acquisition software and software configuration; regular video and high speed camera image processing steps. At the end of the training he showed some demonstration on how to configure and use the software covered in the session.

CFD Training Held

Computational Fluid Dynamics (CFD) has become an industry-standard tool for accurate simulation of heat transfer and gas and fluid flow. More and more researchers, including the Mary Kay O’Connor Process Safety Center, are interested in extending the application of CFD into such areas as combustion and chemical processes. On July 8-10, 2008 MKOPSC held a CFD training session in the Artie McFerrin Department of Chemical Engineering at Texas A&M University. The training session was led by Benjamin Cormier, a recent Ph.D graduate who has extensive experience in CFD modeling. The training focused on

1. The principle of CFD
2. Comparison of available commercial CFD softwares
3. ANSYS CFX software

Cont’d on next page.
A T-junction of mixing hot water and cold water was used as an example in the training with CFD modeling developed for both steady state and the transient state, respectively. For each case, the training illustrated how to create geometry, meshing, selecting input variables, specifying the function of each surface of the control volume (inlet, outlet, wall, opening), selecting materials and their properties from the library, adding materials and their properties to the database, simulation, analyzing results, exporting the data, creating MPEG image and movie file.

The training also involved two of the Center’s current research projects: methane gas dispersion from a leak in a pipe in an enclosed box with openings in the top and front side; and LNG vapor dispersion from a LNG spill on the ground with wind profile and obstructions.

CFD training will continue to be provided to Center researchers and students. The next session will be in October 2008 when Olav Roald Hansen will visit the Center. He will provide FLACS software (FLame ACceleration Simulator) training.

TCC/ACIT EHS Seminar

The Environmental, Health and Safety (EHS) annual seminar was held on June 9-12, 2008 at Moody Gardens Hotel in Galveston, TX. The EHS Seminar was a 4 day event organized by the Texas Chemical Council (TCC) and Association of Chemical Industry of Texas (ACIT). The mission of this seminar is to provides knowledge to foster personal growth of the attendees and the performance of their organizations, while enhancing the image of the chemical industry.

Dr. Mannan attended the EHS seminar accompanied by MKOPSC research scientist Susan Guo and graduate student Sarah Yang. Yang presented “Continual Quantitative Risk Analysis of Process Safety Systems” in the Risk-based Process Safety track. In her presentation, Yang introduced the new methodology of integrating quantitative risk analysis (QRA) with other safety program components to obtain current failure rate data and a continual estimate of the real-time safety level of the system or plant. In this methodology, QRA provides an ongoing model to guide implementation and continual renewal of safety program components, such as risk-informed and cost-effective monitoring, testing, maintenance, reliability assessment, component replacement, shutdown times, and timing of other operational decisions, such as minimal reliability criteria during maintenance shutdowns. The QRA update takes into account the criticality of importance of each component on the overall risk estimate. As she showed in a case study, a QRA update guides selection of the most cost-effective components based on the real life dynamics of component performance and deterioration. System monitoring is performed through a combination of automatic data acquisition and manual monitoring. Propagation of uncertainty is demonstrated using Monte Carlo simulation or employing a second moment method to allow identification of the most significant components needed for risk-informed decisions.

Equipment and Procedures That Fail To Do What We Want Them To Do, presented by Dr. Trevor Kletz

October 27, 2008
Texas A&M University • 2-5PM • $95

Dr. Kletz will briefly illustrate and describe equipment and procedures that failed to do what we wanted them to do. Interactive discussion will follow on why the equipment or procedures didn’t work as expected, why this was not foreseen, and how we can prevent similar errors in the future.

To register or for more info, see:
http://psc.tamu.edu/symposia/2008/trevor-kletz-seminar
Funded by a grant from US Department of Transportation (DOT), the National Association of State Fire Marshals (NASFM) has engaged AcuTech Consulting Group to provide an independent evaluation of the vapor dispersion and source term model reviews being conducted by the National Fire Protection Association’s Fire Protection Research Foundation (FPRF). NASFM intends to ensure that these important tools are fully shared with local and state emergency response officials who are now or may be facing a proposed LNG import terminal. The long-term goal of this project is to ensure that there is credible, sustainable evaluation guidance for emergency responders and others to determine which LNG vapor dispersion and source term models are fit for particular purposes.

This project will have several phases:

1. Review of the Model Evaluation Protocol developed by the Fire Protection Research Foundation (FPRF). This task may include suggesting revisions to the tools, identify missing criteria, and/or suggest alternative assessment tools.

2. Development of a LNG spill and validation database and a source term Model Evaluation Protocol which is integral to creating a long-term tool for emergency responders and others.

3. Conduct of a comprehensive evaluation of the vapor dispersion models, using the Model Evaluation Protocol (as modified and/or validated).

4. Evaluation and validation of the FPRF review of LNG source term model evaluation protocols. If and where appropriate, revisions will be suggested to the FPRF review, for both fully integrated and non-integrated models.

5. Review and comment on a final Vapor Dispersion Model Evaluation Report and a final Source Term Model Evaluation Report. The report will provide guidance on which evaluated models are suitable for particular scenarios and purposes. NASFM will incorporate these reports into its existing LNG safety program, so that emergency responders receive these tools as part of the broader NASFM pipeline/hazardous materials safety projects.

AcuTech is leading and organizing the technical review, and managing the development and review of the technical reports for NASFM. AcuTech has assembled an expert panel to provide input and assistance with this project. The expert panel includes Jason Allen, Scott Berger, Rex Brittner, George Famini, Steve Hanna, Harri Kytomaa, Chris Landholt, Sam Mannan, Robin Pitbaldo, Tom Spicer, Jeff Wiese, and John Woodward.
Library Donations

The Center’s Library continues to accept donations of reference materials related to Chemical Process Safety of all ages and types. We appreciate donations of older, rare material for our researchers because it helps explain the basis for a present practice that may not be well documented. Results of experimental research are very desirable as well as out-of-date industry standards from your corporate library. In addition, symposium proceedings are especially useful since they typically have limited distribution.

The Center reserves the rights to relocate material not suited for the library when appropriate. Please do not donate material with confidential or proprietary information without a release from a person legally authorized to do so.

Research Equipment Donated by Professor Rayford Anthony

Professor Rayford G. Anthony, a valued supporter of the Center and a member of the Center’s Technical Advisory Committee, recently retired from the Chemical Engineering Department at Texas A&M University. From Professor Anthony, the Center has received a generous donation of research chemicals and equipment, including a versatile gas chromatograph-mass spectrometer (GC-MS), a FTIR spectrometer, a high performance liquid chromatograph (HPLC), and a wide range of additional laboratory equipment. Donated to the Center Library were books on chemical processes and safety.

Rayford G. Anthony, Professor Emeritus of Chemical Engineering was a former head of the department from 1995-2002. Professor Anthony joined Texas A&M in 1966 as an assistant professor of chemical engineering and in 1994 was appointed to the C. D. Holland Professorship. He is also a senior fellow at the Texas Engineering Experiment Station, a position that he has held since 1984.

With more than 130 publications,100 presentations, and five patents, Anthony is the co-author of three textbooks with Fundamentals of Chemical Reaction Engineering in its second edition. In his research, Anthony has extensive experience in developing catalysts and modeling catalytic and multiphase reactors. He also received the university’s most prestigious award, the Faculty Distinguished Achievement Award for Research as well as most of the faculty teaching and research awards presented by the Dwight Look College of Engineering.

Library Donated by the Harry H. West Estate

In continuance of his dedication to process safety education, the estate of Dr. Harry H. West has graciously donated a collection of his books and resources to the Center’s library. This addition will further the studies of students who share the same passion for safety as did Dr. West. The donation consists of petroleum engineering titles as well as risk analysis, all of which are important to the research of our graduate research staff.
The 11th annual Mary Kay O'Connor Process Safety Center International Symposium will be held on October 28-29, 2008 at the College Station Hilton Conference Center.

The Frank P. Lees Memorial Lecture entitled, “Lessons for Leaders: Learning from Tragedy,” will be presented by CAPTAIN James J. Colgary USN (Retired), Nuclear Energy Institute. CAPTAIN Jim Colgary commanded the Los Angeles class fast attack submarine USS AUGUSTA (SSN 710) from 1995 to 1998. While under his command the ship received a Secretary of the Navy Commendation for the first operational deployment of the advanced TB-29 towed array sonar system. CAPTAIN Colgary also served in the Pentagon for the Chairman Joint Chiefs of Staff as the Interagency Planning Branch Chief for military war plans and as a Senior Fellow with the Chief of Naval Operations Strategic Studies Group (SSG) XXIV, Newport, Rhode Island.

His additional sea duty assignments included USS PITTSBURGH (SSN 720) as Executive Officer, USS PROVIDENCE (SSN 719) as Engineer Officer and USS CITY OF CORPUS CHRISTI (SSN 705). Ashore, he also served as Deputy Commodore, Submarine Squadron TWO, Engineer Officer, Submarine Squadron TWO, and a Company Officer at the U.S. Naval Academy.

Jim Colgary attended Marquette University, Milwaukee, Wisconsin, in the NROTC program, graduating with a Bachelor of Science degree in Mechanical Engineering. He also completed a Master of Arts Degree from the College of Naval Warfare, Newport, Rhode Island, in National Security and Strategic Studies.

On July 1, 2007 Jim Colgary retired from Naval Service after more than 28 years of active duty. He is employed by the Nuclear Energy Institute (NEI) as executive director to the President and CEO and the President’s staff. NEI is responsible for establishing unified nuclear industry policy on matters affecting the nuclear industry, including regulatory, financial, technical and legislative issues. NEI represents over 300 domestic and international corporations and organizations including all companies licensed to operate power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, major universities and other organizations involved in the nuclear industry.

The Honorable John S. Bresland will present the keynote address entitled “Learning from CSB Investigations,” on the second day of the symposium. John S. Bresland was appointed by President George W. Bush as chairman and chief executive officer of the U.S. Chemical Safety Board in March of 2008.

Mr. Bresland previously served as a CSB board member from August 2002 until August 2007. Before joining the Board he was President of Environmental and Safety Risk Assessment LLC, a chemical process safety consulting company based in Morristown, New Jersey.

In 2006, Mr. Bresland was appointed to be a member of the Department of Energy Hydrogen and Fuel Cell Technical Advisory Committee. He is also a member of U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration Technical Hazardous Liquid Pipeline Safety Standards Committee. He has served as Chairman of the Pennsylvania Chemical Industry Council and as Chairman of the Federation of State Chemical Associations.

Mr. Bresland graduated in Chemistry from Londonderry Technical College, Northern Ireland and from Salford University, England. He is a member of the American Institute of Chemical Engineers, the American Chemical Society and a Fellow of the Royal Society of Chemistry.

Mr. Bresland and his wife Beth reside in Shepherdstown, West Virginia.

Come join us at the College Station Hilton Conference Center for an exciting and informative two days of presentations and meeting with companies in the exhibit area.

The complete program can be found on the following pages. Online registration is available at: http://process-safety.tamu.edu.
INTERNATIONAL SYMPOSIUM - Making Safety Second Nature & World Conference on Safety of Oil and Gas Industry

October 28-29, 2008
Hilton College Station-Conference Center
College Station, Texas

Sponsored by

Mary Kay O’Connor Process Safety Center

Korea Gas Safety Corporation (KGS)

Qualifies for 15 PDHs required by Texas Board of Professional Engineers, when taken with the 1 hr Engineering Ethics session immediately following the Symposium. See website for registration information on the Special Session: Engineering Ethics.

Early Registration Deadline: October 1, 2008

See Web site for details and registration information:

http://process-safety.tamu.edu
## Mary Kay O’Connor Process Safety Center - 2008 International Symposium

### Time
- **8:00 - 9:30 AM**
  - **8AM - Frank P. Lees Memorial Lecture**
    - “Lessons for Leaders: Learning from Tragedy,” CAPTAIN James J. Colgry USN (Retired), Nuclear Energy Institute
  - **9AM - State of the Center: Research Program, Current Activities, and Future Direction,”**
    - Dr. Sam Mannan, Director, Mary Kay O’Connor Process Safety Center

### MKOPSC Track I
- **10AM - 12 noon**
  - **Reactive Chemicals I**
    - *“Roadmap to a National Hazardous Substance Surveillance System (NHSS),”* T.M. O’Connor and M.S. Mannan, MKOPSC
    - *“Using the Last Several Years of QHSE Data to Improve the Next Several Years of QHSE Performance,”* J. Stough, Syntax
    - *“Global Process Industry Initiatives to Reduce Major Accident Hazards,”* R. Pitblado, DNV
    - *“Lessons from the Past/Learnings for the Future, The Significance of ‘Lessons Learned’ Sharing Processes,”* M. Korst, LyondellBasell Industries

### MKOPSC Track II
- **10AM - 12 noon**
  - **Hazard ID**
    - *“Is Risk Analysis a Useful Tool for Improving Process Safety?”* T.M. O’Connor and M.S. Mannan, MKOPSC
    - *“Risk Relevance Indices for the Characterization of Persistence of Chemicals in a Multimedia Environment,”* N. Kazantzis, Worcester Polytechnic Institute
    - *“Thermal Behaviour of Aqueous Solutions of Hydroxylamine During Isothermal Decomposition in a Closed System,”* M. Papadaki, University of Ioannina, Greece

### MKOPSC Track III
- **10AM - 12 noon**
  - **Risk Analysis and Management I**
    - *“Quantitative Assessment of Thermal Radiation in Flare-stack,”* H. S. Lee, Dept of Chemical Engineering, Kwangwoon University, Korea
    - *“A New Method of Calculating the SIL for Zoo3 Architecture in SIS,”* X. Zuo, Y. Yin, University of Petroleum-Beijing, China
    - *“Risk Assessment and Risk-Based Inspection for Petrochemical Plant: A Practical Application,”* S-C. Choi, Institute of Gas Safety R&D, Korea Gas Safety Corporation, Korea
    - *“Research Prospect of Risk Assessment Technology of Explosion Drilling in High Sulfur Gas Field,”* Y. Dong, China University of Petroleum-Beijing, China

### MKOPSC Track IV
- **10AM - 12 noon**
  - **Risk Analysis and Management II**
    - *“Development of a Virtual Reality Education Program for Hydrogen Fueling Station,”* E. Kim, Yonsei University, Korea
    - *“Operator Training Simulator of Olefins Plant for Process Safety Management,”* Q. MA, China University of Petroleum-Beijing, China

### MKOPSC Track V
- **10AM - 12 noon**
  - **Training**
    - *“Troubleshooting Guide System in Refinery,”* J. Kim, Yonsei University, Korea
    - *“The Integrity Management of Wellhead Equipment,”* Z. ZHAO, Research Center of Oil & Gas Safety Engineering Technology, China

### 1:00 - 3PM
- **Facility Design**
  - *“Stability Analysis Based Method for Inherently Safer Process Design at Conceptual Design Stage,”* H. Wang, B. Chen, X. He, T. Qiu, J. Zhao, Tsinghua University, China
  - *“An Approach to Solve the Facility Layout Problem Based on the Worst Scenario,”* R. Vazquez, Technical Institute of Celaya, Mexico
  - *“Inerted Vessels: Understanding Hazards Caused by Gas Buoyancy,”* R. Ogle, Exponent
  - *“Frequency Analysis of Hazardous Material Transportation Incidents as a Function of Distance from Origin to Incident Location,”* C. Samuel, Iowa State University

### 3:30 - 5:30PM
- **Knowledge Management**
  - *“Process Safety Metrics: Considerations from an ASM Perspective,”* D. Metzger, Honeywell Advanced Technology
  - *“Process Safety Metrics: Considerations from an ASM Perspective,”* D. Metzger, Honeywell Advanced Technology

- **Metrics and Performance**
  - *“Is Risk Analysis a Useful Tool for Improving Process Safety?”* H. Pasman, MKOPSC
  - *“Risk Analysis and Management II”*
# Mary Kay O’Connor Process Safety Center - 2008 International Symposium

**Wednesday, October 29, 2008**

## Keynote Session

“Learning from CSB Investigations,” John S. Bresland, Chairman/CEO, U.S. Chemical Safety and Hazard Investigation Board

## MKOPSC TRACKS

### 10AM - 12 Noon

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<th>MKOPSC Track II</th>
<th>MKOPSC Track III</th>
<th>WCOGI Track IV</th>
<th>WCOGI Track V</th>
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<td><strong>Human Factors</strong></td>
<td><strong>Management for Process Safety</strong></td>
<td><strong>Consequence Analysis</strong></td>
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<td><strong>Leak Detection and Monitoring</strong></td>
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### 1:00- 3PM

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<tr>
<td><strong>Reactive Chemicals II</strong></td>
<td><strong>Risk Analysis II</strong></td>
<td><strong>LNG I</strong></td>
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<tr>
<td>S. Chervin, Eastman Kodak</td>
<td>“The Risk of LOPA and SIL Classification, How safety standards can be counterproductive,” C. Pietersen, Safety Solutions</td>
<td>LNG Vapor Cloud Dispersion with Water Spray Curtain,” M. Rana, B. Comer, J. Squidin, Y. Zhang and M.S. Mannan MKOPSC</td>
</tr>
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### 3:15 - 5:15PM

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<tr>
<td><strong>Case Histories</strong></td>
<td><strong>LNG II</strong></td>
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<td>“Changes in BP at Corporate and Site Level Three Years after Texas City,” M. Broadribb, BP</td>
<td>“LNG Pool Fire Tests,” M. Hightower, Sandia National Labs</td>
</tr>
<tr>
<td>“A Little Knowledge is a Dangerous Thing - Learning from Unexpected Reaction Case Studies,” G. Kiihne and J. Brennan, BASF</td>
<td>“Effect of Tank Shape on LNG Release Rates,” D. Hissong, ExxonMobil</td>
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<tr>
<td>“Did a Dust Explosion Occur? Microscopic and Thermogravimetric Techniques to Determine if Dust Participated in an Explosion Event,” T. Myers, Exponent</td>
<td>H.K. Kytomaa, Exponent</td>
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<td></td>
<td>“NASFMP Project on LNG Vapor Dispersion and Source Term Modeling,” D. Moore, AucTech Consulting</td>
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</tbody>
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### 5:15 - 6:15PM

**Special Session: Engineering Ethics** - Dr. Sam Mannan, Mary Kay O’Connor Process Safety Center (Register Separately)
MARY KAY O’CONNOR PROCESS SAFETY CENTER - 2008 INTERNATIONAL SYMPOSIUM & WORLD CONFERENCE ON SAFETY OF OIL & GAS INDUSTRY, KOREA GAS SAFETY CORPORATION
OCTOBER 28-29, 2008
HILTON CONFERENCE CENTER • COLLEGE STATION, TEXAS

This form is for payment by check (payable to Mary Kay O’Connor Process Safety Center)
Payment by Credit Card is available on-line at: http://psc.tamu.edu/symposia/2008

REGISTRATION FEES: {Fee includes refreshments, lunch, handouts and proceedings}
• Received by October 1, 2008 - $495.00 per person • After October 1, 2008 - $550.00 per person
• Partner, Sponsor, and Advisor membership level organizations receive 40%, 20%, and 10% discounts, respectively.

Proceedings only, without registration - $65.00
Symposium Registration $_________________
Ethics Registration $_________________
Trever Kletz Seminar $_________________
TOTAL $_________________

Cancellation Policy: Cancellations must be received ten working days prior to the symposium to receive a full refund. After that time, there will be a 30% penalty. All refunds will incur a $25 service charge.

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TOTAL $_________________

Cancellation Policy: Cancellations must be received ten working days prior to the symposium to receive a full refund. After that time, there will be a 30% penalty. All refunds will incur a $25 service charge.

Wednesday, October 29, 2008 • 5:25-6:25PM,
Mary Kay O’Connor Process Safety Center
2008 Engineering Ethics Session
Fee: $45 (Separate from Symposium registration fee.)

Immediately following the Symposium, SPECIAL SESSION: "Engineering Ethics" will be presented by Dr. Sam Mannan. This session qualifies for one PDH (professional development hour) in the area of professional ethics or roles and responsibilities of professional engineering, as required by the Texas Board of Professional Engineers, RULE §137.17 Continuing Education Program.

Registration is available on-line at: http://psc.tamu.edu/symposia/2008
EXHIBIT at the

2008 Symposium
Making Safety Second Nature

October 28-29, 2008
Hilton Conference Center
College Station, Texas

$1250 includes:

• one Symposium registration
• listing in meeting programs (in print and on-line)
• 10'X10' booth space
• electrical hookup
• table/chairs

Register online at:
http://process-safety.tamu.edu

For more information contact Donna Startz at
phone: 979-845-5981 or email: donnas@tamu.edu

Mary Kay O’Connor
Process Safety Center
64th Annual Instrumentation Symposium
for the Process Industries

Program Schedule and Registration
January 27 – 29, 2009

TECHNICAL PAPERS

Keynote Address, Tuesday at 10:30 a.m.

“Trends in Instrumentation Safety” by Todd Lucey, Endress+Hauser, Inc., Greenwood, IN

Tuesday’s Technical Papers

“Safety and Security - Can You Have the Best of Both Worlds?” by Todd R. Stauffer, Siemens Energy & Automation, Spring House, PA

“Data Mining - Finding the Mother Load in a Fieldbus Vein” by Chuck Carter, Lee College Fieldbus Center, Baytown, TX

“Using HART to Assess the Quality of Information from Instruments in a SIS” by Kris Worfe, Endress+Hauser, Inc., Angleton, TX

“Unexpected Results from the Analysis of PERD Proof Test Data & the Implications for Pressure Relief Valve Safety” by Julia Bukowski, Villanova University, Pocono Pines, PA and William M. Goble, exida Sellersville, PA

Wednesday’s Technical Papers

“How ISA84 Compliant Are You? This Poll Provides a Benchmark on the Herd” by Curt Miller, exida, Round Rock, TX

“Oops, sorry!’ And Other Safety System War Stories” by Paul Gruhn, ICS Triplex, Houston, TX

“Lessons Learned in Auditing Automated Systems for PSM Compliance” by Angela E. Summers, SIS-TECH Solutions, LC, Houston, TX

“Safety Instrumented System Testing” by John Campbell, ConocoPhillips Downstream, Houston, TX

Thursday’s Technical Papers

“The Changing Role of Operators, Automation and the Control Room” by Ian Nimmo, User Centered Design Services, Inc., New River, AZ

“A Structured Approach to Alarm Priority Re-Classification” by James W. Gray, Gray Control Automation, Inc., Friendswood, TX and Christopher C. Hammel, Pasadena Refining Systems, Inc., Pasadena, TX

“Non-traditional Directions for Modern Control and Optimization Theory” by Carl Laird, Artie McFerrin Department of Chemical Engineering at Texas A&M University, College Station, TX

“The ISA100 Standard - Characteristics and Benefits of the Standard, Latest Developments and Progress” by Paul J. Sereiko, AirSprite Technologies, Marlborough, MA

“Report on the Status of API 170 - Subsea Hips” by William M. Taggart IV, Murphy Exploration & Production, Houston, TX
Workshops will be conducted each day. Registration for the symposium, if received by December 5, 2008, includes attendance to the workshops of your choice. Once the early registration deadline has passed, a nominal workshop fee of $10.00 is required for attendance to each workshop. Due to limited space, preregistration is encouraged. A Continuing Education Unit (CEU) certificate will be prepared by the Engineering Program Office for you after the completion of the symposium. CEUs are the nationally recognized units designed to provide a record of an individual’s continuing education achievements.

**Tuesday, 8 – 10 a.m.**

**WS1-1:** “Ethics & Excellence” by Alan Rossiter, Rossiter & Associates  
**WS1-2:** “Fieldbus - Maximizing Your Value with a PLAN FOR LEARNING” by Chuck Carter, Lee College Fieldbus Center  
**WS1-3:** “Quality Assurance in the Management of Instrumented Safety Systems” by Angela E. Summers, SIS-TECH Solutions, LC

**Wednesday, 2 – 4 p.m.**

**WS2-1:** “Effective Presentations” by Paul Gruhn, ICS Triplex  
**WS2-2:** “The Life and Times of a Safety Interlock” by Nicholas P. Sands, Dupont  
**WS2-3:** “Using PERD Proof Test Data to Validate a Mechanical Parts Failure Database” by Julia V. Bukowski, Villanova University and William M. Goble, exida

**Thursday, 1 – 3 p.m.**

**WS3-1:** “Engineering Ethics” by Jerry Bradshaw, Artie McFerrin Department of Chemical Engineering at Texas A&M University  
**WS3-2:** “Control System Cyber Security” by Bob Huba, Emerson Process Management  
**WS3-3:** “Got a Risk Reduction Strategy?” by William (Bill) L. Mostia, Jr., SIS-TECH Solutions, LC

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**REGISTRATION**

To register for the 64th Annual Instrumentation Symposium for the Process Industries and for a complete list of registration guidelines, please visit:

http://instrumentation-symposium.che.tamu.edu
### SEPTEMBER

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<th>Instructor</th>
<th>Location</th>
<th>CEUs</th>
<th>Fee</th>
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<tr>
<td>9-10</td>
<td>8:30am - 4:30pm</td>
<td><strong>Fundamentals of Process Safety Management</strong></td>
<td>Adrian Sepeda</td>
<td>SIS-TECH, Houston</td>
<td>1.4 CEUs</td>
<td>$495</td>
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<tr>
<td>16-17</td>
<td>8:30am - 4:30pm</td>
<td><strong>Process Hazard Analysis Leadership Training</strong></td>
<td>William (Skip) Early</td>
<td>TTI, Houston</td>
<td>1.4 CEUs</td>
<td>$495</td>
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### NOVEMBER

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<tr>
<td>4-5</td>
<td>8:30am - 4:30pm</td>
<td><strong>SIL Verification</strong></td>
<td>Angela E. Summers</td>
<td>SIS-TECH, Houston</td>
<td>1.4 CEUs</td>
<td>$495</td>
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### DECEMBER

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<tr>
<td>2-3</td>
<td>8:30am - 4:30pm</td>
<td><strong>Auditing Your SHE Management System</strong></td>
<td>Jack McVaugh</td>
<td>TTI, Houston</td>
<td>1.4 CEUs</td>
<td>$495</td>
</tr>
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</table>

### Registration Fees:

**Early Registration** (4 weeks prior to course)

- Registration Fees: $695

### Contact Information

- **Contact:** 979-458-1863 • mary-cass@tamu.edu
- **Website:** [http://psc.che.tamu.edu/education](http://psc.che.tamu.edu/education)

Other course offerings are available by request. On-Site courses are also available.

These courses are filling up fast! Please hurry and reserve your seat!
Contact:
Mary Kay O’Connor Process Safety Center
Texas A&M University
3122 TAMU
College Station, TX 77843-3122

Phone: 979/845-3489
Fax: 979/458-1493

http://process-safety.tamu.edu

CALENDAR

October 27, 2008
Steering Committee Meeting
Mary Kay O’Connor Process Safety Center
Texas A&M University

October 28-29, 2008
2008 SYMPOSIUM
Mary Kay O’Connor Process Safety Center
College Station Hilton Conference Center

October 30, 2008
Technical Advisory Committee Meeting
Mary Kay O’Connor Process Safety Center
Texas A&M University

Chemical Engineering
Division of the Texas Engineering Experiment Station
The Texas A&M University System

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College Station, Texas, USA, August 2008