Process Safety in Action

Solving Local, National and Global Process Safety Challenges Together

www.ccpsonline.org

Contents

Acknowledgments

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An AIChE Technology Alliance

CCPS

Center for Chemical Process Safety

THE CCPS STORY

JUST AFTER MIDNIGHT on December 3, 1984, water contamination of a tank of methyl isocyanate in Bhopal, India initiated a series of events that led to a catastrophic toxic release, killing more than 3,000 residents and injuring over 100,000.

In February of 1985, industry leaders asked the American Institute of Chemical Engineers (AIChE) to lead a collaborative effort to eliminate catastrophic process incidents. On March 23, 1985, AIChE formed the Center for Chemical Process Safety; CCPS completed Guidelines for Hazard Evaluation Procedures a short time later.

Subsequent CCPS Guidelines have codified the basic elements of process safety and provided key tools to manage, implement, and continually improve process safety programs. Focused workshops and annual international conferences have provided additional opportunities for integrated learning and formal discussion of process safety.

Unfortunately, occasional incidents still happen around the world. But CCPS and its more than 165 global members continue to learn from them — and eliminate them — leveraging our Global Community Committed to Process Safety to strengthen our broad, international program dedicated to improving process safety culture, understanding, knowledge, and implementation.

While addressing today's challenges, CCPS members actively envision a future incident-free process industries and are designing the programs that will get us there. Come join the Global Community Committed to Process Safety — be ready for the future by helping create it.

Executive Message

Many of my colleagues of a similar age have been working in process safety for most of their careers. When we started, process safety had a great urgency — we essentially were asked to solve "The Bhopal problem" before another Bhopal could happen in our companies. We made great strides in those years, yet incidents kept happening. Many started asking, "When are we going to get there?"

Anyone who has taken their young children on a long trip has heard that chorus. And you know that the question is a lot harder to answer when you know that you still have a long way to go, and you are not totally sure how to get there.

Process Safety Vision 20/20, established by CCPS in 2012, envisions a future where companies and their leaders value, demonstrate actionable commitment to, and are personally involved in implementing the 20 elements of Risk Based Process Safety (see foldout). In this future, all parties will commit to the five core Vision 20/20 tenets, discussed on the next page.

Those of you who have participated in or have followed CCPS for all or part of its 29-year history may well be asking, "So, what is new about that?" Indeed, CCPS discussed all of these topics in its early publication *A Challenge to Commitment* (1990), in *The Business Case for Process Safety* (2003), and dozens of other publications.

The difference — then versus now — is subtle, but important.

In 1985, at the formation of CCPS, as well as in 1990, 2003, and today, the end goal has been to prevent process safety incidents. What's different is that today we have gotten close enough to our goal that we can see the path to get us there. Process Safety Vision 20/20 guides the work of CCPS, its members, other organizations interested in process safety, and society as a whole along this path.

With the goal in sight, it's more important than ever that you get involved in CCPS's work. If your company is a CCPS member and you've not yet gotten involved, now is a great time. If your company is not yet a member, we would be happy to discuss how you can participate. And, if you're associated with an organization with goals complementary to Process Safety Vision 20/20, there are ripe opportunities to collaborate, especially to address the societal themes. Wherever you are in the world, whatever your background, there is a CCPS initiative for you to participate in.

Now back to the question, "When are we going to get there?" We still don't know when exactly. There will be bumps in the road and perhaps a detour or two. However, now the route is clear and the goal is in sight.

Scott Berger
Executive Director, CCPS

Vision

In order to protect people, property, and the environment, AIChE's Center for Chemical Process Safety (CCPS) is committed to bringing the best process safety knowledge and practices to industry, academia, governments, and the public around the world — through collective wisdom, tools, training, and expertise.

Mission

Eliminate process safety incidents, in all industries, by:

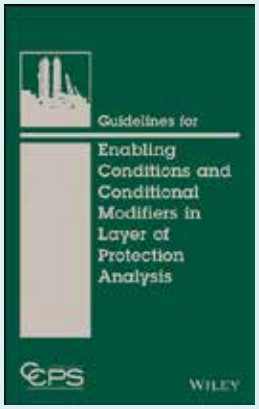
- **Promoting process safety as a key societal value and expectation.**
- **Establishing process safety as the foundation for responsible operations.**
- **Serving as the premier worldwide resource for process safety and development of "state-of-the-art solutions."**
- **Fostering knowledge, understanding, and implementation of process safety among executives, management, technicians, engineers, students, government officials, and the public.**
- **Advancing process safety technology, culture, and management practices.**

Vision 20/20

You made an impact in 2013

- 1st Asia-Pacific Conference
- Guidelines for Determining the Probability of Ignition of a Released Flammable Mass
- Recognizing Hazardous Incident Warning Signs Course
- Process Safety Leading Indicators Industry Survey
- Leadership and Management of Process Safety Course
- Guidelines for Enabling Conditions and Conditional Modifiers in Layers of Protection Analysis
- CCPS Video Channel

1ST CCPS ASIA-PACIFIC CONFERENCE ON PROCESS SAFETY℠



Vision 20/20

By the year 2020, leaders in process safety will value and demonstrate actionable commitment to the Vision 20/20 tenets that prevent, minimize, and mitigate process safety incidents.

Vision 20/20, developed by the Center for Chemical Process Safety (CCPS), looks into the not-too-distant future to demonstrate what great process safety will look like when it is championed by industry, driven by the Vision's five tenets (below), and global societal themes.

Five Tenets for Industry

At the heart of Vision 20/20 is adherence to five core principles that will help industry target and drive performance improvement and achieve great process safety performance:

- **Committed Culture**
- **Vibrant Management Systems**
- **Disciplined Adherence to Standards**
- **Intentional Competency Development**
- **Enhanced Applications of Lessons Learned**

Four Societal Themes

Vision 20/20 is a call to action for all of society — our leaders, our governments, and the public at large — to be fervent about protecting people and property. The Vision 20/20 bridge to that commitment is its four societal themes:

- **Enhanced Stakeholder Knowledge**
- **Responsible Collaboration**
- **Harmonization of Standards**
- **Meticulous Verification**

To Drive Improvement

As manufacturing and oil/gas production become more complex, the need to drive continuous improvement in process safety — not just for industry, but for all stakeholders — becomes increasingly urgent.

Vision 20/20 harnesses the collective expertise and best practices of CCPS to establish a global framework for great process safety, driven by industry tenets and global societal themes that will achieve:

- **Significant reduction of industrial and plant incidents**
- **Consistent overlap of corporate and plant employees, to ensure enhanced process safety understanding and rigorous adherence to standards and practices**

VISION 20/20

- Persistent knowledge, cultural values, understanding, and implementation strategies, which will be utilized by executives, management, technicians, engineers, students, government, and the public
- A worldwide vision, guided by CCPS — a leader in state-of-the-art process safety solutions — for managing process safety improvements to fulfill Vision 20/20.

The 20/20 Difference

What does great process safety look like? CCPS asked top executives to walk us through a typical day in the life of a CEO, a unit manager, and an academic, and then to imagine what that same day would look like if all industries were guided by Vision 20/20 tenets.

See What Industry Leaders Are Saying

How will Vision 20/20 tenets drive great process safety in the year 2020? CCPS interviewed senior executives from ExxonMobil, DuPont, Celanese, Alon USA and others, and asked for their input.

On Committed Culture
"To be successful at both sides of safety...requires a workforce that truly believes that all accidents are preventable.... It's got to be in the heads and hearts of people, if you're going to perform well in process safety."
— Stephen Pryor, ExxonMobil Chemical

On Vibrant Management Systems
"You can't look at this as a regulatory effort, you can't look at it as a cost center. I look...first of all, to ensure that we are doing the right things for the employees...the community...the shareholders, and the board. Through the proper implementation of the process safety system, we're providing a discipline to the organization. It's going to ensure that we have a better-run organization... with better reliability, fewer accidents, fewer environmental problems...there are all kinds of benefits to doing this."
— Paul Eisman, Alon US

Visit www.aiche.org/ccps/about/vision-2020 to read more about the four societal themes and five tenets for industry; to envision a day in industry's not–too-distant future; and to see more of what industry leaders are saying about this important journey of process safety.

Get your Company Involved

Volunteer for a CCPS project subcommittee: get the opportunity to share your knowledge and help shape industry best practices.

Educate your colleagues by hosting a Process Safety Boot Camp® training event.

Share your expertise by submitting an abstract to the Global Congress on Process Safety (GCPS) or a CCPS Regional Conference.

Mentor your new employees by bringing them to the Young Professional program at GCPS.

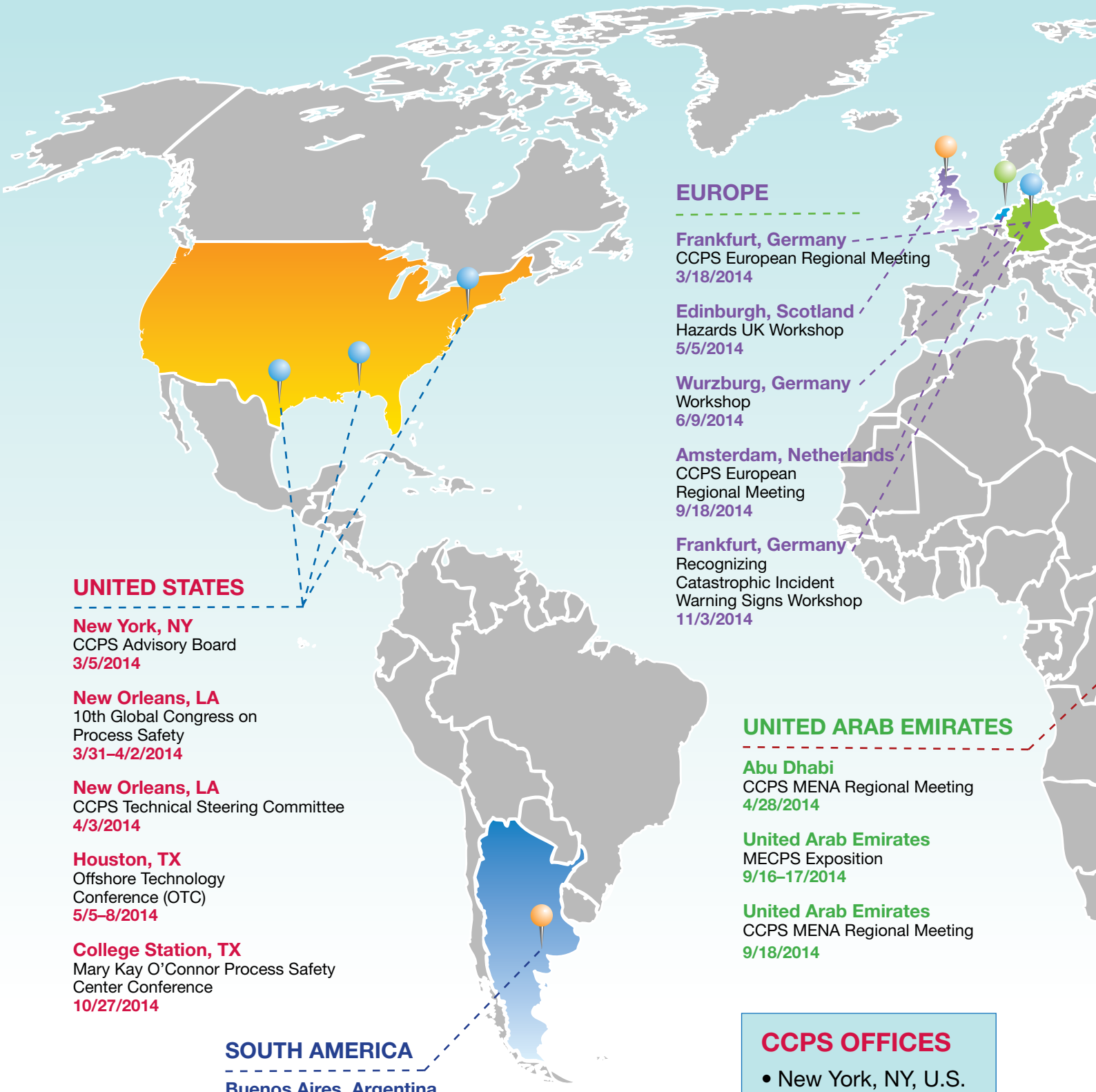
Model your company as a leader in process safety by being a contractor for a CCPS publication.

Communicate the message by forwarding CCPS's monthly business blast, Process Safety Beacon, to your colleagues.

Connect with your process safety peers through CCPS LinkedIn.

Join CCPS as a member company and prevent catastrophic process safety incidents.

CCPS Meetings Destinations and



UNITED STATES

New York, NY
CCPS Advisory Board
3/5/2014

New Orleans, LA
10th Global Congress on Process Safety
3/31–4/2/2014

New Orleans, LA
CCPS Technical Steering Committee
4/3/2014

Houston, TX
Offshore Technology Conference (OTC)
5/5–8/2014

College Station, TX
Mary Kay O'Connor Process Safety Center Conference
10/27/2014

EUROPE

Frankfurt, Germany
CCPS European Regional Meeting
3/18/2014

Edinburgh, Scotland
Hazards UK Workshop
5/5/2014

Wurzburg, Germany
Workshop
6/9/2014

Amsterdam, Netherlands
CCPS European Regional Meeting
9/18/2014

Frankfurt, Germany
Recognizing Catastrophic Incident Warning Signs Workshop
11/3/2014

UNITED ARAB EMIRATES

Abu Dhabi
CCPS MENA Regional Meeting
4/28/2014

United Arab Emirates
MECPS Exposition
9/16–17/2014

United Arab Emirates
CCPS MENA Regional Meeting
9/18/2014

SOUTH AMERICA

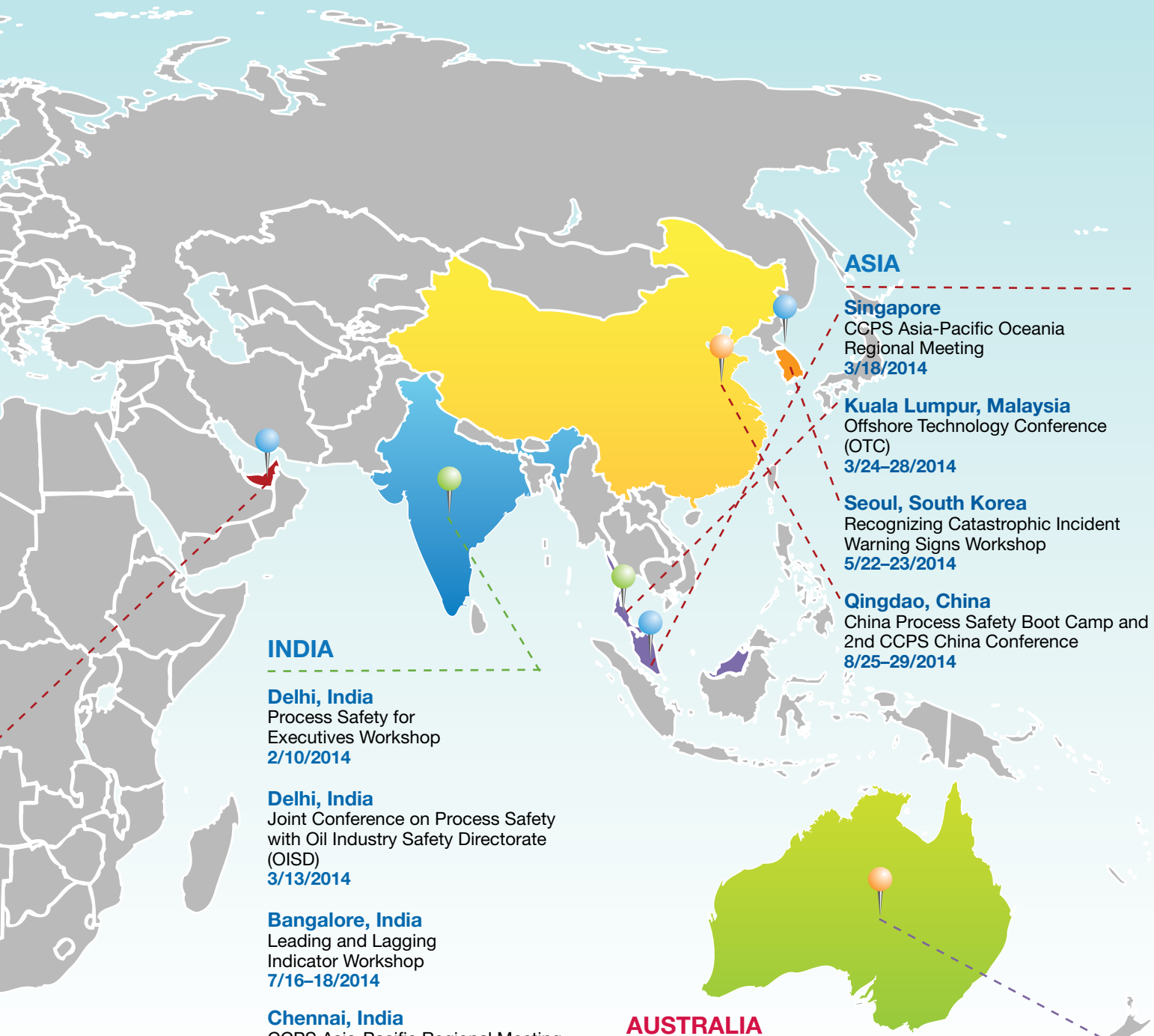
Buenos Aires, Argentina
6th CCPS Latin America Global Conference
9/15–17/2014

Buenos Aires, Argentina
Argentina CCPS Latin America Regional Meeting
9/18/2014

CCPS OFFICES

- New York, NY, U.S.
- Frankfurt, Germany
- Mumbai, India
- Singapore

Global Offices



ASIA

Singapore
CCPS Asia-Pacific Oceania Regional Meeting
3/18/2014

Kuala Lumpur, Malaysia
Offshore Technology Conference (OTC)
3/24–28/2014

Seoul, South Korea
Recognizing Catastrophic Incident Warning Signs Workshop
5/22–23/2014

Qingdao, China
China Process Safety Boot Camp and 2nd CCPS China Conference
8/25–29/2014

INDIA

Delhi, India
Process Safety for Executives Workshop
2/10/2014

Delhi, India
Joint Conference on Process Safety with Oil Industry Safety Directorate (OISD)
3/13/2014

Bangalore, India
Leading and Lagging Indicator Workshop
7/16–18/2014

Chennai, India
CCPS Asia-Pacific Regional Meeting
9/22/2014

Kolkata, India
Managing Process Safety Risks During Organizational Change Workshop
10/9–10/2014

Mumbai, India
CCPS Global Process Safety Summit
12/15–16/2014

Mumbai, India
TSC Meeting
12/17/2014

AUSTRALIA

Brisbane
Recognizing Catastrophic Incident Warning Signs Workshop
5/1–2/2014

Sydney
HAZOP Studies and Other PHA Techniques for PS and Risk Management Workshop
5/7–9/2014

Melbourne
Managing Process Safety Risks during Organizational Change Workshop
6/24–25/2014

Perth
2nd CCPS Asia-Pacific Conference on Process Safety
8/7–8/2014

Perth
Managing Process Safety Risks during Organizational Change Workshop
8/6/2014

Conferences, Workshops & Meetings

PROJECTS

Process Equipment Reliability Database (PERD)

Participating in PERD can be the difference between relying on a 'guesstimate' and having accurate failure rate data. Analyzing equipment performance in a statistically valid manner requires more run time data and failure rates than most companies can provide individually. The Process Equipment Reliability Database (PERD) delivers that expanded population by collecting data from participating companies using standardized taxonomies. For more information, contact Dave Belonger at (609) 654-4914 or by email at dbelonger@verizon.net.

Process Safety Incident Database (PSID)

PSID facilitates the sharing of lessons learned. The continuously growing PSID provides access to anonymously shared lessons learned from nearly 800 incidents, categorized and searchable by chemical, process type, and industry. Participants in the program include petroleum, petrochemical, chemical, and pharmaceutical companies worldwide.

North America

Each year, CCPS and the AIChE Safety & Health Division present the world's largest gathering of process safety professionals, the Global Congress on Process Safety (GCPS). The 10th GCPS will be held at the New Orleans Hilton, New Orleans, LA, March 30 to April 2, 2014. This gathering is comprised of CCPS's International Conference, the Loss Prevention Symposium (LPS), and the Process Plant Safety Symposium, plus additional program tracks. Attendees share practical information and learn about technological advances in all aspects of process safety. More than 1,200 process safety and engineering professionals are expected to participate.

10TH GLOBAL CONGRESS ON PROCESS SAFETY

Celebrate GCPS turning 10, by joining your colleagues at a special GCPS banquet — where we will look back on the achievements of GCPS honor and recognize GCPS participants and contributors, and take a look at the future of the GCPS In addition to the banquet, special sessions such as "Best of the Best: 10 Years of GCPS Best Papers" will be incorporated into the conference's technical program to highlight our process safety accomplishments. Join us Sunday, March 30, 2014, 7:30pm-10:00pm to celebrate both our process safety accomplishments and the friendships we've built through GCPS.

South America

The Latin American Conference on Process Safety (LACPS) is part of CCPS's worldwide effort to prevent major accidents by promoting lifelong learning and continual improvement in process safety. The 5th LACPS took place from August 12-14, 2013, in Cartagena, Colombia. More than 400 registrants representing 15 countries and 107 companies were in attendance. Simultaneous English-Spanish translation was provided. High-quality speakers, an exciting panel discussion, and excellent presentations made for a strong technical program, and was complemented by networking breaks, luncheons, and receptions that provided opportunities for attendees to make new connections and strengthen old ones.

The 6th LACPS will take place in Buenos Aires, Argentina, from September 15-17, 2014, at the Plaza Hotel. CCPS's member companies in the region look forward to exchanging information with colleagues and learning from experts from around the world. Expect another can't-miss technical program.

Australia

The 1st CCPS Australia-Oceania Workshop: Recognizing Catastrophic Incident Warning Signs in Process Safety, was held on August 29-30, 2013,in Perth, Western Australia. CCPS extends its thanks and appreciation to member companies Wesfarmers Chemicals Energy & Fertilisers and DuPont Singapore, for their generous support.

On 6 Continents

The keynote speakers were Phillip Hine, Director, Dept. of Mines and Petroleum, Govt. of Western Australia; and Miranda Taylor, Director- Safety, Environment & Skills, Australian Petroleum Production & Exploration Association (APPEA), Australia. The inaugural event was a great success, with more than 60 delegates from organizations including BP, Santos, Woodside, ConocoPhillips, Inpex, Maxam, NOPSEMA, Worker Cover NSW, Cristal, Chevron, DMP, APPEA, Proteus, and Tronox.

CCPS is planning the 2nd Asia-Pacific Oceanic Conference on Process Safety in Perth, on August 6-8, 2014. CCPS also is planning on four Workshops in Australia in different cities on Process Safety. The workshops will feature a series of interactive sessions based on various topics in Process Safety.

Europe

In 2014, the CCPS European office in Frankfort, Germany, plans to organize several events in Europe. The CCPS Regional Meeting will be held March 18, 2014, at the DECHEMA- House in Frankfurt am Main, Germany. Attendees will benefit from presentations in various fields of chemical process safety, and will also have the opportunity for technical discussions. Another CCPS Regional Meeting will take place on September 18, 2014, in Belgium or the Netherlands, and will cover current topics and practical case studies. The 2nd CCPS Workshop on Process Safety, CCPS HAZOP Studies and other PHA Techniques for Process Safety and Risk Management, will be held on June 5–6, 2014. This event will take place at the famous Fortress Marienberg in Wuerzburg, Germany. After a successful debut in 2013, the Recognizing Catastrophic Incident Warning Signs Workshop will take place for a second time on November 4–5, 2014, at the DECHEMA-house, Frankfurt am Main, Germany. Lastly, we are excited to announce that a CCPS Process Safety Boot Camp will be conducted on May 13–16, 2014, at the DECHEMA-House in Frankfurt am Main.

Asia

The 1st Asia-Pacific Conference on Process Safety (APCPS) took place on September 4-5, 2013 at the Kempinski Hotel in Qingdao, China, as part of the Global Congress on Process Safety family. CCPS presented the conference along with the China University of Petroleum, and the China Chemical Safety Association to more than 500 people.

PROJECTS

Guideline for Barrier Risk Management — Bow Tie Analysis (Project #237)

Bow Tie Analysis is rapidly gaining popularity in upstream and offshore operations, as well as in the downstream and chemical sectors. As a result, the process industries needs detailed instructions to drive consistency and help avoid common errors. Constructs for process threats — corrosion, impact, improper operation / human error, operational upsets, etc. — will be demonstrated. Its use in ongoing facility operational management will also be discussed as well as how it links to ongoing incident investigations.

Guidelines for Process Safety Knowledge and Expertise (Project #239)

This guideline targets multiple audiences, from front-line operators, mechanics and instrument technicians, to senior management and financial and business executives. A super-matrix of process safety knowledge / expertise versus competency will assist you in the identification of training gaps and in targeting needed follow-up.

Guidelines for Implementing Process Safety Management Systems, 2nd Edition (Project #240)

Most companies now have some form of process safety management system, but a number of companies — especially smaller companies — need a roadmap of how to efficiently and effectively upgrade their systems. This second-edition will include a practical approach and information on how to navigate this challenge successfully. A training course will also be created.

Conferences

PROJECTS

Guidelines for Safe Automation, 2nd Edition (Project #241)

This second-edition will cover state-of-the-art design and maintenance of Basic Process Control Systems (BPCS) and their role in overall safe operation, focusing on the BPCS / operator interface. Worked examples of control schemes in combination with Safety Instrumented Systems (SIS) will be linked to Risk Based Process Safety principles. The book will also address a control strategy for cyber-attack security.

Student Handbook for Process Safety (Project #242)

In its Investigation Report of the T2 Laboratory, the Chemical Safety Board recommended that AIChE and the Accreditation Board for Engineering and Technology (ABET) modify the university chemical engineering curricula to increase awareness of chemical reactivity hazards. In 2011, ABET approved new program criteria for accredited chemical engineering programs. This project includes development and evaluation tools for applying process safety principles throughout the standard curriculum, in an interactive electronic format, supporting both the new ABET requirements and similar requirements worldwide.

Guidelines for Asset Integrity Management (Project #243)

Risk Based Process Safety Management Systems require sound Asset Integrity Management (AIM) Systems and reliability programs to ensure the effective performance of process assets, including equipment, instrumentation, and safety systems. Developing and maintaining successful AIM programs is a continual challenge for many facilities. These new guidelines will expand on the previous CCPS book Guidelines for Mechanical Integrity Systems to help companies address these challenges.

This conference brought together professionals, government, and academics in China and Internationally to share advancements in process safety. The CCPS Singapore office will be opening in the first quarter of 2014. CCPS conducted a Process Safety Boot Camp in Singapore on March 19–20, 2013, for the Petrochemical Corporation of Singapore (Private) Limited (PCS). Louisa Nara and John Murphy served as instructors for this very successful training. Akira Yonemura, Managing Director, kicked off the Boot Camp with a presentation strongly supporting the importance on process safety management to the success of the company. The 7th Asia Pacific Regional Meeting will be held in Singapore on March 18, 2014.

We are proud to announce that our CCPS India office officially opened in October 2013 in the heart of Mumbai, India. The MoU was signed between the Center for Chemical Process Safety and the Oil Industry Safety Directorate (OISD), Ministry of Petroleum and Natural Gas, Government of India, on March 14, 2013. Previously, on March 14–15, 2013, the Recognizing Catastrophic Incident Warning Signs, Workshop was held in Goa, India, and was generously hosted by Reliance Industries Ltd. More than 40 attendees participated from CCPS member and non- member companies, including Cairn India, Reliance Industries, Syngenta, Larsen and Toubro, Tata Chemicals, Intertek, and Cholamandalam MS Risk.

Middle East and North Africa

CCPS held its 1st CCPS MENA Regional Meeting on October 7, 2013, in Dubai. The meeting welcomed more than 35 attendees from over 13 companies. The meeting provided a platform for PSM leaders and professionals to share their knowledge and experience with other CCPS member companies. Upcoming is the 2nd CCPS MENA Regional Meeting, to be held in the Abu Dhabi, April 2014, followed by the 1st CCPS MENA Conference on Process Safety in early 2015.

Global Tools

Instantly Search the Entire CCPS Library

The complete collection of CCPS books is available online through partnership with Knovel Corporation. The CCPS-Plus collection, available exclusively to CCPS members, contains additional content and is available at a discounted price.

What's in CCPS Plus?

- All current and archived editions of CCPS titles, available on Knovel
- A master index of check lists from the CCPS library
- All historical issues of the CCPS Process Safety Beacon
- GCPS, CCPS and LPS conference proceeding.

Reactive Measurement Tool (RMT)

Incidents involving uncontrolled chemical reactions continue to result in injuries, fatalities, economic loss, and harm in industry. These incidents are often the result of not identifying or understanding the chemical reactivity hazards involved in storage, mixing or processing operations. The chemical reactivity evaluation Tool (RMT) and the Help Guide that accompanies it can be used as an aid in identifying and evaluating chemical reactivity hazards so that they may be effectively avoided or controlled.

Process Safety Beacon

The Process Safety Beacon is a resource aimed at delivering process safety messages to plant operators and other manufacturing personnel. The monthly one-page Process Safety Beacon covers the breadth of process safety issues. Each issue presents a real-life accident, and describes the lessons learned and practical means to prevent a similar accident in your plant. With an estimated distribution of around one million, the Beacon is CCPS' most widely read publication. The Beacon is dependent upon the input of users like you, who share their plant incidents and lessons-learned for the benefit of all operation personnel. Help us bring the process safety message to an even larger worldwide audience each month by encouraging your colleagues to register to receive the Beacon. You may choose to receive the Beacon in as many of the available languages as you wish. **Register to receive the Beacon — FREE — at www.ccpsonline.org.**

CCPS Video Channel

CCPS is creating a collection of short videos that quickly inform plant supervisors, engineers, and operators about the process safety considerations of specific processes and processing equipment. In seven minutes or less, viewers can see the safety-critical mechanics and science behind the equipment of interest and what could go wrong. This resource will help CCPS communicate how to eliminate simple mistakes that could lead to mechanical failures and potential major releases.

PROJECTS

Process Safety Vision 20/20 (Project # 244)

Vision 20/20 looks into the future and describes characteristics of companies with great process safety performance. Those characteristics include a committed culture, disciplined adherence to standards, intentional competency development, vibrant management systems, and enhanced applications of lessons learned. Society also plays a role in great process safety performance through enhanced stakeholder knowledge, responsible collaboration, harmonization of global standards, and meticulous verification. The project will develop tools to evaluate current performance and measure progress.

The Business Case for Process Safety and Sustainability (Project # 245)

Companies typically implement process safety practices to reduce their risk for catastrophic fires, explosions, or toxic releases. But many companies have discovered that implementing process safety as part of a holistic approach to reducing manufacturing variability can also lead to substantial improvements in equipment reliability, unit on-stream time, unit capacity, and energy and raw material efficiencies. This update to the classic CCPS booklet will highlight the role process safety can play in improving global manufacturing competitiveness, as well as in more fully reflecting the interplay of process safety and sustainability.

Guidelines for Facility Siting and Layout, 2nd Edition (Project #246)

Recent global incident reports identified facility siting and layout as key or contributing factors to injuries and fatalities. As we gain information about such incidents, we must update our knowledge base and share it with personnel who are designing and evaluating facilities. This second-edition book will include new and practical information on occupied portable buildings, facility and plant layout, and more.

Classroom, eLearning & University Education

PROJECTS

Integrating Management Systems and Metrics to Improve Process Safety (Project #247)

You can't improve what you don't measure. This book will discuss ways to identify and implement synergistic opportunities in developing management systems and reporting metrics. Key topics include how to anticipate and alleviate resistance to integration, how to streamline audit functions by reducing or eliminating duplication of audits, operational reliability, and highly reliable organizations.

Tools for Making Acute Risk Decisions with Chemical Process Safety Applications, 2nd Edition (Project #248)

Today's risk decisions are complex, and include considerations pertaining to impact on personnel and the community, profitability, capital, risk reduction, alternatives, codes, standards, regulations, and good industry practices. This second-edition will incorporate modern decision-making processes based on current practices informed by new tools, such as LOPA, inherently safer design, etc.

Essential Practices for Developing, Strengthening and Implementing Process Safety Culture (Project #249)

Process safety culture is the combination of group values and behaviors that determine how process safety is managed. Without a good culture, even the best management system will achieve mediocre results or fail outright. If you cannot define your culture you cannot measure it. And if you cannot measure it, you cannot manage it. This project will develop guidance and tools to support organizations in establishing, evaluating, improving and sustaining a positive process safety culture.

Hazard Identification for Operators and Maintenance Workers

This course helps operators learn how to recognize and respond to hazards at the field level. Attendees learn how to identify, rank and address the physical and process safety hazards they may encounter in the workplace. Process hazards are less obvious than physical hazards and can't always be detected at first glance. As a result, additional effort and different approaches may be required to identify process hazards so that they are addressed appropriately. **Course ID: ELA121.**

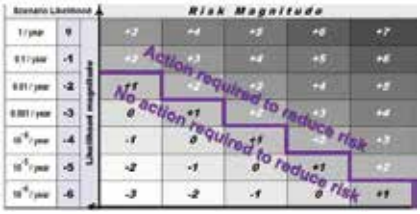
Process Safety Leadership for Frontline Supervisors

Effective supervision is a core value of successful organizations, and the frontline supervisor plays a key role in driving process safety culture on the shop floor. It is essential that frontline supervisors not only understand process safety concepts, but also their role in execution of process safety principles. Process safety for front line supervisors is a series of e-learning modules describing concepts and roles with practical examples focusing on operating and maintenance procedures, work force involvement, contractor management, auditing, hazard identification and risks, management reviews, management of change, incident investigation, conduct of operations, safe work practices and process safety leadership. **Course ID: ELA122** *(new release in 2014)*.

Safety In Undergraduate Education

For the past 20 years, the Safety and Chemical Engineering Education program (SAChE) has been at the forefront of supporting process safety as an integral part of undergraduate chemical engineering curricula. SAChE provides more than 50 prepared lectures and eight self-study certificate modules on a range of process safety topics used worldwide at over 200 universities. Lectures can be integrated into mainstream chemical engineering courses, or used as part of a comprehensive process safety course. Self-study modules conclude with an online test. Students passing the test receive a certificate. **Course ID: SAChE** *(new release in 2014)*.

HAZOP Studies, Other Hazard Evaluation Procedures and Advanced Concepts for Process Hazard Analysis Combo Course



This course offers a five-day immersion in HAZOP studies and other process hazard analysis techniques and advanced concepts in process hazard analysis. The course is a combination of two popular courses: HAZOP Studies and Other PHA Techniques for Process Safety and Risk Management (CH157) and Advanced Concepts for Process Hazard Analysis (CH754). **Course ID: CH759.**

Process Safety Boot Camp

Process Safety Boot Camp was developed by CCPS especially for companies looking to train chemical engineers in the fundamentals of process safety. It is widely used by corporate training departments across different sectors of the chemical enterprise. Companies large, small, and in-between all use the Process Safety Boot Camp to ramp-up staff knowledge to a common level, quickly and efficiently. This intensive four-day course is taught jointly by process safety veterans with decades of experience at major companies from the process industries. The course is highly interactive. **Course ID: CH900**.

Senior Leaders and Process Safety: The Role and The Opportunity

Great process safety begins at the top. This short course for executives touches on what leaders should know and do to achieve process safety excellence; leadership attributes of high reliability organizations; comparison of the chemical and petrochemical organizations with nuclear, aviation and other high reliability organizations; what corporate leadership should mean in terms of chemical accident prevention; competency in process safety; learning from incidents; public reporting of process safety performance; the changing landscape of our global economy and how this impacts process safety decisions; communication and perception of corporate leadership performance; leadership in government, regulatory and trade organizations. **Course ID: CH902** (*new release in 2014*).

20 Elements of Risk Based Process Safety (RBPS)

This course will introduce you to the CCPS Risk Based Process Safety Management (RBPS) approach, described in the CCPS book Guidelines for Risk Based Process Safety (2007). The course covers the four pillars and twenty elements that define the structure for the RBPS approach. The course will help you to design, implement, and maintain a risk based process safety management system that will fit your company's needs and resources. **Course ID: ELA120.**

PROJECTS

Guidelines for Integrating Process Safety into Engineering Projects (Project #250)

Getting process safety right in the design and construction phase saves time and money. This book will provide guidance on process safety scope definition in the capital process, performance validation of engineering and contracting (E&C) firms and examples of how to incorporate adequate process safety considerations into designs. The book will address a range of projects, from the design of an individual facility component to major capital projects.

Guidelines for Process Safety in Pilot Plants and Laboratories (Project #251)

The current version of NFPA 45 (2011), *Standard on Fire Protection for Laboratories Using Chemicals*, provides extensive information on controls that laboratories prevent chemical accidents and mitigate their consequences. However, it does not provide detailed guidance on many aspects of chemical process safety. NFPA 45 also does not apply to facilities classified as pilot plants or laboratories that are primarily manufacturing operations. This project will present information from the literature and from company experience on past process safety incidents; lessons learned and best practices for implementing process safety management systems and hazard controls; and procedures specific to bench scale, pilot plant and small-scale chemical-manufacturing operations in labs and pilot plants.

Organizational Structure

Technical Steering Committee (TSC)

The Technical Steering Committee (TSC) consists of one representative from each CCPS Member Company. Additional representatives may be appointed by the CCPS Executive Director from academia, government agencies, and AIChE. The key functions of the TSC are to assist the CCPS Executive Director in developing an overall, multi-year program for CCPS; defining the priorities for project selection; selecting specific projects; defining and reviewing the scope for these projects; suggesting membership for the Project Subcommittees; and reviewing the status of projects and programs. The CCPS Technical Steering Committee meets twice per year in person and three times by web-conference. TSC meetings feature presentations on useful new developments, process safety technology and management, as well as discussions of ongoing CCPS projects and programs. The Technical Steering Committee is CCPS's primary operating group, providing technical oversight of CCPS activities and selecting projects. TSC members serve voluntarily on CCPS project subcommittees and provide the technical expertise evident in CCPS publications. All member companies have one voting representative on the Technical Steering Committee.

CCPS Activities

Activities are monitored and directed by a Managing Board, an Advisory Board, a Planning and Operations Committee and a Technical Steering Committee. Additionally, members of the Technical Steering Committee and other member company representatives serve on subcommittees that oversee CCPS projects. The Managing Board, chaired by the Executive Director of AIChE, has fiduciary responsibility for CCPS's operations. Board members include the CCPS Executive Director and members of AIChE's Board of Directors, providing linkage to the chemical engineering profession. The Advisory Board, chaired by the CCPS Executive Director, has strategic responsibility for CCPS. Board members, who include senior executives representing member companies, review CCPS's mission and strategies and recommend new initiatives. The Planning and Operations Committee has responsibility for evaluating opportunities and gaps in CCPS programs relative to its strategy and generating potential initiatives to address them. Committee members are selected from the Technical Steering Committee.

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Projects *(continued)*

Essential Practices for Control and Mitigation of Dust Hazards (Project #252)

Fires and explosions caused by combustible dusts may lead to both business and personnel losses in a number of different applications, including metals, chemicals, electronics, pharmaceuticals, food and agricultural operations. Safe operation in these industries depends on identification, control and mitigation of dust hazard issues. This concept book will provide guidance on how to control and mitigate dust hazards, focusing on existing methodologies for predicting and measuring parameters, as well as cost-effective application of suppression and venting systems, among other topics. Worked examples will be used to illustrate the application of appropriate techniques, and point out pitfalls to be avoided.

Effective Process Safety Communications (Project #253)

This project will identify ways to improve the delivery and effectiveness of process safety communications at all levels, covering operating procedures, warning signs, design details, emergency planning, and more — so that key, life-saving information can be transmitted and received in an effective manner. Illustrative examples and case studies will be used to help identify both desirable and undesirable practices.

Process Safety Boot Camp, 2nd Generation (Project #254)

Since 2010, CCPS has conducted more than 100 Process Safety Boot Camps, training nearly 3,000 participants with a wide range of experience. That number increases year-by-year. To gear the learning to the trainee's level of experience, we will expand the base course to target different segments of the workforce.

Translation of CCPS Books and Tools into Mandarin, Spanish and Portuguese (Projects #257, #260 and #261)

With the continued growth of the process industries in China and South America, process safety professionals and operations personnel need CCPS materials available in their native languages. To date, five CCPS books have been translated and published in Mandarin, and one in Spanish. A five-year plan to publish 10 books in each region has been developed based on each region's specific process safety journey, as identified by CCPS member companies in those regions.

Guidelines for Process Safety in Outsourced Manufacturing Operations, 2nd Edition (Project #262)

Outsourcing of operations has become increasingly prevalent in many global corporations as they streamline processes to increase efficiency. Companies large and small also use outsourcing to concentrate on core competencies and to collaborate with others who can apply and achieve economies of scale in an operation. This book will update the information in the first edition with more-recent information and lessons learned, to help companies (both the client company and the contract manufacturing company) to ensure an appropriate focus on process safety.

New Project Starting in 2014:

- Guidelines for Assessing and Managing the Risk of Aging Equipment
- Preventing Normalization of Deviation
- Process Safety Leadership Challenge (A Concept Book)

Sign up online:
http://www.aiche.org/ccps/resources/forms/become-volunteer-ccps-projects

CCPS Staff

Scott Berger, Executive Director joined CCPS in 2001 after 23 years at Owens Corning and at Rohm and Haas Company, with leadership positions in R&D, engineering, and EHS Management. Scott received a BSChE and MSChE from the Massachusetts Institute of Technology.

Louisa Nara, Technical Director joined CCPS in 2010 after a 30 year career, most recently at Bayer, where she was Director of Risk Management, NAFTA. Louisa received a BSChE from West Virginia University, an MS in Environmental Engineering from Villanova University and is a Certified Compliance and Ethics Professional (CCEP).

Lamese Bader, Membership and Communications Coordinator joined CCPS in late 2011. Before joining CCPS, Lamese was the Associate Director of the Arab America Association of New York and was the Dean of Discipline at A. Fantis Parochial School. Lamese received her BA from Hunter College and an MA in International Affairs from The New School University.

Albert I Ness, CCPS Technical Staff Writer. Al joined CCPS after 39 years with Rohm and Hass, GE Plastics, The Dow Chemical Company and ABS Consulting where he was an active subcommittee member on a number of books. Al's present responsibilities include technical writing for new CCPS books, editing and peer reviewing documents and books and working with Wiley to ensure consistency in the Guideline and Concept book series.

Jing Chen, CCPS Operations Associate joined CCPS in 2012. Jing received her BS and MS degrees in Chemical Engineering from Polytechnic Institute of NYU. At NYU she worked in the DNA probe biosensor kinetics and surface stability laboratory. She also worked as a research fellow on the optimization of carbon nanotube synthesis, and as a tutor and orientation leader.

Angela Louis, Administrative Associate joined CCPS in 2013. Angela provides support to the Membership and Commutations Coordinator and the Technical Director. Angela graduated from Baruch College with a BA in Business Management.

Horst Massong, Europe Regional Manager joined CCPS in 2013. Horst has four years of experience with DECHEMA in Germany (Society for Chemical Engineering and Biotechnology). Horst also has experiences in Quality Management and Project Management. Horst received a PhD in Physical Chemistry from Bonn University.

Umesh Dhake, Asia Pacific Regional Manager joined CCPS in 2012. Umesh has more than 13 years of experience in risk consulting with ABS Consulting and Germanischer Lloyds GmbH. Umesh received a BSChE from Mumbai University. Umesh has been involved in various PSM related activities such as PHA, QRA, and ALARP.

Dr. S. Ganeshan (Gunny), Program Director Asia-Pacific. Dr. Ganeshan's responsibilities include developing programs for Asia-Pacific Region for CCPS, supporting the creation and implementation of training courses and AIChE student chapter growth in the region.

Shami Nayak, Asia-Pacific Region Business and Logistics Manager joined CCPS in 1999. Shami received a BS in Psychology and an MBA from Mumbai University as well as an International Business Management from US University. Shami's spends her time off volunteering at several children's English language education non-profit organizations in Mumbai, India.

Anne A. Schaeffer, Director of Education has led the AIChE and CCPS Education Department since 2012. Anne has over 30 years of experience in Professional Development and Training. Anne received her BA in English and Secondary Education from SUNY Oswego and her MBA from Bernard M. Baruch College City University of New York.

Denise Deluca, Education Specialist for In-Company training and Global Recruitment Sales Manager, has been with AIChE and CCPS for over 20 years, working in numerous departments.

Jeffrey Perez, Training Coordinator, has worked in the AIChE and CCPS Education Department since 2013 and is responsible for Instructor-Led Training. Previously, Jeffrey worked as the Academic and Membership Coordinator for Fiscal Management Associates, LLC. Jeffrey has also been a Director at East Harlem Business Capital Corporation. Jeffrey has a B.A . from SUNY-College at New Paltz and an M.A. in Corporate Communications from Bernard M. Baruch College – City University of New York.

Suman Patil, Product Manager, eLearning has worked in the AIChE and CCPS Education Department since 2012. Suman is responsible for eLearning, webinars and web forums. Previously, Suman worked for New York University where she was the Associate Director for Membership and Business Development for an international healthcare program. Suman has a BA from Ohio University and an MBA from DePaul University.

Ashley Smith, Training Coordinator, has worked in the AIChE and CCPS Education Department since 2013 and is responsible for Instructor-Led Training. Ashley received a BA in Zoology and an MA in Science Education from Miami University.

CCPS Staff Consultants

Don Abrahamson joined CCPS in 2011 after retiring from Celanese Corporation as the Global Process Safety Manager. Don has a BS in Chemical Engineering from Cleveland State University and over forty years of experience in operations, engineering and process safety.

David J. Belonger joined CCPS in 1996. He spent most of his career in various assignments with Rohm and Haas Company, including Corporate Safety Director and Plant Manager. Dave has a BS in Chemical Engineering from the University of Wisconsin and an MBA from Temple University.

Jim Conner joined CCPS in 2011. He retired from Celanese in 2010 as VP Operations and Technology after a 34-year career spanning process engineering, process safety, and manufacturing. Jim holds a BS Chemical Engineering and an MS Environmental Engineering from Rice University.

Charles Cowley, C. Eng. joined CCPS in 2012 after 30 years in industry. He worked for Shell on major projects, maintenance and technical safety. Charles has a BSc in Mechanical Engineering from the University of Nottingham and an MBA from Henley Management College.

Walt Frank, PE joined CCPS in 2008. His experience includes 24 years with DuPont and 15 years in consulting practice. He has a BS in Chemical Engineering from Rose-Hulman Institute of Technology. Walt focuses on process safety management system design and improvement and safety culture.

Dennis Hendershot joined CCPS in 2005 after a 35-year career with Rohm and Haas Company. Dennis is one of the world's foremost champions of inherently safer design. Dennis has a BS in Chemical Engineering from Lehigh University and an MBA from the University of Pennsylvania.

John Herber joined CCPS in 2009 after a 33-year career with 3M Company that included positions in process and project engineering, production operations and corporate safety. John has a BS in Chemical Engineering from Purdue University.

Jerry L. Jones, PE joined CCPS in 2012 after more than 40 years in the chemicals, polymers, pharmaceuticals, and electronics materials industries. He earned BS and ME degrees in Chemical Engineering from Cornell and an MS in Environmental Engineering from Stanford.

Greg Keeports joined CCPS in 2008 after retiring from Rohm and Haas Company. He has over 38 years experience in the chemical industry. Greg has BS and MS degrees in Chemical Engineering from Penn State and University of Pennsylvania and an MBA from the Wharton Business Management program.

Brian Kelly PE, joined CCPS in 2005 after 35 years with Imperial Oil and Syncrude Canada Ltd. where he held senior positions in engineering, operations, risk management and process safety. Brian received his BASc and MASc degrees in chemical engineering from the University of Ottawa.

CCPS Sadly Bids Farewell to Irv Rosenthal

Irv Rosenthal, who passed away in 2013, supported CCPS in many ways over many years, starting with founding member Rohm and Haas and continuing with collaborations through his tenures at the Wharton Risk and Decision Making Center and the US Chemical Safety Board.

In all his roles, Irv encouraged CCPS to stretch and grow in scope and influence. Irv's intellect, vision, and humor will be missed.

Jack McCavit retired from Celanese Chemical Company after 35 years with experience in operations management and practical application of process safety management systems. Jack served as the BP Baker Panel's technical project manager. He graduated from Texas Tech University with a BS in chemical engineering.

John Murphy, PE retired from the U.S. Chemical Safety and Hazard Investigation Board as lead investigator. John also retired from Dow Chemical Company as a leader in process safety. He has a BS in Chemical Engineering from Tufts University and an MBA from Central Michigan University.

Bob G. Perry retired as Managing Director of AIChE in 1997. Previously, Bob worked 37 years with Union Carbide and retired as VP of Manufacturing and Engineering. Bob has a BS in Chemical Engineering from the University of Texas, where he was a Distinguished Graduate in Engineering.

Robert Rosen joined CCPS as a staff consultant in 2013. He retired from BASF Corporation in 2003 and since then has done Occupational Safety, Process Safety and Emergency Response consulting. Prior to 1997, Bob worked for Merck, Polaroid, Story Chemical, and Polysar. Bob received a B.Ch.E in 1966 from Clarkson University.

Adrian L. Sepeda, PE joined CCPS in 2002 after 33 years with Occidental Chemical Corp. where he held a variety of technical and management positions, retiring as Director of HES Risk Management. Adrian holds a BS in Mechanical Engineering from Lamar University.

Daniel E. Sliva joined CCPS after he retired from GE, where he held a variety of management positions over his 30-year career. Dan received his BS and PhD in Chemical Engineering from Rensselaer Polytechnic Institute and an MS in Chemical Engineering from the University of Rochester.

Néstor Sposito joined CCPS in 2011 after 32 years with Dow Argentina. He is actively involved in the leadership of NFPA and the United Nations Environmental Program's APPEL Process. Nestor has BS degrees in Chemistry and Chemical Engineering and an MS in Hygiene and Safety Engineering.

Byron Sun joined CCPS in 2012 after a successful career with DuPont in Shanghai, China. Byron holds a Diploma in Chemical Process from Shanghai University of Science and Technology and an MBA from Tongji University.

CCPS China Section

Prof. Zhao Dongfeng has worked in the China University of Petroleum since 1992. He is now the Director of theCCPS China Section.

Dr. Yi Liu works at the China University of Petroleum as Associate Professor and is a state registered safety engineer. He received his PhD from the State Key Laboratory of Fire Science in the University of Science and Technology of China in 2003 and is now serving as the Assistant Director of the CCPS China Section and serves on the TSC.

CCPS Bids Farewell to Jack Weaver, Former CCPS Director

Jack Weaver, former CCPS Director, died on December 11, 2013, at age 76. After earning his PhD at the University of Delaware, Jack spent most of his chemical engineering career at Rohm and Haas, starting in research in 1969 and retiring in 1990 as Vice President for Environmental, Health and Safety, and Engineering. He subsequently joined the AIChE staff and led CCPS through the late 1990s, retiring in 2002. Among Jack's notable contributions to CCPS and the process safety community at large are the Business Case for Process Safety, which laid the foundation for acceptance of process safety as a business responsibility.

2014 Important Dates

EVENT	LOCATION/TIME	DATE
Advisory Board Meeting	New York, NY, U.S.	3/5/14
European Regional Meeting	Frankfurt, Germany	3/18/14
Asia-Pacific Regional Meeting	Singapore	3/18/14
10th Global Conference on Process Safety	New Orleans, LA. U.S.	3/31-4/2/14
TSC Spring Meeting	New Orleans, LA. U.S.	4/3/14
2nd Middle East Regional Meeting	Abu Dhabi, UAE	4/28/14
TSC Web Meeting	10:00 am EDT	6/17/14
2nd Asia-Pacific Oceania Conference on Process Safety	Perth, Australia	8/7-8/14
2nd CCPS China Conference on Process Safety	Qingdao, China	8/28-29/14
6th CCPS Latin America Conference on Process Safety	Buenos Aires, Argentina	9/15–17/14
TSC Web Meeting*	9:00 am EDT	9/18/14
Latin America Regional Meeting*	Buenos Aires, Argentina	9/18/14
European Regional Meeting*	Amsterdam, Netherlands	9/18/14
Middle East Regional Meeting*	United Arab Emirates	9/18/14
Asia-Pacific Regional Meeting*	Chennai, India	9/18/14
CCPS Global Process Safety Summit	Mumbai, India	12/15-16/14
TSC Fall Meeting	Mumbai, India	12/17/14
TSC Web Meeting	10:00 pm EST	2/10/15
TSC Web Meeting Repeated	9:00 am EST	2/11/15

*These meetings will link live from 9:00-10:00 am, EDT.

For more details e-mail ccps@aiche.org

Thank you

CCPS wishes to thank the Beacon Translators for their outstanding contributions to the Beacon. The Beacon translators provide invaluable insight and effort to support process safety. Each month, the Beacon is sent to over 28,000 people in 31 languages. The Beacon is freely shared and the actual readership likely exceeds 1.5 million. Special thanks to:

Zulfan AdiPutra Consultant

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Sergej Beljaew Consultant

Pham Sy Bich TNK

Claes Broman Borealis

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Fabiano Ferrari Green Oleo

Helder Figueira DuPont Safety Resources

Martin Fuchs Chemtura

Robert Gauvin Pétromont (retired)

Nur Gueler The Dow Chemical Company

Shirish Gulawani Thermax Limited

Sara B. Güler The Dow Chemical Company

Vr Gupta Bharat Petroleum Corporation Limited

Boaz Harel Consultant

Hizami Consultant

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Mitsubishi Chemical Corporation
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PROCESS SAFETY AT A GLANCE

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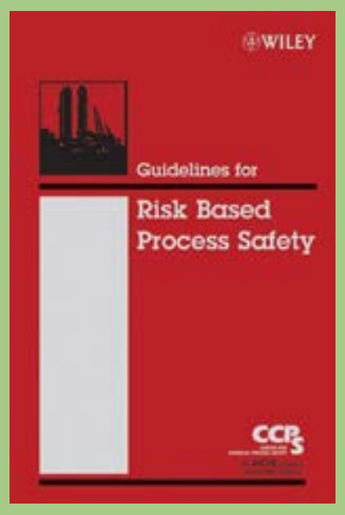
CCPS Center for Chemical Process Safety

Find CCPS resources to meet your needs from the chart on this page.

It always makes sense to start with "Guidelines for Risk Based Process Safety."* When you're ready to learn more:



Find CCPS Management Resource Tools

Look up CCPS resources based on the 20 CCPS Elements of Risk Based Process Safety categories. Find the applicable elements from the center column, and look left to find more detailed resources.

CCPS Technical Resource Tools

Look up CCPS resources for specific technical topics by searching the right hand column for the topical area, and then search for a title within the area.

Most CCPS Books are Available at

www.wiley.com/go/ccps

Deep Search CCPS

By searching on "CCPS" and keywords on Knovel.com. See Page 11 for more details.

* Available in Spanish, Japanese and Portuguese

** Available in Chinese

GUIDELINES (G/L) FOR RISK BASED PROCESS SAFETY

CCPS RESOURCE MANAGEMENT TOOLS

20 CCPS ELEMENTS OF PROCESS SAFETY

COMMIT TO PROCESS SAFETY

- G/L for Implementing Process Safety Management Systems
- G/L for Process Safety in Outsourced Manufacturing Operations
- Local Emergency Planning Committee Guidebook: Understanding the EPA Risk Management Program Rule
- Inspiring Process Safety Leadership: The Executive Role (online and DVD)
- Process Safety Boot Camp 2nd Generation / Foundations of Process Safety for Offshore Operations
- Process Safety Culture Toolkit

Process Safety Culture

Standards, Codes, Regulations, and Laws

Process Safety Competency

Workforce Involvement

Stakeholder Outreach

UNDERSTAND HAZARDS AND RISK

- A Practical Approach to Hazard Identification**
- HAZOP eLearning
- LOPA eLearning
- Hazard Identification eLearning
- Hazard Identification for Operations and Maintenance eLearning
- G/L for Chemical Process Quantitative Risk Analysis, 2nd Ed.
- G/L for Chemical Transportation Safety, Security, and Risk Management
- G/L for Developing Quantitative Safety Risk Criteria
- G/L for Hazard Evaluation Procedures, 3rd Ed.
- Layers of Protection Analysis**
- G/L for Enabling Conditions and Conditional Modifiers in Layer of Protection Analysis
- Recognizing Catastrophic Incident Warning Signs in the Process Industries

Process Knowledge Management

Hazard Identification and Risk Analysis

MANAGE RISK

- Conduct of Operations and Operational Discipline
- G/L for Management of Change for Process Safety**
- G/L for Managing Process Safety Risks During Organizational Change
- G/L for Improving Plant Reliability Through Data Collection and Analysis
- Process Equipment Reliability Database
- G/L for Mechanical Integrity Systems
- G/L for Performing Effective Pre-Startup Safety Reviews**
- G/L for Process Safety Documentation
- G/L for Technical Planning for On-Site Emergencies
- Revalidating Process Hazard Analysis
- G/L for Analyzing and Managing the Security Vulnerabilities of Fixed Chemical Sites
- Process Safety for Front-Line Supervisors eLearning
- G/L for Writing Effective Operating and Maintenance Procedures

Operating Procedures

Safe Work Practices

Asset Integrity and Reliability

Contractor Management

Training and Performance Assurance

Management of Change

Operational Readiness

Conduct of Operations

Emergency Management

LEARN FROM EXPERIENCE

- CCPS Process Safety Benchmarking Program
- CCPS Process Safety Metrics Online Reporting Application
- G/L for Process Safety Metrics
- Process Safety Leading and Lagging Metrics, "You Don't Improve What You Don't Measure"*/**
- Process Safety Leading Indicators Industry Survey
- G/L for Acquisition Evaluation and Post Merger Integration
- G/L for Auditing Process Safety Management Systems, 2nd Ed.
- G/L for Investigating Chemical Process Incidents, 2nd Ed.
- Incidents that Define Process Safety
- Process Safety Incident Database
- Tools for Making Acute Risk Decisions with Chemical Process Safety Applications
- Vision 20/20 Process Safety: The Journey Continues

Incident Investigation

Measurement and Metrics

Auditing

Management Review and Continuous Improvement

CCPS TECHNICAL RESOURCE TOOLS

VENTING AND EMERGENCY RELIEF

- Deflagration and Detonation Flame Arrestors
- Emergency Relief Systems Design Using DIERS Technology
- G/L for Pressure Relief and Effluent Handling Systems
- Safe Design and Operation of Process Vents and Emission Control Systems

CHEMICAL REACTIVITY HAZARDS

- Chemical Reactivity Hazard Training CD-ROM
- Essential Practices for Managing Chemical Reactivity Hazards
- G/L for Process Safety in Batch Reaction Systems
- G/L for Reactivity Evaluation and Application to Process Design
- G/L for Safe Storage and Handling of Reactive Materials
- Reactivity Evaluation Software Tool

SAFE DESIGN

- Continuous Monitoring for Hazardous Material Releases
- G/L for Engineering Design for Process Safety, 2nd Ed.
- G/L for Fire Protection in Chemical, Petrochemicals and Hydrocarbon Processing Facilities
- G/L for Safe Warehousing of Chemicals
- Inherently Safer Design, 2nd Ed.

CONSEQUENCE MODELING

- G/L for Consequence Analysis of Chemical Releases
- G/L for Evaluating Process Plant Buildings for External Explosions, Fires and Toxic Releases, 2nd Ed.
- G/L for Evaluation the Characteristic of Vapor Cloud Explosion, Pressure Vessel Bursts, BLEVE, and Flash Fire Hazards, 2nd Ed.
- Understanding Explosions
- Wind Flow and Vapor Cloud Dispersion at Industrial and Urban Sites
- G/L for Determining the Probability of Ignition of a Released Flammable Mass

BIOPROCESS SAFETY

- G/L for Process Safety in Bioprocess Manufacturing Facilities
- **PSM Biodiesel eLearning**
- **PSM Bioethanol eLearning**

DUST EXPLOSION HAZARDS

- G/L for Safe Handling of Powders and Bulk Solids

HUMAN FACTORS

- Human Factors: Methods for Improving Performance in the Process Industries
- G/L for Preventing Human Error in Process Safety

SAFETY INSTRUMENTED SYSTEMS

- G/L for Safe and Reliable Instrumented Protective Systems
- G/L for Safe Automation of Chemical Processes

R&D

- Making EHS an Integral Part of Process Design

UPSTREAM

- Most CCPS titles apply equally to upstream processes (please see appropriate RBPS element or technical topic)