Mary Kay O'Connor Process Safety Center

Chemical Engineering Division of the Texas Engineering Experiment Station

The Texas A&M University System

Centerline

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SUMMER 2010

INSIDE . . .

2010 International Symposium

The 2010 Mary Kay O'Connor Process Safety Center International Symposium, *Beyond Regulatory Compliance, Making Safety Second Nature* will be held October 26-28, 2010 at the Hilton Conference Center in College Station, Texas. Early registration is available through September 15.

The Frank P. Lees Memorial Lecture will be presented on the first day of the symposium. Keynote speaker for day two is Dr. Steven A. Flynn, Vice President, Health, Safety, Security and Environment, BP Group. The day three keynote speaker is Dr. Paul Amyotte, Professor at Dalhousie University, Department of Chemical Engineering, presenting "Dust Explosions Happen Because We Believe In Unicorns."


Dr. FLynn


Dr. Amyotte

Go to page 16 for the complete symposium program. Exhibit space is still available. For more information, see: http://psc.tamu.edu/symposia/2010

Early registration continues to be available through September 15.

KHOU TV Interviews Dr. Mannan

The complex aspects of diesel engine explosions and their relation to the BP accidents of this year and 2005 were recently discussed by Regents Professor and Director of the Mary Kay O'Connor Process Safety Center Sam Mannan as part of a news story by KHOU of Houston.

The June 8 story "The Diesel Connection: Investigators looking at similarities in BP explosions" features Mannan speculating on possible causes of both explosions. With his vast knowledge, and the wealth of information available through the Mary Kay O'Connor Process Safety Center, Mannan was able to assist in understanding the causes behind these tragic events.

"All ignition sources are not alike," Mannan noted. "[A diesel engine] creates what's known in the science as a bang-box type of explosion, which has more probability to lead to a high-intensity explosion." For more information, please go to: www.khou.com.

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Director's Corner

For the academic year 2010 (September 2009-August 31, 2010) the Center will graduate six PhD students and 1 Masters student (see page 6). Since 1999, the Center has graduated 24 PhDs and 25 Masters. For every graduating class, we hold a luncheon in their honor. As I do with all the students in the Center, up until the last moment, I try to give them some parting advice. One of the core concepts I try to impart on these students is that they should always remember to take care of their *virtual resumé*. So, the natural question asked is — What is a virtual resumé?

It is your reputation, credibility and integrity. Your virtual resumé precedes you wherever you go. You should take what you have learned with you to add to your virtual resumé so that your name will speak for itself in the best way possible. Next, you should not look at an event as a problem, nor as a challenge. Every event in your life should be viewed as an opportunity. I have a slight variation of a common saying, "There are those who just watch things happen, there are those who are part of things that happen, and then there are those who **make things happen**." Try to be the ones who make things happen. Have integrity in everything you do and above all respect everyone no matter who they are. We live in a global world and in order to lead and make things happen, we must respect everyone's point of view and perspective, and we must also learn to listen first before expecting others to listen. These things will create a positive reputation and add to your virtual resumé .

There are several current issues unfolding in front of all of us in the news every day. Some are blips on the radar screen and others will change how we do business and live our lives. We plan the Center's activities with the involvement of the Steering Committee (SC) members to be proactive. For 2010, the Center developed several areas of focus: Consortium membership, Specialized Continuing Education training, International Symposium schedule, development of distance learning programs, fostering relationships with our industry and government contacts, and faculty recruitment.

In developing strategies for all of these issues through meetings with our current SC members, a need to expand and diversify our initiatives related to education, research and service for the offshore, upstream, and exploration and production industry was identified. As a result of that, we have undertaken new programs in continuing education and research targeted to these industry sectors. For more information on these initiatives, please visit our website.

M. Sam Mannan

Summer, 2010

New Members

The Center welcomes several companies as new members of the consortium. Following is a complete list of Mary Kay O'Connor Process Safety Center consortium members:

Partners

BP
ConocoPhillips
Dow Chemical Company
ExxonMobil Chemical
Huntsman Corporation
Invista
Occidental Petroleum
Shell International

Sponsors

AE Solutions
AMOT/Metrix
Apex Safety Consultants
Atkins Global
DNV
GexCon
KBR
Lloyd's Register
RRS Engineering
Siemens OGM
Wanger Consulting
Zurich

Associates

ABS Consulting
Exida
Formosa Plastics
Kestrel
PPG Industries
Riskbytes

More information on becoming a consortium member can be found at: http://psc.tamu.edu/membership, or by calling Ms. Valerie Green at: 979/845-6884

Center and Department Expands Process Safety and Chemical Engineering to Tianjin University, China

Continuing its efforts to provide students with enhanced study abroad opportunities throughout the world, the Artie McFerrin Department of Chemical Engineering recently offered a three-week faculty-led study abroad program in Tianjin, China this past summer. The program, which partners with Tianjin University, offers chemical engineering students the opportunity not only to broaden their technical skills but also to become familiar with one of the most dynamic and culturally significant countries in the world. Dr. Sam Mannan said."As we educate leaders of the future, this study abroad program will play a significant role in giving the students a once in a lifetime experience that will be of tremendous help in their careers."

Tianjin University, established in 1895 with the name of "Peiyang University," is the first educational institution of higher learning in China. More than 1,800 students attend its School of Chemical Engineering where they receive instruction from 300 faculty members. "It's imperative that chemical engineering students gain an international perspective that enables them to not only develop world-class leadership skills but also to appreciate diversity of both culture and thought when it comes to defining and overcoming engineering challenges," said Department Head and Charles D. Holland '53 Professor Michael V. Pishko.

Graduates

Liu

Rana

Yang

News & Events

Graduates

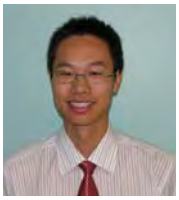
Last August, **Lijun Liu** graduated with a Ph.D. He is working at CGG Veritas in Houston, Texas. **Morshed Rana** graduated with a Ph.D this past December. He accepted a position with ExxonMobil and is currently working at ExxonMobil Manufacturing Engineering, Singapore.

In May 2010, **Xiaole (Sarah) Yang** graduated with a Ph.D. She accepted a position with Shell International E&P in Houston, Texas.

This summer, **Suhani Patel, GeunWoong Yun, Qingsheng Wang,** and **Seungho Jung** have successfully completed their Ph.D. Suhani and GeunWoong have both accepted positions with Shell International E&P in Houston. Qingsheng will be joining the Oklahoma State University as an Assistant Professor. Seungho has accepted a position with Air Products and Chemicals in Philadelphia, Pennsylvania. Also, **Sarah Khan** graduates this summer with a MS degree. Sarah is currently completing her internship at Mustang Engineering in Houston, Texas.

Patel

Yun



Wang

Jung

Khan

Undergraduate Summer Research Grant (USRG) Program

On July 16, 2010, **Dr. Sam Mannan** presented a speech entitled "Research Opportunities for the Coming Decade" at the Undergraduate Summer Research Grant (USRG) speaker luncheon. The USRG is a program that involves outstanding students who have completed their sophomore year and are interested in pursuing graduate studies. These students will make a contribution to ongoing faculty research and, more importantly, gain an appreciation for and an interest in a research career. This program is providing new and exciting opportunities to many chemical engineering students at Texas A&M.

Tsinghua University Students Come to TAMU

As discussed in the article earlier in the newsletter regarding the efforts of the Chemical Engineering department and the Center to develop a relationship, eight students came to TAMU this summer for a two-month visit. Four of the students have joined the Center while the other four are working with other chemical engineering faculty. As Co-Op research assistants, they are given a defined problem or research project to work on that will give them an idea of process safety research, yet be an attainable goal within the two months they are here. However, we understand that all work an no play would not be a fulfilling experience. So, while they have been here, they have attended the Lions' Club PRCA Rodeo held at the Bryan Expo Center where they enjoyed and evening of watching cowboys and cowgirls perform in team roping, bronc and bull riding, and barrel racing. The students have also toured the George W. Bush Presidential Library and then enjoyed a private tour of the Messina Hof winery. They have gone to a Brazos Valley Bombers baseball game, and shopping at the Galleria and Outlet Mall during Tax Free Weekend. While in Houston, they will visit the NASA Space Center and then end their weekend with a dinner at Yao's Restaurant. We hope that after their experiences with us, they will decide that process safety research is the area for them…and who knows maybe even here at the Center!

Mannan Appointed to the Chemical Engineering Advisory Board of Worcester Polytechnic Institute

Dr. Mannan has been appointed to the Chemical Engineering Advisory Board of Worcester Polytechnic Institute (WPI). As an internationally recognized expert on process safety and risk assessment, Dr. Mannan will serve on the board, which has the primary mission of increasing WPI's level of engagement with both industry and the outside academic community in order to enhance its education and research. The board also aims to promote greater involvement by members of WPI's external constituencies in the affairs of the institute and provide support to advance WPI's mission. "Your knowledge and experience will be extremely valuable to us in our continuing efforts to nurture and grow the excellence of our academic programs," wrote WPI Provost and Senior Vice President John A. Orr in a letter to Mannan.

Founded in Worcester, Mass., in 1865, WPI is one of the nation's earliest technological universities. Today, WPI's 80-acre traditional, New England campus is home to 13 colleges and more than 35,000 students, offering more than 50 undergraduate and graduate degree programs in science, engineering, technology, management, the social sciences and the humanities and arts.

Process Safety Center presents at the Loss Prevention 2010 & Safety 2010

In addition to Dr. Mannan giving one of the keynote talks on day 2 of the 13th International Symposium on Loss Prevention and Safety Promotion in the Process Industry in Bruges Belgium on June 6-9, 2010, he also presented 3 papers. Dr. Mannan's keynote speech was entitled, *Challenges and Needs for Process Safety in the New Millennium*. In order to be sustainable, the chemical, petroleum, food, pharmaceutical and other such industries must strive for a balance between process operations and process safety. There is no doubt that process safety must be treated as an integral part of the wide-ranging plant operations. These expectations have come from a need for sustainable development and the painful lessons learned from tragedies such as the Bhopal gas disaster (1984) and the Flixborough incident (1974).

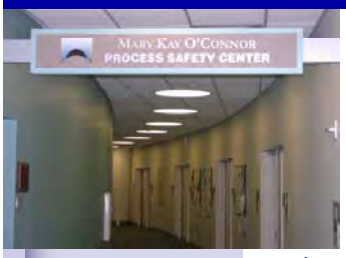
The presented papers were authored by students and research staff in the Center. The presentations included: "Recent advances in LNG field experiments and modeling of LNG, release and mitigation scenarios;" M.A. Rana, R. Qi, G. Yun, D. Ng and M.S. Mannan; "Medium scale LNG experiments at Brayton fire training field, Texas and their relationship to process safety in the LNG industries in Qatar," R. Qi, O. Basha, S. Mannan, T. Olewski and S.P. Waldram; and "A new approach to optimizing facility layout by mapping risk estimates on plant area, monetizing and minimizing," S. Jung, D. Ng, H.J. Pasman and M.S. Mannan.

The International Symposium on Safety & Loss Prevention in the Process Industries is an important forum for experts in the field of process safety to gather and share information. The symposium encourages papers describing practical applications as well as new research. The Mary Kay O'Connor Process Safety Center was delighted in being a part of the conference this year.

At Safety 2010, sponsored by The American Society of Safety Engineers, Dr. Mannan presented during the session titled "How Can Academia and the Safety industry Support Each Other?" His presentation entitled, *The Role of Different Stakeholders with Regard to Safety Education*, addressed importance and significance of the role played by academia, industry, and government in developing a partnership for improved chemical process safety education. Safety must be integrated into the curriculum at different levels. First, it must be woven throughout the chemical engineering curriculum by incorporating safety-related problems in all courses. Second, chemical process safety must be taught as a stand-alone course that brings together all the fundamentals in a comprehensive course. Third and finally, safety must be a required and significant component of the senior design course. Academia, government, and industry all have a role in making this happen.

Safety 2010 was held in Baltimore, Maryland on June 13-16. It is a premier conference that offers the chance for safety professionals from many fields to gather and discuss their perspectives, expertise, products and educational resources.

Visitors to the Center



Recently MKOPSC has had the opportunity to host many visitors to the center and the Texas A&M campus. We would like to recognize our guests for their contribution and dedication to the center's mission of encouraging safer processes, equipment, procedures and management.

Dr. Maria Molnarne visited us this spring and will be returning this fall to work on research and work with our graduate students and professors. She presented the seminar "Brief Introduction to GHS and Classification of Physical Hazards." Her specialties include explosion prevention and protection in the field of flammable substances

Dr. Maria Papadaki will be spending the month of July at the center working on research with students from Tsinghua University. She is from the University of Ioannina in Greece.

Mr. Roy Sanders visited several times throughout the spring to talk with students and staff. He gave a two day short course entitled "What Went Wrong? Case Histories." Mr. Sanders has written several books on chemical process safety, among other things.

Dr. Jinsong Zhao will be visiting the center in July from Tsinghua University in Beijing. He presented a seminar entitled "Research Progress for PSM at Tsinghua University." His research is focused on developing PSM and HAZOP software.

Engineers from **Saudi Aramco** met with staff and toured the center and library on July 1. Saudi Aramco is the largest oil company in the world and has its headquarters in Dhahran, Saudi Arabia.

Dr. Felipe Munoz, an assistant professor in chemical engineering, visited in July from Universidad de los Andes in Bogota, Columbia. He toured the center and library and talked with professors and staff. His research is focused on process safety and risk analysis. Three of his students participated in an exchange for 6 months with the Center and the Universidad de los Andes.

Dr. Richart Vazquez-Roman, a professor from the Instituto Tecnológico de Celaya, in Mexico visited the Center in July. He met with students and presented a two day training course on Aspen software.

Dr. Arturo Jimenez, with the Instituto Tecnológico de Celaya in Mexico, will be working with the center and Dr. El-Halwagi concerning safety issues for the design of chemical processes, during his six-month sabbatical.

Ecopetrol and Universidad de los Andes

On June 8, 2010 a group from Ecopetrol and Universidad de los Andes led by Professor Maurcio Sanchez visited. Ecopetrol is a large Columbian based Engineering company that has a joint graduate program with the Universidad de los Andes. A group of professionals, professors, and students traveled to Texas for a week in June to visit Texas A&M University and many Houston based companies. When the group visited the Center they were given a tour of the facilities, including the library and labs. They had the opportunity to visit with graduate students and professors, to share knowledge on process safety, mechanical integrity and instrumentation systems, operating procedures safety, transport and oil refining, and to ask detailed questions on how real life processes function. Overall this was a great opportunity to collaborate on ideas. The Center hopes to continue to foster this relationship with Ecopetrol and the Universidad de los Andes.

Alumni Reunion

The center held its annual alumni reunion on April 10, 2010. Past and present students, staff and researchers were in attendance. Everyone was welcomed by Dr. Michael Pishko, department head and Dr. Kenneth Hall, TEES deputy director. The day included a tour of the center's library, offices, and labs. After dinner live entertainment included traditional Indian and Chinese music, a traditional Chinese dance and a magic act.

The Mary Kay O'Connor Process Safety Center would like to recognize those students who won poster awards at the alumni reunion. The first place poster was LNG presented by Ruifeng Qi, Geun Woong Yun, Byung Kim, Anisa Safitri, and Carolina Herrera.

Two posters tied for second place, the Facility Siting poster, presented by Seungho Jung, Christian Diaz-Ovalle, Bibian Amaya and the Reactive Chemicals poster, presented by Victor Carreto Vazquez, Yuan Lu, Qingsheng Wang, and Lina Saenz Noval.

The Center thanks **Shell E&P** for sponsoring the reunion.

TAMUQ Announces Visualization Contest Winners

Dr. Waldram

DOHA TEXAS A&M University in Qatar (TAMUQ) announced the winners of its Visualization Development Competition. **Dr. Simon Waldram** and his research group were awarded second place for their "Visualization of Liquefied Natural Gas (LNG) Spill and Dispersion: Safety Assessment" project. The winners were awarded prizes at a function recently. It was attended by representatives of QSTP, QF, ExxonMobil, RasGas, Sidra and Qatar University. The event showcased six projects undertaken with the university's 3-D Immersive Visualization Facility (IVF). Each of the six projects was recognized as having met the four competition criteria which included innovation; benefit for both research and education activities at Education City and Qatar; acceptable resource allocation and approval by a selection committee.

Jeong Honored with Teaching Excellence Award

Dr. Jeong

Dr. Hae-Kwon Jeong, assistant professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, has been named a recipient of the Teaching Excellence Award, issued as part of a voluntary, student-selected honors program of The Texas A&M University System.

The winners represent the top 20 percent of participating faculty members from all 11 campuses of the Texas A&M System. Awards are based on rankings from evaluations created and administered by students, with weighting for factors such as class size, and all faculty members are eligible.

This semester Jeong teaches "advanced nanostructured materials", which introduces the chemical synthesis and characterization of materials with structures and properties in the nanoscales.

Cheng Receives Tenure, Promotion to Associate Professor

Dr. Cheng

Dr. Zhengdong Cheng, a faculty member in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, has received tenure and promotion to associate professor.

Cheng's research focuses on the self-organization of intelligent colloids and anisotropic particles, the fabrication of photonic crystals and integrated photonic circuits, solar hydrogen production via water splitting, and the application of microfluidics to bio-encapsulation. The techniques developed are applicable to the modeling of phase transitions and liquid crystal materials, the engineering of nano-composites and semiconductor of light, solar energy harvesting, and a wide range of therapeutic treatments.

Petersen Joins Center Faculty Fellows

Dr. Petersen

Dr. Eric L. Petersen, Associate Professor in the Texas A&M University Department of Mechanical Engineering has joined the center as a Faculty Fellow. Dr. Petersen specializes in the study of combustion, gas dynamics and propulsion. His research includes experiments and analyses on reacting flows, chemical kinetics, and shock waves for applications ranging from advanced propellants and rockets to optical diagnostics and gas turbine engines. The center welcomes Dr. Petersen.

Laird Named Student Organization New Adviser of the Year

Dr. Laird

Dr. Carl Laird, assistant professor in the Artie McFerrin Department of Chemical Engineering, has been named the Registered Student Organization New Adviser of the Year for 2009-2010 by Texas A&M University's Department of Student Activities.

Laird has since 2008 served as adviser to the Texas A&M chapter of Omega Chi Epsilon, the National Honor Society for Chemical Engineering. He was formally recognized with the university-level award at a Division of Student Affairs Awards Ceremony on May 5. Omega Chi Epsilon promotes high scholarship, encourages original investigation in chemical engineering and recognizes the valuable traits of character, integrity and leadership. It serves both undergraduate and graduate students and fosters meaningful student-faculty dialogue. The purpose of the organization is to recognize outstanding academic achievement in the Artie McFerrin Department of Chemical Engineering. This organization aims to bring motivated students together both socially and professionally to promote student faculty interaction as well as philanthropic endeavors.

Case Histories

Methanol Tank Fire and Explosion at Bethune Point Wastewater Treatment Plant
Presented by *Alba Lucia Pineda* at the April 29, 2010 Steering Committee Meeting

On January 11th, 2006, an explosion and fire occurred at the Bethune Point Wastewater Treatment Plant in the City of Daytona Beach, Florida. As a result of the acccident, two workers were killed. One was severely injured and fourteen people sought medical evaluation, but there were were no off-site consequences from this incident. The explosion occurred while two workers were removing a damaged roof above a methanol storage tank. Sparks from the cutting torch ignited methanol vapors coming from the tank vent creating a fire ball which flashed back through the flame arrester into the tank causing the explosion.

The CSB investigation revealed that the City of Daytona Beach did not implement a hazard identification method for non-routine work, adequate controls for hot-work, nor a permit-to-work system. Furthermore, the City had offered Hazard Communication (HAZCOM) training only 7 times in 12 years and not since 2002. The flame arrester was made of aluminum, which is known to be corroded by methanol. In addition, no requirement for maintenance of the flame arrester was included in the operation and maintenance manual; as a result, it was severely corroded. Another contributing factor was the fact that piping and valves were made of PVC instead of steel, which would have likely prevented the piping rupture. In order to exclude the use of thermoplastics in aboveground flammable liquid service, the CSB made recommendations to OSHA and NFPA to revise their standards.

Moreover, the CSB recommended to the City of Daytona Beach and the Governor and Legislature of the State of Florida to enact legislation that requires implementation of practices and procedures that are at least as effective as OSHA. At the same time, it was recommended to the Water and Environment Federation and Methanol Institute to work together in the distribution of information about methanol hazards. Finally, it was recommended to Camp Dresser & McKee Inc. (process designer) to review policies and procedures to ensure the quality of their designs and compliance with applicable standards.

Explosion at CTA Acoustical — Presented by *Derrick Thomas* at the April 30, 2010 Technical Advisory Committee Meeting

A February 20, 2003, dust explosion at the CTA Acoustics, Inc. (CTA) facility in Corbin, Kentucky, killed seven and injured 37 workers. This incident caused extensive damage to the production area of the 302,000-square-foot plant. The plant produced acoustic insulation for major automobile companies such as Ford Motors.

This most likely cause was an oven fire that ignited combustible phenolic resin dust, a main ingredient of the acoustical insulation. A broken oven temperature controller led the workers to open the oven door and manually cool and monitor oven temperature. A clog in an inefficient suction and filtration system led to a combustible dust cloud on the process floor. Inappropriate cleaning methods such as sweeping and blowing dust from the floor allowed dust to build up on hanging ceiling structures. The combination of these events caused catastrophic results for the plant.

CSB key findings from this case show that the explosion hazard was not explicitly communicated to CTA management by MSDS or recent dust explosions with similar chemicals. OSHA inspectors and CTA insurers did not cite the facility for violations even though dust explosions with similar chemicals had occurred and operation and maintenance of the facility was poor.

A Case Study from the BP Amoco Thermal Decomposition Incident Presented by *Byung-Kyu Kim* at the June 24, 2010 Steering Committee Meeting

Pressurized material expelled from the polymer catch tank and created an explosion at the BP Amoco polymer plant in Augusta, Georgia on March 13, 2001. Although significant business loss had not been reported, three employees were killed from the accident. Unlike other reactive chemical accidents, a tank without any heat supply was involved and the primary cause of the accident was caused by endothermic reaction. This incident was one of the wake-up calls for the process industry regarding the current safety system. The NFPA 704, a standard system for the identification of the hazards of materials, does not recognize hazards arising from the pressure when materials decompose. The reactivity hazard rating for the chemical involved in this accident is 'zero' based on the current NFPA 704, which is negligible hazard.

Photo by CSB

BP Amoco Augusta facility produces high-performance nylon thermoplastic, known as 'Amodel'. CSB has identified several contributing causes from their investigation. Firstly, there was not adequate information on materials being handled. Employees at the site had no information on the hazard of high pressure build-up due to decomposition. The management of change for the important start-up procedure had not been properly conducted. The design deficiencies for the tank and all the resulting near-misses were not properly investigated. Also, since Amodel did not comprise any of the 137 OSHA-listed highly hazardous chemicals, it was not subjected to the OSHA's PSM standard. Moreover, it was reactive chemicals used in the process industry, that emphasizes the need to develop best practices for improving the current reactivity hazard rating.

Recent Publications

1. Zhao, F., W.J. Rogers and M.S. Mannan, "Calculated Flame Temperature (CFT) Modeling of Fuel Mixture Lower Flammability Limits," Journal of Hazardous Materials," vol. 174, no. 1-3, February 2010, pp. 416-423.

2. Prem, K.P., D. Ng, M. Sawyer, Y. Guo, H.J. Pasman and M.S. Mannan, "Risk measures constituting a risk metrics which enables improved decision making: Value-at-Risk," Journal of Loss Prevention in the Process Industries, vol. 23, no. 2, March 2010, pp. 211-219.

3. Yang, X. and M.S. Mannan, "An Uncertainty and Sensitivity Analysis of Dynamic Operational Risk Assessment Model: A Case Study," Journal of Loss Prevention in the Process Industries, vol. 23, no. 2, March 2010, pp. 300-307.

4. Lian, P., A.F. Mejia, Z. Cheng and M.S. Mannan, "Flammability of Heat Transfer Fluid Aerosols Produced by Electrospray Measured by Laser Diffraction Analysis," Journal of Loss Prevention in the Process Industries, vol. 23, no. 2, March 2010, pp. 337-345.

5. Lu, Y., D. Ng, L. Miao and M.S. Mannan, "Key Observations of Cumene Hydroperoxide Concentration on Runaway Reaction Parameters"," Thermochimica Acta, vol. 501, no. 1-2, March 2010, pp. 65-71.

6. Safitri A., and M.S. Mannan, "Analysis of methane gas visualization using infrared imaging system and evaluation of temperature dependence gas emissivity," Industrial and Engineering Chemistry Research, vol. 49, no. 8, 2010, pp. 3926-3935.

7. Díaz-Ovalle, C., R. Vázquez-Román and M.S. Mannan, "An approach to solve the facility layout problem based on the worst-case scenario," Journal of Loss Prevention in the Process Industries, vol. 23, no. 3, May 2010, pp. 385-392.

8. Pokoo-Aikins, G., A. Heath, R.A. Mentzer, M.S. Mannan, W.J. Rogers and M.M. El-Halwagi, "A Multi-Criteria Approach to Screening Alternatives for Converting Sewage Sludge to Biodiesel," Journal of Loss Prevention in the Process Industries, vol. 23, no. 3, May 2010, pp. 412-420.

9. Markowski, A.S., M.S. Mannan, A. Kotynia-Bigoszewska, and D. Siuta, "Uncertainty aspects in process safety analysis," Journal of Loss Prevention in the Process Industries, vol. 23, no. 3, May 2010, pp. 445-454.

10. Patel, S.J., D. Ng and M.S. Mannan, "Integration of Safety Issues in Conceptual Design of Solvent Processes," Journal of Loss Prevention in the Process Industries, vol. 23, no. 4, July 2010, pp. 483-491.

11. Prem, K.P., D. Ng and M.S. Mannan, "Harnessing Database Resources for Understanding the Profile of Chemical Process Industry Incidents," Journal of Loss Prevention in the Process Industries, vol. 23, no. 4, July 2010, pp. 549-560.

12. Yang, X. and M.S. Mannan, "The Development and Application of Dynamic Operational Risk Assessment in Oil/Gas and Chemical Process Industry," Reliability Engineering and System Safety, vol. 95, no. 7, July 2010, pp. 806-815.

13. Lu, Y., D. Ng, and M.S. Mannan, "Prediction of the reactivity hazards for organic peroxides using QSPR approach," *Proceedings of 6th Global Congress on Process Safety*, San Antonio, Texas, March 21-25, 2010.

14. Jung, S., D. Ng, C. Laird, and M.S. Mannan, "Optimizing Facility Siting and Layout through Mapping Risk Estimates on Plant Area and Monetizing," *Proceedings of 6th Global Congress on Process Safety*, San Antonio, Texas, March 21-25, 2010.

15. Mannan, M.S., K.P. Prem and Dedy Ng, "Challenges and Needs for Process Safety in the New Millenium," *Proceedings of 13th International Symposium on Loss Prevention and Safety Promotion in the Process Industries*, Brugge, Belgium, June 6-9, 2010, pp. 5-13.

- Continued on next page

16. Rana, M.A., R. Qi, G. Yun, D. Ng and M.S. Mannan, "Recent Advances in LNG Field Experiments and Modeling of LNG Release and Mitigation Scenarios," *Proceedings of 13th International Symposium on Loss Prevention and Safety Promotion in the Process Industries*, Brugge, Belgium, June 6-9, 2010, pp. 57-64.

17. Qi, R., O. Basha, M.S. Mannan, T. Olewski and S.P. Waldram, "Medium-Scale LNG Experiments at Brayton Fire Training Field, Texas and Their Relationship to Process Safety in the LNG Industries in Qatar," *Proceedings of 13th International Symposium on Loss Prevention and Safety Promotion in the Process Industries*, Brugge, Belgium, June 6-9, 2010, pp. 65-72.

18. Jung, S., D. Ng, H.J. Pasman and M.S. Mannan, "A New Approach to Optimizing Facility Layout by Mapping Risk Estimates on Plant Area, Monetizing and Minimizing," *Proceedings of 13th International Symposium on Loss Prevention and Safety Promotion in the Process Industries*, Brugge, Belgium, June 6-9, 2010, pp. 113-120.

19. Mannan, M.S., "Lessons Learned from Past Incidents Shed Light on Present Day Needs and Challenges in Process Safety," Distinguished Lecture Series, Texas A&M University at Qatar, Doha, Qatar, January 26, 2010.

20. Mannan, M.S., "Development of the Effective Metrics for Measuring Improvements in Safety Performance," Plenary Keynote Lecture, The 3rd Doha Engineering and Technology Forum at Texas A&M University at Qatar and the 1st Texas A&M at Qatar Safety Symposium, Doha, Qatar, March 15-16, 2010.

21. Yun, G., D. Ng and M. S. Mannan, "A medium-scale field test on expansion foam application – key findings of LNG pool fire suppression on land," 10th Topical Conference on Natural Gas Utilization, 2010 AIChE Spring National Meeting, San Antonio, Texas, March 21-25, 2010 (presented by G. Yun, graduate student).

22. Qi, R., D. Ng, S.P. Waldram and M. S. Mannan, "Uncertainties in Modeling LNG Vapor Dispersion with CFD Codes," Professor Cedomir M. Sliepcevich Memorial Session, 10th Topical Conference on Natural Gas Utilization, 2010 AIChE Spring National Meeting, San Antonio, Texas, March 21-25, 2010 (presented by R. Qi, graduate student).

23. Patel, S., D. Ng and M. S. Mannan, "Integrating Safety Issues in Solvent Selection and Process Design," 2010 AIChE Spring National Meeting, San Antonio, Texas, March 21-25, 2010 (presented by S. Patel, graduate student).

24. Jung, S., D. Ng, C. Laird and M. S. Mannan, "A New Approach to Optimizing Facility Layout by Mapping Risk On Grids," 2010 AIChE Spring National Meeting, San Antonio, Texas, March 21-25, 2010 (presented by S. Jung, graduate student).

25. Wang, Q., B.F. Bennighof, J.A. Suardin, N.R. Popat, J. McPhate and M. S. Mannan, "RIV and SSIV Installations On Deepwater Platforms: A Decision Making Screening Tool," 2010 AIChE Spring National Meeting, San Antonio, Texas, March 21-25, 2010 (presented by Q. Wang, graduate student).

26. Yang, X., C.D. Laird and M. S. Mannan, "Pareto Optimization On Component Inspection Interval for Level Control in An Oil/ Gas Separation System," 2010 AIChE Spring National Meeting, San Antonio, Texas, March 21-25, 2010 (presented by X. Yang, graduate student).

27. Mannan, M.S., "How Can Academia and the Safety Industry Support Each Other," American Society of Safety Engineers Annual Conference, Baltimore, Maryland, June 13-16, 2010.

Mary Kay O'Connor PROCESS SAFETY CENTER

Ask the Expert

Ask the Expert is a chance for you to pose a question about anything regarding process safety and chemical engineering through our website at http://psc.tamu.edu/ask-the-expert. You will receive a personalized response that is well researched and answered by a panel of experts in the corresponding field. If it is deemed that the response to your question will be useful to many, we will post the question and response in our newsletter. Of course, the question and answer will be sanitized of person (and affiliation) posing the question. In addition, all previous questions and answers to the "Ask the Expert," portal are archived in the Members Area of the Center Website. Here is a good example.

Question: **What would you consider to be the top 5-10 chemical process safety conferences?**

Answer: **Following are some of the top chemical process safety conferences:**

1. Mary Kay O'Connor Process Safety Center, Annual International Symposium. This is a research heavy conference with participation from industry, academia, and government sponsored by the Mary Kay O'Connor Process Safety Center, held in College Station, Texas in the last week of October annually. More information is available at: http://psc.tamu.edu/symposia

2. The Global Congress on Process Safety, presented by the Center for Chemical Process Safety (CCPS) and the AIChE Safety & Health Division. This annual event — is a forum for practitioners to share practical and technological advances in all aspects of process safety. It is actually a combination of three different conferences:

   - CCPS International Conference
   - the Loss Prevention Symposium (LPS) and
   - the Process Plant Safety Symposium (PPSS)

   More information is available at: http://www.aiche.org/conferences/specialty/gcps.aspx

3. The HAZARDS Symposium Series sponsored by Institute of Chemical Engineers, UK, held every 18 months in Manchester, UK. More information is available at: http://www.icheme.org/hazardsxxi/

4. Loss Prevention and Safety Promotion in the Process Industry, International Symposium held every three years sponsored by the European Federation of Chemical Engineering. More information is available at: http://conf.ti.kviv.be/Lossprevention2010/

   So, these are the top six conferences (three packaged together as shown in item two above). Some specialty conferences that focus on certain aspects of process safety are shown below:

5. Annual Instrumentation Symposium, http://instrumentation-symposium.che.tamu.edu/

6. North Atlantic Thermal Analysis Society Conference, http://natasinfo.org/

Upcoming Events

Many upcoming events are scheduled in the next few months. Registration for these events are filling up and seats are limited! Take advantage of early registration discounts when offered.

- **Fall courses** begin August 30. Register now for your continuing education credits.
- **International Symposium**—Early registration ends September 15
- NEW COURSE: **Gas Explosion Hazards on Offshore Facilities** (*presented in conjunction with GexCon*)

Safety Engineering Courses — Fall 2010

Classes start August 30, 2010. Register Now!

DISTANCE LEARNING

SENG 310: Industrial Hygiene Engineering

Instructor: Dr. Dedy Ng

Application of scientific and engineering principles in the selection and design of control systems related to chemical, physical and ergonomic exposures in the process and manufacturing industries; relationships of criteria, analysis, and specifications for the assessment and control of occupational related illnesses. Prerequisites: CHEM 107; MATH 308; PHYS 208; or approval of instructor.

CHEN 455/655 – SENG 455/655: Process Safety Engineering

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; includes source modeling for leakage rates, dispersion, analysis, relief valve sizing, fire and explosion damage analysis, hazards identification, risk analysis, accident investigations.

CHEN 430 – SENG 430: Risk Analysis Safety Engineering

Instructor: Dr. William J. 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. Prerequisite: Junior or senior classification.

To register for a course, contact:

Mary Cass
Mary Kay O'Connor Process Safety Center
3122 TAMU - 244 Jack E. Brown Building
College Station, TX 77843-3122
Phone: (979) 458-1863
E-mail: mary-cass@tamu.edu

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

Distance Learning Objectives

The Mary Kay O'Connor Process Safety Center (MKOPSC) is safety education and process safety engineering courses in Fall 2010. 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 TAMU.

Future plans include offering the Master of Science Engineering program through distance education. For more information, please see our website at:

http://psc.tamu.edu/education

Mary Kay O'Connor Process Safety Center

2010 INTERNATIONAL SYMPOSIUM
Making Safety Second Nature

October 26-28, 2010
Hilton Conference Center
College Station, Texas

The symposium qualifies for 16.25 PDHs. The Texas Board of Professional Engineers requires 15 PDHS (including 1 PDH in Engineering Ethics).

A one-hour session on Engineering Ethics is offered immediately following the symposium on Wednesday, October 27. See website for registration information.

Online Registration is available on-line at

http://psc.tamu.edu/symposia/2010

Exhibit space is also available. Please see the website for more information and online reservations, or contact donnas@tamu.edu or 979/845-5981.

Mary Kay O'Connor Process Safety Center • Texas A&M University • College Station, TX 77843-3122
Phone: 979.845.3489 • Fax: 979.458.1493 • http://process-safety.tamu.edu

Mary Kay O'Connor Process Safety Center
2010 International Symposium
Beyond Regulatory Compliance, Making Safety Second Nature

TUESDAY, OCTOBER 26

8:00AM	**Frank P. Lees Memorial Lecture**			
9:00AM	State of the Center: "Research Program, Current Activities, and Future Direction," **Dr. Sam Mannan**, Director, Mary Kay O'Connor Process Safety Center			
9:15 - 10:00AM	**Break and Exhibit Hall • Break Sponsored by**			
	Track I Room: Oakwood	**Track II** Room: North/South 40	**Track III** Room: Brazos	**Track IV** Room: Mockingbird
	Skip Early, Kathy Shell, Michela Gentile	**George King, Marc Levin, Ammar Alkhawaldeh**	**Mike Marshall, Scott Ostrowski, Sara Saxena**	**Kiran Krishna, Ray Mentzer**
	Safety Climate/Safety Culture I	**Inherent Safety/Chemical Security**	**Process Management for Safety - I**	**Facility Siting**
10:00AM	➢ "Safety Culture in High Reliability Organizations," **R. Hartley**, B&W Pantex	➢"incentives for the Application of Inherent Safety for Chemical Security," **D. Moore**, AcuTech Consulting	➢"Surveillance of Hazardous Substance Releases Due to Equipment Failure," **A. Anderson**, ATSDR/DHS	➢ "Occupied Building Impact Studies," **P. Partridge**, Dow Chemical
10:30AM	➢ "Development of a Process Safety Climate Tool," **C. Butler**, HSL	➢ "Developing Technical Knowhow for Inherent Safety for TIH's," **R. Mentzer**, MKOPSC	➢"Compliance Auditing Can Lead to Effective Value-Added Solutions," **L. Morrison**, BP	➢"Facility Siting, Risk Management and Community Relations," **A. Carpenter**, Exponent
11:00am	➢ "A Barrier-Based Approach for Risk Informed Safety Culture Assessment for a Canadian Nuclear Power Station**,"** **J. Joseph**, DNV	➢"New approaches for design of inherently safe and scalable processes in an efficient and rapid way," **L. Schellekens**, MT	➢ "Non-traditional Functional Safety (ISA84) Applied to Onshore Gas Production," **C. Miller**, Exida	➢"An approach for risk reduction (methodology) based on optimizing the facility layout and siting in fire and explosion scenarios," **S. Jung**, MKOPSC
11:30AM	➢"Leading Indicators to Predict Incidents & Alarm Management in Chemical Plants Using Near-Miss Analysis," **A. Pariyani**, University of Pennsylvania	➢ "Inherently Safer Design Oriented Segregation of Chemical Process Operating Region," **B. Chen**, Tsinghua University	➢ "Implementation of a "Process" CCTV System for Operability and Safety," **M. Hernandez**, Fluor	➢ "Risk-Based Siting Considerations for LNG Terminals - Comparative Perspectives," **F. Licari**, DOT PHMSA
12:00 - 1:30PM	**Lunch and Exhibit Hall (1.5 hrs) • Lunch Sponsored by**			
	Risk Assessment I	**Regulations**	**Case Histories I**	**Hazard Assessment I**
1:30PM	➢ "Fatal Accident Rates Across Nations and the Cultural Dimension of Uncertainy Avoidance," **F. Infortunio**, GE	➢ "Improving Process Safety Regulations - Industry Suggestions," **S. Arendt**, ABS Consulting	➢ "Beyond API 2000 - Preventing Sudden Vacuum Collapse," **G. van Sciver**, Dow Chemical	➢ "Assessing the Credibility of Major Incidents During a Process Hazards Analysis," **O. Hansen**, GexCon US
2:00PM	➢ "Common Procedural Execution Failure Modes during Abnormal Situations," **P. Bullemer**, HCS	➢"Are Industry Actions Pushing Government Towards Prescriptive Regulations?," **C. Hamlin**, Wanger Consulting	➢"Compression System Check Valve Failure Hazards," **C. Thompson**, Equistar Chemicals	➢ "Prediction Models for the Flash point of Pure Components," **R. Vazquez**, Inst Tecnológico de Celaya
2:30PM	➢ "Using Layers of Protection Analysis: The Do's and the Views," **R.Sanders**, MKOPSC	➢ "Inherent Safe Design & PSM; An overview of Benchmarking and Risk Assessment," **S. Layton**, Zurich Engineering	➢ "Accidental Mix of 50% Caustic with Chlorinated Organic Vent Residues Forming DCA (dichloro acetylene, toxic explosive)," **W. Fort**, Dow Chemical	➢ " Early-on HAZOP (PHAZOP) Advocation: Best Practices, Building from the Past to the Future in Integrity Management," **B. Wittkower**, JP Kenny, Inc.
3:00 - 3:30PM	**Break and Exhibit Hall • Break Sponsored by**			

TUESDAY, OCTOBER 26 (continued)

	Track I Room: Oakwood	Track II Room: North/South 40	Track III Room: Brazos	Track IV Room: Mockingbird
	Skip Early, Kathy Shell, Michela Gentile	**George King, Marc Levin, Ammar Alkhawaldeh**	**Mike Marshall, Scott Ostrowski, Sara Saxena**	**Kiran Krishna, Ray Mentzer**
	Human Factors	**Safety Climate/Culture II**	**Mitigation Systems**	**Contractors**
3:30PM	➢ "Electroencephalographic Assessment of Mental Fatigue on Visual Tasks," **S. Cheng**, Chia-Nan University	➢ "Process Safety Basics and a Systems Approach," **R. Avendano**, BP	➢ "Relief Valves in Parallel," **J. Lawrence**	➢ "Leading and Lagging Indicators in Contractor Management: Using Analytics for Improved Decision Making," **D. Yemenu**, ISNetworld
4:00PM	➢ "Moving Towards a Learning Organization: Integrating Human Factor Investigation Data into Analysis of Process Safety Incidents," **A.W. Armstrong**, Kestrel Mgmt Services	➢ "Safety Climate Mediating the Relationship Between safety Leadership and Safety Performance in Petrochemical Industries," **T. Wu**, Hung Kuang University	➢ "Factors Impacting Atmospheric Discharges and Selection of Pressure Protection Disposal Systems," **A. Aldeeb**, Siemens Energy	➢ "Issues in Managing Contractor Safety in the Middle East," **M. Snakard**, AcuTech
4:30PM	➢ "The Effective of Chemical Protective Suits on Human Performance," **S. Murray**, University of Missouri - Rolla	➢ "Practical Steps to Improve Process Safety Culture – Case Studies and Lessons from the Process Industry," **R. Curtis**, ABS Consulting	➢ "LOPA," **F. Salimi**, ADEPP Academy	➢ "Framework for Process Safety Management based on Engineering Activity through Plant Lifecycle," **Y. Shimada**, JNIOSH Japan
5:00PM	➢ "Regulatory Pitfalls in Managing Multiple Employers," **J. McKinney**, Packer Engineering	➢"A Logical Hazard Identification in the Workplace," **M. Kumasaki**, Yokohama National University	➢ "Consistent Alarms Improve Process Economics and Increase Process Safety," **R. Brooks**, Curvaceous	

5:30-7:00PM Cocktail Reception • Sponsored by

WEDNESDAY, OCTOBER 27

8:00AM	**Keynote Lecture** – **Steve Flynn**, Vice President for Health, Safety, Security & Environment, BP Group
9:00AM	Presentation of Annual Merit Award, Harry H. West Service Award, and the Lamiya Zahin Memorial Safety Scholarship, **Dr. Sam Mannan**, Director, MKOPSC

9:30 - 10:00AM Break and Exhibit Hall • Break Sponsored by

	Track I Room: Oakwood	Track II Room: North/South 40	Track III Room: Brazos	Track IV Room: Mockingbird
	Skip Early, Kathy Shell, Michela Gentile	**George King, Marc Levin, Ammar Alkhawaldeh**	**Mike Marshall, Scott Ostrowski, Sara Saxena**	**Kiran Krishna, Ray Mentzer**
	Risk Assessment - II	**Reactive Chemicals/ Flammability - I**	**Process Management for Safety - II**	**Hazard Assessment II**
10:00AM	➢ "LOPA Case Study - What to Do with Rare Events," **R. Freeman**, S&PP Consulting	➢ "Incorporating Pressure Data in Reactive Chemicals Screening Analysis," **K. First**, Dow Chemical	➢ "ExxonMobil Production HAZOPs: A Valuable Risk Assessment Tool," **J. Thomas**, ExxonMobil	➢ "Risk Based Method to Establish Inspection Intervals for Pressure Relief Devices**," P. Henry**, Equity Eng.
10:30AM	➢ "Bringing Consistency to LOPA (semi-quantitative consequence severity estimation)," **A. Summers**, SIS-TECH Solutions	➢ "Study on Self-Heating of RDF," **H. Koseki**, NRIFD Japan	➢"Reconsidering Mechanical Devices for Partial Stroke Valve Testing," **M. Mitchell**, CAMERON Flow Control	➢ "Analysis of Potential Escalations Due to Release of LNG at LNG Port and Marine Vessel," **A. Kulkarni**, Vectra Middle East, UAE
11:00AM	➢ "Fuzzy Logic Application to Explosion Risk Assessment," **A. Markowski**, Technical University of Lodz	➢ "Process Safety Aspects in Water-Gas-Shift (WGS) Catalytic Membrane Reactors Used for Pure Hydrogen Production**," N. Kazantzis**, WPI	➢ "Safety Audits at Oil & Gas Installations – A Supervisory Activity," **S. Chakravorty**, OISD India	➢ "Refrigeration System ex-HAZOP," **M. Sawyer**, Apex Safety Consultants
11:30AM	➢"Study on Fire Hazard of Biodiesel (BDF)," **H. Koseki**, NRIFD Japan	➢ "Prediction and Assessment of Safer Operating Conditions for N-oxidation of Alkylpyridines**," L. Saenz**, MKOPSC	➢ "Safety in the Engineering Enterprise," **F. Joop**, Intergraph Corporation	➢ "Does Your facility Have a Dust Problem: Methods for Evaluating Dust Explosion Hazards," **S. Davis**, GexCon US

WEDNESDAY, OCTOBER 27 (continued)

12:00 - 1:30PM Lunch and Exhibit Hall (1.5 hrs) • Lunch Sponsored by

	Track I Room: Oakwood	Track II Room: North/South 40	Track III Room: Brazos	Track IV Room: Mockingbird
	Skip Early, Kathy Shell, Michela Gentile	**George King, Marc Levin, Ammar Alkhawaldeh**	**Mike Marshall, Scott Ostrowski, Sara Saxena**	**Kiran Krishna, Ray Mentzer**
	Hazard Assessment III	**Consequence Modeling**	**Reactive Chemicals II**	**LNG I**
1:30PM	➢ "Automatic Flammability Apparatus and Application," **C. Mashuga**, Dow Chemical	➢ "Using CFD in Platform Design," **S. Nodland**, Scandpower	➢ "Development and Testing of a Micro-Cantilever Based Nano-Calorimeter for Explosives Detection," **D. Banerjee**, Texas A&M	➢ "A parameter sensitivity analysis for the optimal design of water spray curtains," **O. Basha**, Texas A&M Qatar
2:00PM	➢ "Deflagration to Detonation Transition in a Lean Hydrogen-Air Unconfined Vapor Cloud Explosion," **K. Thomas**, Baker Engineering	➢ "Multi-Scale Modeling of Crystalline Energetic Materials," **T. Cagin**, Texas A&M	➢ "Pyrolysis Mechanism of Triazole Compounds by Molecular Orbital Calculation and Evolved Gas Analysis," **S. Yoshino**, Yokohama National University	➢ "Visualization of Liquefied Natural Gas (LNG) Spill and Dispersion: Safety Assessment," **S. Nayak**, Texas A&M Qatar
2:30PM	➢ "Comparison of Flammability and Oxidising Power of Gas Mistures Using the ISO/DIS 10156 With Measured Flammability Data," **M. Molnarne**, BAM Germany	➢ " Class-2 Hazmat Transportation Consequence Assessment On Surrounding Population," **J. Parikh**, Nat'l Institute of Technology	➢ "Effects of Metal Contaminants on the Reactivity Hazards of Organic Peroxides," **Y. Lu**, MKOPSC	➢ "A Source Term Model for Evaporating Liquid Flow in a Channel," **P. Raj**, Technology & Mgmt Systems

3:00 - 3:30PM Break and Exhibit Hall • Break Sponsored by

	Case Histories II	**Offshore I**	**Database/ Analysis**	**Risk Assessment III**
3:30PM	➢ "Disarming a 6000 Gallon Reactor," **H. Johnstone**, Dow Chemical	➢ "Consequence Modeling on Subsea Release Using PLUMERISE and Numerica Models," **A. Qiao**, DNV	➢ "Incident Database 2.0: Harnessing the Power of the Internet for Collecting and Disseminating Incident Information," **A. Liu,** Univ of Louisiana-Lafayette	➢ "Layer of Protection Analysis - Developments, Applications and Limitations," **P. Myers**, Advantage Risk Solutions
4:00PM	➢ "Detonation of NOx Gums in a Cold Box," **G. Kiihne**, BASF	➢ "Escape, Evacuation and Rescue Analysis based on Consequence Modeling at a Remote Offshore Platform," **N. Vaez**, Aftab Imen Parto Consult. Engineers	➢ "Migrating an Organizational Incident Reporting System to a CCPS Process Safety Metrics Model," **T. Morrison**, Exponent	➢ "Effective Management of PSM data in implementing the ANSI/ISA-84.00.01 Safety Lifecycle," **C. Presgrave**, AE Solutions
4:30PM	➢ "Case Study, Loss to Restart: Explosion of Process Unit at a Kraft Food Production Facility," **C. Schemel**, Packer Engineering	➢ "Improving Situational Awareness through the Design of Offshore Installations," **B. Woodcock**, RRS/Schirmer	➢ "Decision theory: why it is important for improving chemical process safety," **K. Prem**, MKOPSC	➢ "Executing QRA Effectively on a Project," **L. Porter**, Fluor

5:00 - 6:00PM - Engineering Ethics Session (1 hr)

(Thursday, October 28 on next page)

Online registration is available at:

http://psc.tamu.edu/symposia/2010

Mary Kay O'Connor Process Safety Center • 2010 International Symposium

THURSDAY, OCTOBER 28

8:00AM	**Keynote Lecture** - **Dr. Paul Amyotte**, Professor, Dalhousie University			
8:45AM	"National Toxic Substance Incidents Program – Panel Discussion," **Dr. David Williamson** and **Dr. D. Kevin Horton**, ATSDR		"Globally Harmonized System of Classification and Labeling of Chemicals (GHS)"	
9:45 – 10:15AM	**Break and Exhibit Hall • Break Sponsored by**			
	Track I Room: Oakwood	**Track II** Room: North/South 40	**Track III** Room: Brazos	**Track IV** Room: Mockingbird
	Skip Early, Kathy Shell, Michela Gentile	**George King, Marc Levin, Ammar Alkhawaldeh**	**Mike Marshall, Scott Ostrowski, Sara Saxena**	**Kiran Krishna, Ray Mentzer**
	Metrics and Performance Drivers	**LNG II**	**Offshore II**	**Risk Assessment IV**
10:15AM	➢ "RP 754-Metrics and RP 755-Fatigue Management," **R. Chittim** and **K. Haase**, API	➢ "Evaluating the Potential for Overpressures from the Ignition of an LNG Vapor Cloud during Offloading," **F. Gavelli**, GexCon US	➢ "Utilizing Quantified Risk Assessment in the Offshore Oil & Gas Industry to Support the Principles of Inherent Safety and Continuous Risk Reduction," **A. Warwick**, Atkins	➢ "Radiative heat transfer to Liquefied Natural Gas (LNG) pool fires," **C. Herrera**, MKOPSC
10:45AM	➢ "Process Safety Indicators Used by the Delaware Accidental Release Prevention Program," **J. Brabson**, Delaware	➢ "Small Scale LNG-Related Experiments and CFD Simulation of Water Curtain," **T. Olewski**, Texas A&M Qatar	➢ "Riser Piping Impact Risk Assessment," **S. Zhang**, DNV	➢ "Lessons Learned from Real World Application of the Bow-tie Method," **K. Smith**, Risktec Solutions
11:15AM	➢ "The Taxonomy (Classification) of Process Safety," **J. Chosnek**, KnowledgeOne	➢ "A Compilation of Current LNG Technology," **J. Woodward**, BakerRisk	➢ "Offshore Regulatory and Safety Standards," **S. Mannan** and **Q. Wang**, MKOPSC	➢"Risk Informed Optimization of a Hazardous Material Multi-Periodic Transportation Model," **V. Kazantzi**, Technological Education Institute of Larissa, Greece
11:45AM	➢ "Implementing a Leading Indicator Management Scorecard," **K. Carter**, Syntex	➢ "Modeling the Vapor Source Associated with the Spill of LNG into a Sump or an Impoundment Area," **N. Ponchaut**, Exponent	➢ "Variations in the evaporation rate of a cryogenic liquid on a water surface," **H. Kytomaa**, Exponent	➢ "Drawing More Business Risk Assessment Value from Process Safety Management Hazard Analyses," **K. Shell**, AE Solutions
12:15 Noon - Close				

Early Registration through September 15.
Online registration is available at:
http://psc.tamu.edu/symposia/2010

Sponsorships and Exhibit space is available.
More information and exhibit registration is available online at:
http://psc.tamu.edu/symposia/2010/exhibitors

EXHIBIT AT THE

2010 Symposium

Making Safety Second Nature

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October 26-28, 2010
Hilton Conference Center
College Station, Texas

$1250 includes:

- one Symposium registration
- listing in meeting programs (in print and on-line)
- 10'X8' booth space
- electrical hookup
- skirted table/2 chairs

Register online at:

http://psc.tamu.edu/symposia/2010

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

Mary Kay O'Connor
Process Safety Center

Calendar of Events

Upcoming Short Courses: *(For more info see: http://psc.tamu.edu/education/continuing-education)*

8/17/2010 Reactive Chemical Hazards Assessment

8/24-25/2010 Best Practices – Pressure Relief Systems

8/24-25/2010 Dust Explosion

8/30-31/2010 Gas Explosion Hazards on Offshore Facilities

Meetings:

October 25, 2010
STEERING COMMITTEE MEETING
Mary Kay O'Connor Process Safety Center
College Station Hilton Conference Center

October 28, 2010
TECHNICAL ADVISORY COMMITTEE MEETING
Mary Kay O'Connor Process Safety Center
College Station Hilton Conference Center

Symposium:

October 26-28, 2010
2010 SYMPOSIUM
Mary Kay O'Connor Process Safety Center
College Station Hilton Conference Center

Mary Kay O'Connor
Process Safety Center

Contact:

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