The 2013 International Symposium of the Mary Kay O'Connor Process Safety Center will be held at the College Station Hilton Conference Center on October 22-24, 2013.

Ms. Judith Hackett, chair of the UK Health and Safety Executive, will present the Frank P. Lees Memorial Lecture on Tuesday, the first day of the symposium. Mr. Wes Lohec, Vice President, Health, Environment and Safety, at Chevron will present the keynote on the second day and Prof. Gord Winkel with the University of Alberta will deliver the keynote on the third day.

The complete program will be made available online at http://psc.tamu.edu/symposia/2013-sym

Center Personnel Visit West

On May 23, Mr. John Bresland, research fellow, escorted a group of MKOPSC graduate researchers to the town of West, Texas. Two Chemical Safety Board investigators guided the group around areas of town affected by the ammonium nitrate explosion. This was an invaluable experience for the graduate researchers and the Center.

Zhe Han, one of the graduate researchers, has been conducting research involving ammonium nitrate for several years. A technical summary of her research in this area is on page 6.
Director’s Corner

I am sure 2013 is another year of hope and progress in all areas of our respective endeavors. In the case of Mary Kay O’Connor Process Safety Center and Texas A&M University, we are going through a change in realignment and reorganization. In keeping with these changes, we are also changing our Center logo to get aligned and consistent with the system logo.

I am sure many of you have developed a connection and recognition with the earlier logo we had been using for the last 16 years and look back on it with nostalgic feelings. But changes in logo and branding are sometimes needed in order to align organizations and bring uniformity. Regardless, I want to assure you that the Mary Kay O’Connor Process Safety Center goals and vision remain the same, and we will tirelessly continue on our journey to help improve process safety in the industry through our extensive programs in education, research and service. A branch of the Center has already been established and is operational in Doha, Qatar. Negotiations are under way to establish such extensions and branches of the Center at a few other locations. The approach is very simple. At these extensions and branches, we will establish the same programs and activities that have brought great successes at the College Station campus of Texas A&M University.

Effective June 1, 2013, the Mary Kay O’Connor Process Safety Center logo is:

I also want to take this opportunity to say a few words about the West, Texas, ammonium nitrate incident. We are devastated by the incident and our heart goes out to the victims, their families and the town in general. However, the incident should give us reason for pause and reflection. The hazards of ammonium nitrate are very well known starting from the Texas City tragedy in 1947 to the incident in Tolouse, France, and the terrorist attack of the Alfred Murrah Federal building in Oklahoma City. The questions that come to mind include:

1) How many facilities like West are there in Texas?
2) How many facilities like West are there in the U.S.?
3) How can regulatory oversight of worksites such as the West plant be improved using existing regulations and programs?
4) Are there any existing regulations and regulatory bodies in Texas specifically that deserve the most attention in the wake of this disaster?
5) Based on all the ammonium nitrate incidents that have happened in the past, would it be correct to say that the largest group among the casualties tends to be first responders?
6) What lessons have been learned in past fires involving ammonium nitrate and which of those lessons may be relevant again here?
7) Did West have zoning considerations or land-use planning considerations when allowing all other development to run snug up against the fence line of a depot storing such huge quantities of explosive materials?
8) Since 10 of the 14 people who died were killed while fighting the fire, were there any mistakes in how first responders handled the emergency?

9) What fire-fighting measures were used in past incidents involving ammonium nitrate? More importantly, can we say definitively what is the best way to fight an ammonium nitrate incident?

10) Is there a concrete way for us to determine how much water should have been available at the West site (measured by fire hydrants or capacity)?

11) Is there variation in how different states or localities dictate how much water should be available on site for locations that store or handle large amounts of flammable or explosive material?

12) How would third-party auditing work in situations like this? And incrementally how much would it cost the facility?

13) Is there a need for new regulations? Why, where and how could they be enforced?

14) Is there an effective way for industry themselves to come up with some way to improve the situation?

As we deal with the aftermath of the West incident and hopefully investigation reports reveal the root causes, we at the Mary Kay O’Connor Process Safety Center will continue to explore these broader questions and report back to you in our future communications. In the meantime, let’s hope and pray that the lives lost in West, Texas, were not in vain and the lessons learned from the incident and the investigation reports lead to safer storage, handling and usage of ammonium nitrate and other hazardous materials.

M. Sam Mannan
Spring 2013
Texas A&M Qatar Signs Agreement for World-Renowned Process Safety Center

http://www.qatar.tamu.edu/newsroom, March 25, 2013 • Texas A&M University at Qatar has signed an agreement to bring an extension of the Mary Kay O'Connor Process Safety Center to Doha. The satellite center will duplicate the academic programs and activities of the center at Texas A&M University in College Station, Texas. The Memorandum of Understanding (MOU) was signed during the annual Process Safety Symposium March 11-12 at the Qatar National Convention Center.

Dr. Kenneth Hall, associate dean for research and graduate studies at Texas A&M at Qatar, said, "The Qatar Process Safety Symposium has become a showcase for the commitment of the University to improving the quality of life in Qatar. This year, the symposium contained an event of special significance. The Mary Kay O'Connor Process Safety Center, the premier academic program addressing this crucial issue, located in College Station, Texas, elected to establish an extension of itself in Texas A&M University at Qatar. At the Qatar Process Safety Symposium, Dr. Sam Mannan, executive director of the center, and I signed an MOU to Dr. M. Katherine Banks, dean of the Dwight Look College of Engineering at Texas A&M, requesting her approval to establish the extension. We have proposed Dr. Luc Véchot to be the managing director of the extension. Texas A&M University at Qatar is proud to have gained the confidence of Dr. Mannan and the MKOPSC, and we pledge that MKOPSC-Qatar will strive to instill the goal of MKOPSC: making safety second nature."

The Center's mission is to promote safety as a second nature in industry around the world with goals to prevent future accidents. The Center’s vision is to be an international leader in minimizing losses within the process industry through safer processes, management, equipment and procedures. The Qatar center (MKOPSC-Q) will provide good science based counsel, develop and disseminate best practices through consulting and short courses, provide benchmarking for process safety management systems and practices, and conduct research. It will also provide industry with a forum to exchange ideas and advance technologies to stay competitive.

Dr. Sam Mannan, executive director of the MKOPSC-Qatar, said, "The establishment of the Mary Kay O'Connor Process Safety Center in Doha represents a major step forward in bringing all the successful programs and activities that have been developed at the main campus in College Station to Texas A&M at Qatar. These programs will lead to the integration of process safety into the curriculum in the education, research and service programs of Texas A&M at Qatar. This will be of tremendous mutual benefit for the University and the industry in Qatar."

Dr. Luc Véchot, managing director of the MKOPSC-Qatar, said, "We are very pleased by the establishment of the Mary Kay O'Connor Process Safety Center here in Doha. Such a structure, which brings together academia, industry and regulatory institutions, was needed in Qatar and we look forward to working with industry on process safety issues. Very importantly, together with our colleagues from the industry, the center will actively contribute to educate new generations of engineers for whom safety is second nature."

Dr. Sam Mannan and Dr. Ken Hall at Signing Ceremony

Centerline, Vol. 17, No. 1 4 Spring 2013
News & Events

January 29-30
Mr. John Bresland
*Safety Culture in the Investigation of Recent Major Accidents*
International Workshop Human Factors and Operational Management under Crisis Conditions
Paris, France

February 20
Dr. Sam Mannan
*Dashboard Data for Managers for Monitoring and Measuring Process Safety Performance*
Lake Area Industries/McNeese Engineering OSHA Process Safety Studies Workshop
McNeese University, Lake Charles, LA

March 11-13
Dr. Sam Mannan
*Process Safety Research Agenda for the 21st Century*
TAMUQ Safety Symposium
Doha, Qatar

March 19
Dr. Sam Mannan
*For Want of a Nail the Kingdom Was Lost*
W. L. Gore Sales Meeting
San Antonio, TX

May 12-15
Dr. Sam Mannan
- Revisiting Age Old Corrosion Problems with Modern Tools and Techniques.
- The Fukushima Incident and the Impact on Risk Perception and Risk Communication.
14th International Symposium on Loss Prevention and Safety Promotion in the Process Industries
Florence, Italy

May 27-31
Dr. Sam Mannan
*Leadership Training on Process Safety*
Reliance Industries Limited
Mumbai, India

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2013 AIChE Spring Meeting

Nine papers and posters from the Mary Kay O’Connor Process Safety Center were presented at the AIChE Spring Meeting held in San Antonio, Texas, from April 28 to May 2:

- **Summary of Expert Forum On the Use of Performance-Based Regulatory Models in the U.S. Oil and Gas Industry, Offshore and Onshore** presented by Dr. Xiaodan Gao
- **Scale up of Stirred Batch and Semi-Batch Reactors—Gaps and Limitations of the Current Methodologies** presented by Olga Reyes
- **Can Fire Suppressants Promote Ignition? A Study Of HFC-125 and HFC-227** presented by Carmen Osorio
- **Lower Flammability Limits of Mixtures of Hydrogen and Methane at Atmospheric and Sub-Atmospheric Pressures** presented by Hai Le
- **Key Findings of Experimental and Theoretical Studies On Forced Mitigation System for an LNG Spill Emergency** presented by Byung Kim
- **Forced Dispersion Analysis of LNG Vapor Mitigation Using Fire Dynamic Simulator** presented by Wilson Molina
- **Minimum Ignition Energy Study of Flowing Heat Transfer Fluid Aerosols: Experimental and Theoretical Approach** presented by Szu-ying Huang
- **The Use of CFD to Evaluate the Interactions Between Multiple-Leak Sources and to Assess Effectiveness of Integral Modeling Techniques in a Multiple-Leak Scenario** presented by Josh Richardson
- **Explosion Characteristics of Carbon Nano-Fibers** presented by Wilson Molina
Research Summary

NH$_4$NO$_3$ Reduction of Explosion Hazard while Maintaining Agricultural Benefit

Runaway reactions present a potentially serious threat to the chemical process industry. In general, this research topic will investigate the mechanisms that drive these reactions, develop predictive models, and create appropriate and effective mitigation strategies. Specifically, this project will look at reducing the explosion hazard associated with ammonium nitrate (AN) while maintaining its agricultural benefit. On one hand, the safety issues associated with the storage of AN will be considered. On the other hand, more efforts will be spent on developing the reaction stoichiometry, thermodynamic parameters and kinetic parameters related to AN.

In this project, experimental analysis, theoretical methods and systematic approach for reactivity evaluation will be used to better study the mechanisms that result in explosion hazards. The first step is to study the decomposition of AN, using a Reactive System Screening Tool (RSST), an Automated Pressure Tracking Adiabatic Calorimeter (APTAC), and a Differential Scanning Calorimeter (DSC)/Thermogravimetric Analyzer (TGA). Some materials act as inert which results in the dilution of AN, and others tend to increase the chemical reaction zone to reduce the probability of explosion. Therefore, this study will look into the behavior of AN with additives. Furthermore, weathering effect, humidity effect, and volume effect will be tested to find out how the storage condition will affect decomposition of AN. A Gas Chromatograph will be used to analyze the gas composition. In addition to the experimental work, modeling tools such as Gaussian and Material Studio will also be used to validate the experimental data.

Zhe Han is a second year PhD research at the Mary Kay O’Connor Process Safety Center.

Upcoming Speaking Events

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<td><strong>CCPS-Pan Pacific Process Safety Conference</strong></td>
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<td>Speaker: Dr. Sam Mannan</td>
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<td>Luminant</td>
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<td><strong>IRN Workshop</strong></td>
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<td>Houston, Texas</td>
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<th>August 21-24</th>
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<td><strong>NCEES 2013 Annual Meeting</strong></td>
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2013 Instrumentation Symposium  
Boasts New Location, Record Attendance  

The 68th Annual Instrumentation Symposium for the Process Industries was held January 22-24 in the newly reconstructed and reopened Memorial Student Center (MSC) at Texas A&M University. The symposium was hosted by the Mary Kay O’Connor Process Safety Center.

This change in venue offered notable improvements to the symposium, including an increase in paper and workshop presentations and an exhibition hall more suited to the expanding program. This year, the symposium was able to offer an additional workshop and nearly double the amount of papers presented by adding a second track to the program due to the increase of available space in the MSC.

Along with a newly refurbished location, the Instrumentation Symposium has had a second consecutive year of record attendance. The 2012 and 2013 symposia show a steady increase of attendees that will likely continue to grow in the coming years.

Keeping up with the latest software, knowledge, and regulations as they affect the instrumentation world is what continues to bring professionals, students, and faculty together each January. This long-standing symposium provides a forum for technical presentations, workshops, networking, and exhibits offering the latest technology for the industry.

A unique feature of the 2013 Instrumentation Symposium was the inclusion of the first Instrument Reliability Network Symposium, which was presented jointly to raise awareness and provide an opportunity for knowledge exchange and networking. The Instrument Reliability Network’s (IRN) mission is to share historical information and lessons learned in order to minimize environmental harm, improve industry safety, maximize asset performance, and reduce maintenance costs through better lifecycle management of instrumentation and controls applied in the process industry.

The IRN is a natural addition to the Instrumentation Symposium due to the connections to instrumentation and the process industry. This year, the second track of papers for two of the days was focused solely on the IRN and its growth potential.

To demonstrate the growing number of relevant topics at the symposium, this year featured three keynote speakers. The first keynote address was given by Joe Gregory, General Manager of Major Capital Projects for the Deepwater Exploration and Projects Business Unit of Chevron North America Exploration and Production Company. In his presentation “Excellence in Automation: Key Enabler for Business Success,” Gregory discussed the application of technology to maintain a successful business in the process industries. (continued)
Visitors to the Center

January

Dr. Ning Shi and Dr. Feng Sun with SINOPEC visited the Center in January. They toured the Center lab facilities and gave a presentation on their research and Center.

February

Dr. Kazutoshi Hasegawa gave a presentation entitled, “Minor Hazards as well as Major Hazards - How to promote risk management in Japanese process industries,” as part of his week-long visit. Dr. Hasegawa is a professor in the Department of Risk and Crisis Management System at the Chiba Institute of Science, Japan.

Dr. Ali Rangwala, a professor from Worcester Polytechnic Institute, spent his sabbatical at the Center this spring. He presented several seminars to Center research staff and students, including “Portable Gasoline Container Flammability,” “Ignition of a Dust Deposit in a Wedge Shaped Hot Plate,” and “Hybrid Methane-Air-Laminar Coal Dust Flames.”
March

Dr. Hans Pasman and Dr. Simon Waldram visited for most of the month of March.

Dr. Chi-Min Shu, Distinguished Professor at the Process Safety and Disaster Prevention Laboratory at the National Yunlin University of Science and Technology in Taiwan, visited March 8.

Dr. Hiroshi Koseki from the National Research Institute of Fire and Disaster (NRIFD) in Japan came for two days.

Dr. Chad Mashuga with Dow Chemical met with students March 21.

April

Dr. Khaliquur Rahman visited the Center again in April.

Dr. Ali Sari and Dr. Kiran Krishna from WS Atkins visited the Center in April. Dr. Sari presented a seminar, “Fire and Blast Response of Structures.”

Dr. Bernd Schrörs and Professor Börcsök with Bayer came for a one-day trip April 9.

Dr. Nikos Kiritsis and Dr. John Griffith (pictured below with Roy Sanders, Valerie Green and Dr. Mannan) from McNeese University in Lake Charles, Louisiana, arrived on April 15.

Mr. Roy Sanders joined us from April 15-18.

May

Professor Andrzej Kraslawski with the Lappeenranta University of Technology in Finland, visited May 3-8. He met with students and researchers to discuss their research and to discuss future collaborations with the Center and LUT.

Dr. Awadh O. Oadah, Head of University Relations, Dr. Henryk Marcinkiewicz, Head of University Relations & Placement, and Mr. Ahmed Aburas, the Administrator of Program Development & Quality Assurance, all with Saudi Aramco, visited the College and the Center on May 16.

Clive Wilby, Chuck Gill, and Mark Cox with Intergraph met with Center personnel on May 24, to discuss collaborations.
The Center held the 6th Annual Alumni Reunion, sponsored by Shell E&P, April 20, 2013. More than 150 past and present students, staff, researchers and family members were in attendance. Byung Kyu Kim, Center graduate student, was this year's Master of Ceremonies. Dr. Naz Karim, Head of the Artie McFerrin Department of Chemical Engineering at Texas A&M and Cindy Wall, Assistant Agency Director for Operations, TEES, welcomed everyone. Presentations from current students about their recent internship experiences were made by Szu-ying Huang, Carmen Osorio and William Pittman. Alumni at different stages in their careers spoke about their experiences and insights since graduating. Alumni speakers included Shubharthi Barua, Ali Ashfaque, and Susan M. Losavio.

The day included a tour of the Center’s library and labs, a “Safety Climate” pamphlet competition judged by the alumni, dinner and entertainment. A surprise highlight of pre-dinner entertainment was a performance of the “Gangnam Style” dance by current Center students. The after-dinner entertainment lineup included: the Texas A&MU Belly Dance Association, Apotheosis, Ballet Folklorico Celestial, and Salsa Fusion Latin Dance Company.


The two key issues of this incident are the use of nitrogen in confined spaces, and the safety of temporary enclosures. This incident occurred at Union Carbide Corporation’s Taft/Star Manufacturing Plant, in Hahnville, Louisiana on March 27, 1998. Two workers were overcome by nitrogen gas while performing a black light inspection at an open pipe during a turnaround time. One was killed and the other severely injured. The unit where this incident occurred produces ethylene oxide using ethylene and methane. The oxygen feed mixer was removed for cleaning, and the reactors were maintained with a new catalyst. Since the catalyst is sensitive to moisture, nitrogen gas was added to displace air in the reactors, and the bypass valves were opened to retard rust in piping. The removal of the oxygen feed mixer left the two pipes open. Nitrogen gas was vented through the north end pipe, which is 150 feet away from the nitrogen supply. Two workers did a black light inspection on the second day for the open pipe flanges, even though this was not necessary. The sunlight was strong at noon; a black plastic sheet was used to cover the opening of the pipe with the help of two contractors, which led to a temporary enclosure. The two workers did the inspection in the pipe. No incident occurred in the south end pipe since there was nitrogen venting from it. Later, two workers inspected the north end pipe flange in the same manner and were overcome by nitrogen. One worker died on arrival at the hospital, and the other was severely injured and received oxygen therapy for several days.

The hazards involved in this incident are confined space hazard and secondary hazard of open pipe venting nitrogen. Inadequate procedures of controlling potential hazards of temporary enclosures and nitrogen and inadequate hazard warnings of confined space and nitrogen are the root causes of this incident. The fact that human senses cannot detect nitrogen is one contributing cause of this incident.

CSB recommended that the plant post warning signs for confined space and nitrogen, and ensure a safety program to address the control of hazards created by erecting temporary enclosures. CSB also recommended OSHA issue a safety alert to address the hazard of temporary enclosure, and provide guidelines for the use of temporary enclosures around equipment containing hazardous substances. Center for Chemical Process Safety and Compressed Gas Association should communicate the findings of the CSB report to its membership.

One similar incident took place in a Valero refinery in Delaware City, DE, on November 5, 2005. Two workers died due to nitrogen asphyxiation. CSB reported that 85 incidents occurred with 80 fatalities due to nitrogen asphyxiation from 1992-2002.
This case study concerns the events of November 8, 2001, on the premises of Corus UK Ltd, Port Talbot, South Wales. The explosion of one of the company’s blast furnaces, No. 5 Blast Furnace, led to the tragic deaths of three employees and injury of a number of other people.

The entire furnace, which with its contents weighed approximately 500 tonnes, lifted bodily at the lap joint, rising some 0.75 m from its supporting structures, leading to the explosive release of hot materials and gases into the cast house. The explosion caused widespread alarm and concern throughout the locality.

The outcome of the explosion was unprecedented in the steel-making industry, but was the result of many failings in safety management by the company over an extended period. The explosion occurred after a prolonged attempt over two days to recover the furnace from a chilled hearth situation caused by cooling water ingress. The immediate cause was the mixing of water and hot materials within the lower part of the furnace. The water had entered the furnace from its cooling system following a chain of events initiated by the failure of safety-critical water cooling systems. At the time of the explosion, attempts were continuing to rectify the abnormal operating conditions that this had created and to recover the furnace.

The precursors to the explosion were a combination of significant failures in health and safety management extending over many years. A failure to carry out suitable and sufficient risk assessments for blast furnace operations resulted in the failure to implement robust technical and procedural controls. There was insufficient redundancy and security of cooling water supplies, and overall cooling system reliability showed a downward and deteriorating trend over several months. A joint investigation was carried out by South Wales Police and the Health and Safety Executive (HSE) under the Work-Related Deaths Protocol. The company was subsequently prosecuted under sections 2 (1) and 3 (1) of the Health and Safety at Work Act 1974 and was fined £1.33 million in the Crown Court, with £1.74 million costs also being awarded. The investigation identified a number of learning points for both Corus UK Ltd. and its blast furnace operations, the wider steel industry, and other manufacturers.

Lessons Learned:

1. Safety Management - The company should review the role and function of the Safety Department;
2. Management of Change - A formal system of pre-modification risk assessments should be instituted for any changes;
3. Human Factors - All personnel are aware of others’ responsibilities;
4. Decision making - A clear “line of responsibility” for decision making.
5. Cooling water - Sufficient cooling water for furnaces should be available at all times; the supply systems should have an adequate level of reliability;
6. Leak Detection - Speed in locating furnace cooling water leaks is essential;
7. Maintenance - Maintenance, inspection and testing of plant and equipment should be paramount;
8. Design Issues - The design of rebuilt furnaces should take into account the need to improve the reliability of cooling water supplies.
Case History—Carbide Industries, LLC. Electric Arc Furnace Explosion: Normalization of Deviance - A new normal to routine
Presented by Byung Kim at the March 28 Steering Committee Meeting

The incident occurred at Carbide Industries. The electric arc furnace exploded and killed two employees on March 21, 2011, in Louisville, Kentucky. Carbide Industries mainly produced calcium carbide by mixing lime and coke and heating it up to 4,100° F. During this operation, the electric arc furnace exploded, killing two employees working inside the operating room. Two other employees working around the furnace suffered minor injuries. The Chemical Safety Board (CSB) determined that there was a significant gap in NFPA regulations, which did not provide clear guidance on how to safely design and operate the electric arc furnace. The water cooling system around the furnace had numerous leaks, which had not been properly investigated. Also, facility siting had been an issue, as the operating room, which is normally occupied during operation, was located only 12 feet away from the furnace.

The Carbide Industries facility was not an OSHA PSM regulated facility and the main root cause for the incident was not clearly verified. However, the CSB decided to do a case study on this incident because of the phenomena called "normalization of deviance." This is a phenomenon where employees get used to the deviant behavior after being exposed to gradual shift away from the normal operation. This phenomenon was brought to attention during the NASA Columbia Disaster investigation. It has also been a main contributor to many incidents that have occurred in the chemical industry.

Case History—Tazreen Fashion Factory Industrial Fire Accident
Presented by Nirupama Gopalaswami at the March 28 Steering Committee Meeting

On November 24, 2012, a fire occurred in the Tazreen Fashion factory in which more than a hundred people were killed and many more were injured. The fire may have been caused due to electric spark although clear reason is not currently available. Many people were trapped inside a multistory plant which had no staircases or emergency exits. The gates were also locked when the fire occurred. This resulted in increased number of deaths and injuries. In Bangladesh, there are around 4,000 garment factories in the country, with 3.5 million workers. Since 2006, more than 500 Bangladeshi workers have died and thousands more were injured in scores of frequent garment factory fires. After the accident, the fire department of Bangladesh inspected 232 factories in the industrial area where the Tazreen factory was located. More than one-quarter of the factories were found to be in category C, which meant that the fire safety licenses were expired and firefighting equipment like fire extinguishers and water reservoirs were inadequate for fighting fires. Two months after the Tazreen accident, an accident occurred on January 26, 2013, in the Smart Garments Factory. Seven people were killed and five were injured. It was found that many similar accidents have also occurred. The immediate root causes and contributing factors of such accidents were presented. Recommendations for the incident were classified into four categories - fire protection approach, health and safety initiatives, regulatory approach and certification and training.
**Case History—Chevron Richmond Refinery Fire**

Presented by Monir Ahammad at the March 27 Technical Advisory Committee Meeting

On Monday, August 6, 2012, at about 6:15 p.m., workers at the Chevron Richmond Refinery identified a leak in the number four crude unit. The pipe section that was leaking was made of carbon steel. It was carrying gas oil from an atmospheric distillation unit to a stripper at about 680°F and 58 psig. Around 6:30 p.m., Chevron’s fire department was on site and the maintenance team tried to fix the leak while keeping the unit in operation. As the insulation was removed, the boiling hydrocarbon leakage increased, which caused a large vapor cloud that forced the maintenance crew to evacuate the area. While the exact cause of fire is still under investigation, it is speculated that the idling fire truck sitting in front of the facility might have been the ignition source. Fortunately, there were no major injuries. However, there were six minor injuries to the emergency response team members. A level three community shelter-in-place warning was issued during this incident, which was lifted at around 11:12 p.m. A metallurgical investigation of the ruptured piece of pipe revealed that the failure was caused by sulphidation corrosion. The API RP 939-C guideline recommends using high chrome alloy such as 9-cr or carbon steel with higher silicon content (more than 0.1%) to avoid sulphidation corrosion. Cal/OSHA issued 25 citations for this incident, which Chevron intends to appeal. Actions such as, a) Enhancing inspections of carbon steel (low silicon) components to avoid accelerated sulfidation corrosion; b) Strengthening reliability programs for piping and equipment; c) Strengthening leak response protocols and reinforcing the authority that everyone has to shut down equipment; and d) Creating more management oversight and accountability for process safety and re-emphasizing focus on process safety were recommended to all industry to avoid similar events.

**Case History—Explosion and Fire at the Veolia ES Technical Solutions in West Carrollton, OH**

Presented by Yan-Ru Lin at the March 27 Technical Advisory Committee Meeting

On May 4, 2009, an explosion and fire occurred at the Veolia ES Technical Solutions recycling facility. THF, common solvent used in industry, was the main material released through the relief systems. THF can react with oxygen to form unstable peroxide. If the peroxide is 0.05%, it must be destroyed prior to distillation. If the peroxide is 1% or more, the THF cannot be used anymore and must be destroyed by incineration. However, no precautions were taken to prevent the peroxide accumulation in distillation unit three. There were multiple root causes. The relief devices vented directly to the atmosphere. Uncontrolled venting can allow vapor to accumulate to a concentration that can be explosive. Also, the distance between the process area and natural gas-fired boilers was only 30 feet. The control room, which had no centralized shutdown system, was located too close to the process area. Finally, the lack of a centralized shutdown system made mitigation impossible. Deficiencies in training, inspection, maintenance and lack of written standards for operation were also found. Many other incidents with similar causes have happened over the past several years. We should utilize the lessons learned from these incidents and avoid them in the future.
2013 International Symposium
Making Safety Second Nature

It is time to reserve your EXHIBIT!

Booth fee: $1,750
Includes
- 10'X10' booth
- electrical hookup
- table/chairs
- listing in meeting programs, print and online
- one complimentary registration

October 22-24, 2013
Hilton Conference Center
College Station, Texas

Register Online
http://psc.tamu.edu/symposia/2013-sym
Contact Donna Startz – donnas@tamu.edu
Phone: 979-845-5981
Classes start August 26

Register now!

Distance Learning Objectives
These courses may be taken for either continuing education credit or academic credit. Continuing Education programs provide focused training in specialized areas of technology. These courses can be of value to satisfy current job skills requirements and professional and governmental certification requirements. Where needed, we can provide CEU (Continuing Education Unit) certifications for these programs. You do not need to apply to the university to gain a certificate. However, if you wish to take these courses for academic credit, please contact us.

SENG 680: Industrial Hygiene Engineering
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.

SENG 670: Industrial Safety Engineering
Concepts of designing, operating and maintaining optimally safe systems, risk management, economic impact, legislation, performance measurement and accident investigation/analysis; principles and practices in industrial hygiene engineering, fire protection engineering and introduction to systems safety engineering.

SENG 677: Fire Protection Engineering
Fire protection design concepts and considerations for chemical, petrochemical and hydrocarbon processing facilities. Special attention given to fire hazard analysis, fire risk assessment, fire protection features, and emergency response. Specific fire protection design considerations are studied for the various types of facilities and processes. Prerequisite: Instructor approval.

CHEN 655 – SENG 655: Process Safety Engineering
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
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.

Online registration
http://psc.tamu.edu/education/schedule-of-classes-registration#DLReg

For questions, contact
Tricia Hasan
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3122 TAMU
244 Jack E. Brown Building
College Station, TX 77843-3122
Phone: 979-458-1863
E-mail: triciahasan@tamu.edu
Calendar of Events

Short Course

August 14
8:30 a.m. – 4:30 p.m.

Reactive Chemical Hazards Assessment
Houston, TX
Instructor: Dr. Bill Rogers
0.7 CEUs/7 PDHs

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

Symposium

October 22-24, 2013
Mary Kay O'Connor Process Safety Center
16th Annual International Symposium
Beyond Regulatory Compliance, Making Safety Second Nature
Hilton Conference Center
College Station, TX

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