An AIChE Technology Alliance

CCPS

Center for Chemical Process Safety

"What good PSM looks like and how we can achieve it"

Shakeel H. Kadri, Executive Director & CEO, CCPS

My presentation outline

- Brief introduction & Safety values I picked up
- Why Process Safety?
- Bhopal Gas Tragedy
- About CCPS
- CCPS Vision 20/20 Project
- "What good PSM looks like"
- Tools for "Roadmap to Process Safety Excellence"
- Q&As

AIChE
The Global Home of Chemical Engineers

Shakeel Kadri
Executive Director & CEO, CCPS

AP-Air Separation Unit Process Design

AP- Global Process Safety Director

AP- Industrial & Specialty Gas & Chemicals

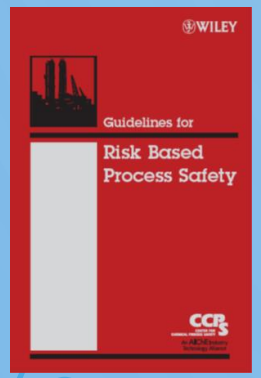
APCI
AICHE - CCPS

Executive Director & CEO, CCPS

Risk, HSE & Technology Leader
AP / CCPS

AIChE & CCPS Fellow

AIR PRODUCTS



SAChE
Safety+Chemical Engineering Education

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APCI: Air Products & Chemicals, Inc.
AICHE: American Institute of Chemical Engineers
CCPS: Center for Chemical Process Safety

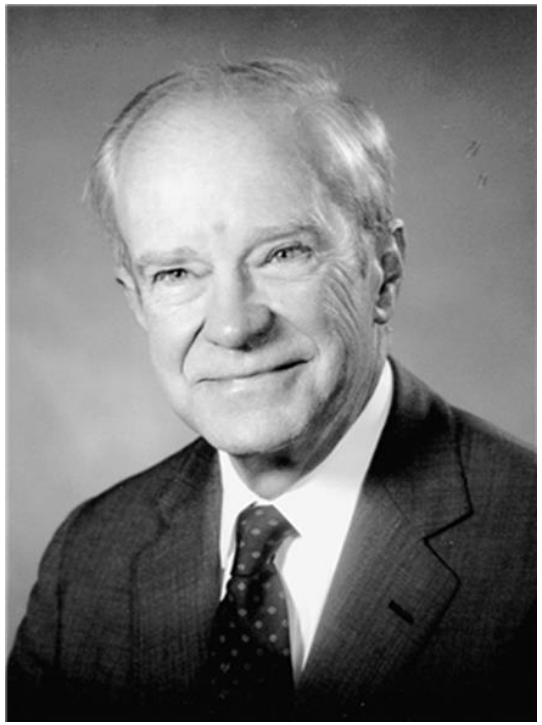
Air Products Total Safety Philosophy

"What We Believe"

1978

"Nothing is more important than safety…

not production, not sales, not profits…"



Ed Donley, Chairman
1978 - 1986

1. all accidents and injuries are preventable…
   not inevitable;
2. safety is a management responsibility…
   and safety can be managed;
3. safety is an individual responsibility …and a condition
   of employment;
4. safety is a way of life … around the clock

Air Products Total Safety Philosophy
"Safety Accountabilities"

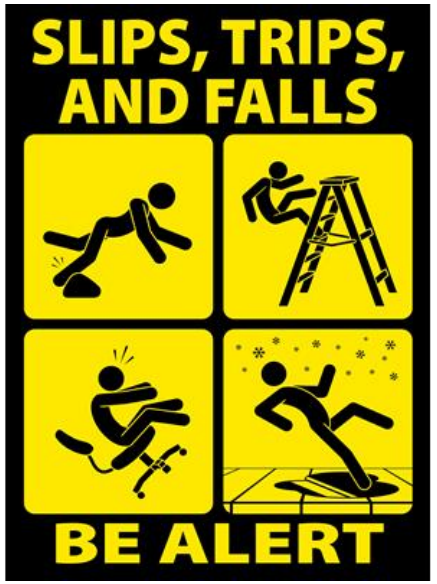
1978

- Chairman of the Board [and CEO] is the Chief Safety Officer
  - gives safety the highest priority
  - demands superior safety performance
- Line Managers are directly accountable for the safety performance of their organizations
- Safety is everyone's job and responsibility

Safety

The condition of being safe from suffering or causing injury, injury or loss

Personal Safety



- Actions of an Individual that normally affect the safety of only one person
- Personal Safety Programs addresses risk of personal injuries like slips, falls, struck-by incidents, electrocution, auto incidents, etc.

Process Safety

- Actions of an Individual and/or equipment/process that affect any personnel in the area of the incident or beyond
- Incidents can have catastrophic effects, multiple injuries, fatalities, and substantial economic, property, and environmental damage.

Process Safety Defined

Why Process Safety?

BHOPAL India Gas Tragedy

The most influential process safety accident in our history

Could this happen to YOU?

- Complacency due to your superior safety performance
- Normalizing your safety critical requirements
- Ineffective Risk Assessments of your systems
- Reversing the Burden of Proof when evaluating safety of operations
- Employees Not Speaking Freely of their safety concerns
- Business Pressures at odds with safety priorities
- Failure to Learn and apply learnings to improving your culture

CCPS® Formed on 23 March 1985

- On February 26th 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.

Center for Chemical Process Safety [CCPS®]

CCPS 30th Anniversary Film

“The Global Community Committed to Process Safety”

Center for Chemical Process Safety (CCPS)

(founded 1985)

CCPS founded by leading global companies after the Bhopal, India tragedy.

CCPS Vision: A World without Process Safety Incidents™

ZERO is the GOAL

CCPS Mission:

- **Serve** as a premier worldwide resource for PS knowledge & understanding
- **Advance** PS culture, technical concepts & mgt. practices
- **Enhance** individual & organizational Process Safety competency
- **Foster** collaboration within & across organizations, at all levels
- **Promote** PS as a key societal value & foundation for responsible sustainable operation

CCPS tools:

- Process Safety Beacon
- Chemical Reactivity Worksheet
- Golden Rules
- LOPA Data
- Process Safety Incident Database
- Process Equip. Reliability Database
- **Risk Analysis Screening Tool (RAST) & Che Hazard Engr. Fundamentals (CHEF)**
- Safe Work Practices (permit require[illegible]ork)

About CCPS

VISION20/20

236 Member Companies (June 2022)

An AIChE Technology Alliance

CCPS Center for Chemical Process Safety

THE GLOBAL COMMUNITY COMMITTED TO PROCESS SAFETY

Representing 46 Countries (April 2022)

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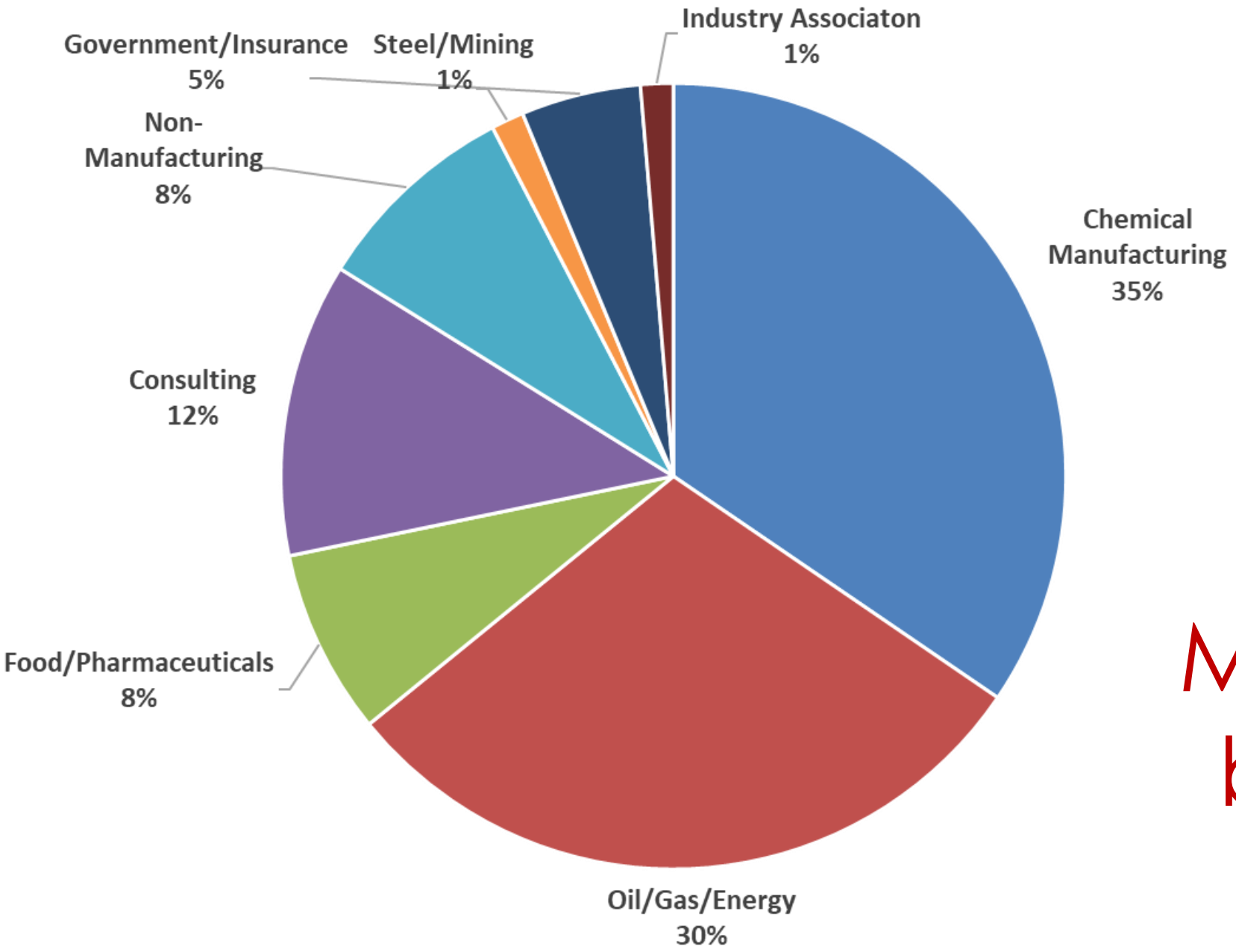
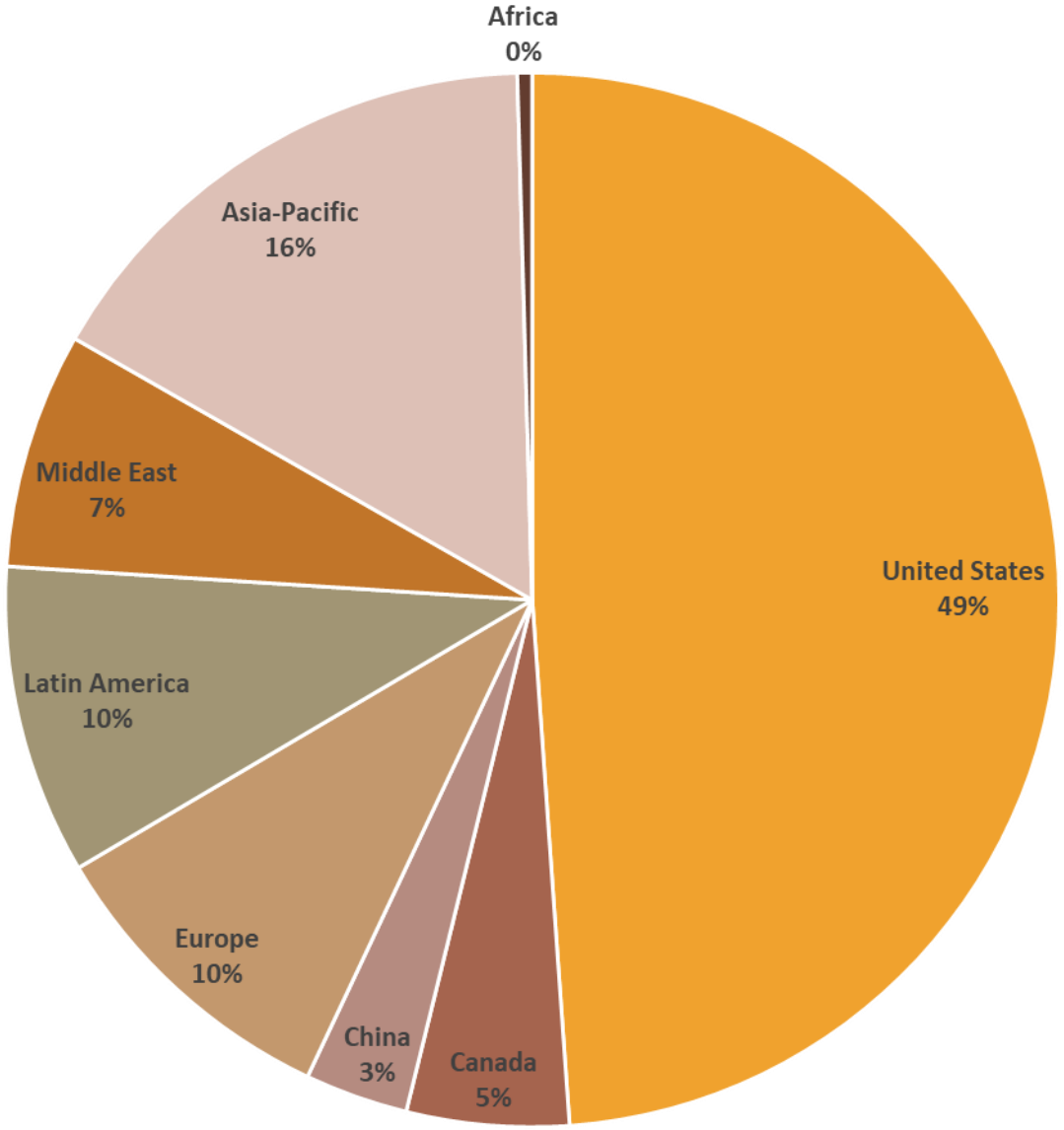


CCPS Membership by Industry



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CCPS Membership by Region

Leading Process Safety since 1985

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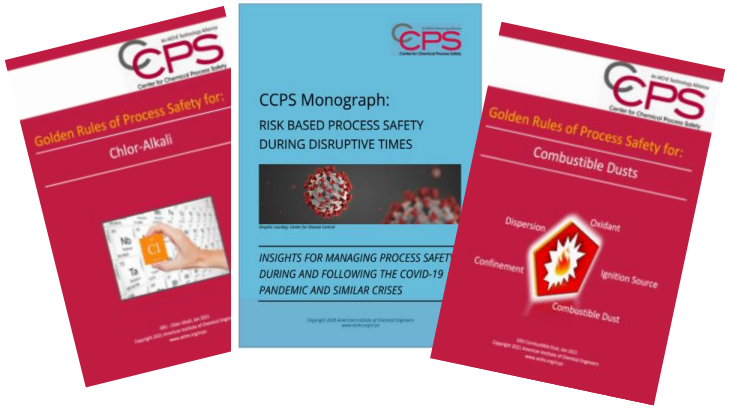
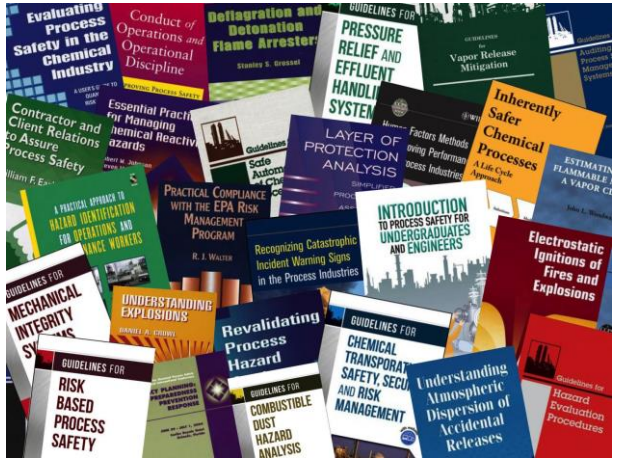
CCPS Certified(**CCPSC)** and CCPS Fundamentals **(CCPSf)**

Sharing Best Practices



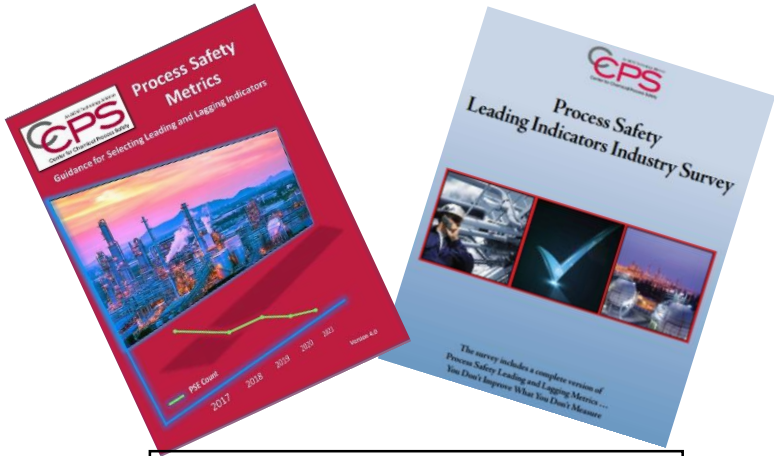
Process Safety Beacon

Creating Books and Publications/Translation into Global Languages



Conducting Global and Regional Conferences and Training

Creating Industry-wide Tools, Programs and Guidelines



Educating Students/Educators

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Failure to Learn

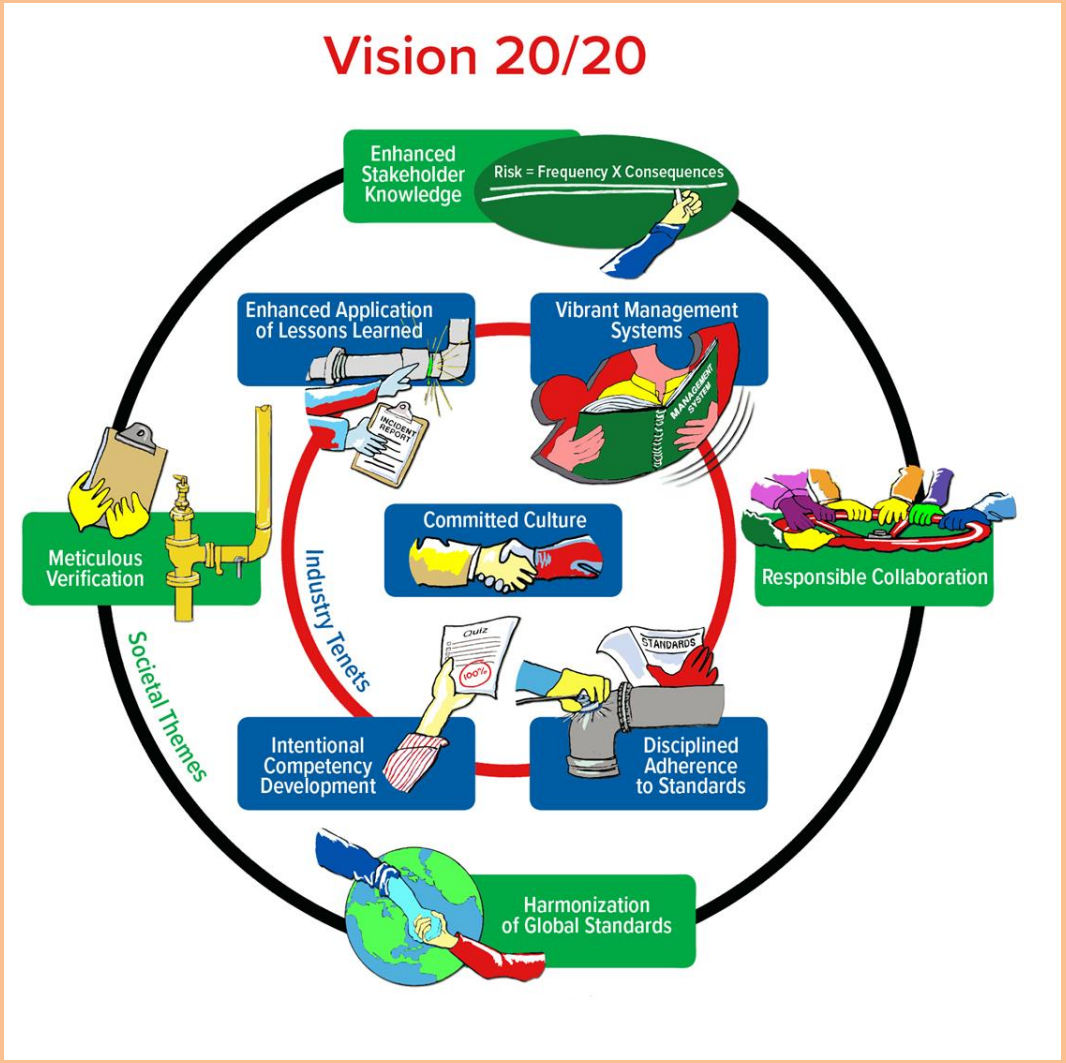







2020-21

CCPS Vision 20/20



"What good PSM looks like and how we can achieve it"

Vision 20/20 Project

- In 2011, the Center for Chemical Process Safety (CCPS) began an effort to approach the challenge differently in a project called Vision 20/20.
- In this project, participants worked hard to envision the process safety future and ask what will be the characteristics of companies with great process safety performance in the future?
- What will distinguish the companies with fewer process safety incidents from those with more process safety incidents?
- How can we work together in companies and with all our stakeholders to further process safety performance?

Vision 20/20

- Vision 20/20 looks into the not-too-distant future to describe how great process safety is delivered when it is collectively and fervently supported by industry, regulators, academia, and the community worldwide.
- driven by five tenets of culture, standards, competency, management systems and lessons learned
- and enhanced by community passion and four global societal themes.

Five Industry Tenets

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"What good PSM looks like"

In a Committed Culture, executives involve themselves personally, managers and supervisors drive excellent execution every day, and all employees maintain a sense of vigilance and vulnerability.

- ✓ Executives personally and visibly lead process safety
- ✓ Operators and mechanics diligently follow procedures and speak up when they suspect a problem or see an opportunity for improvement.
- ✓ Supervisors and managers verify work is done properly, intervene to correct situations, and openly communicate negative news to management.
- ✓ All employees and contractors commit to "do it right" and have a plan for when it goes wrong.

Committed Culture

What key leaders are saying?

Ellen Kullman
Chair and CEO DuPont [Ret]

James Alder
Executive VP, Celanese [Ret]

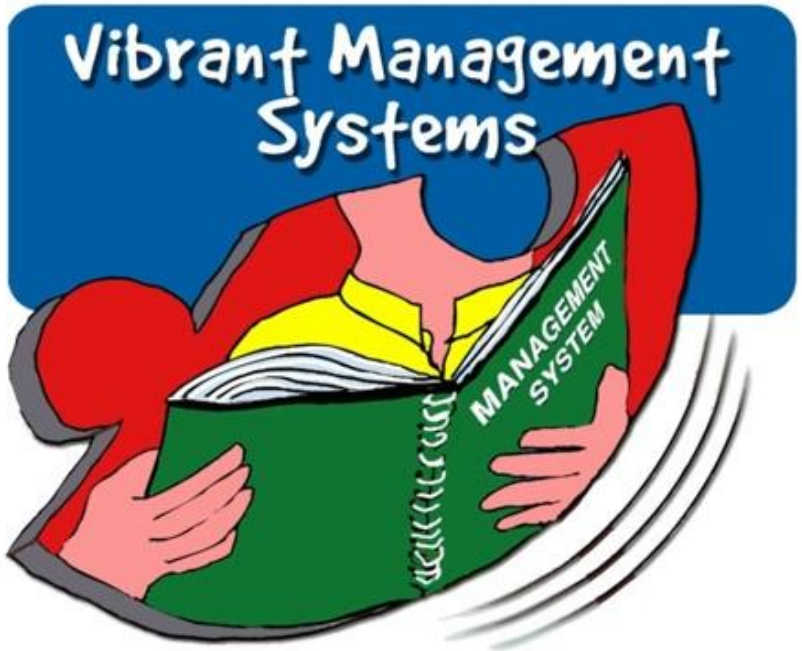
Luke Kissam
President and CEO at ALBEMARLE CORP [Ret]

Stephen Pryor
President ExxonMobil Chemicals [Ret]

"The Global Community Committed to Process Safety"

“How we must Lead?”

Vulnerability, Commitment & Culture



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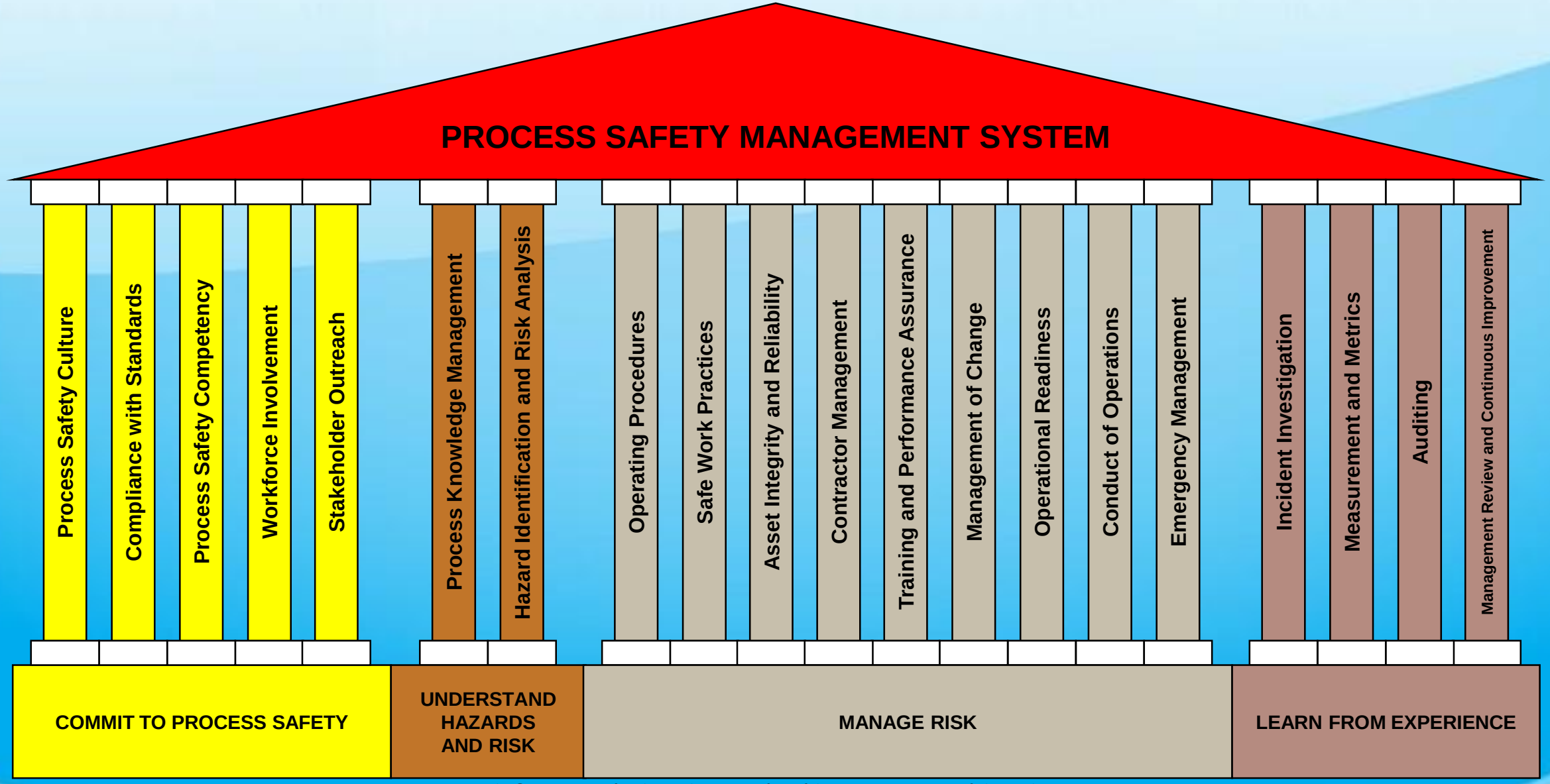
"What good PSM looks like"

Vibrant Management Systems are engrained throughout the organization. Vibrant systems readily adapt to the organization's varying operations and risks.

- ✓ For vibrant management systems to be effective, all employees must clearly understand their role in managing process safety.
- ✓ The management system:
  - ✓ Is documented, accessible, and easily used,
  - ✓ Defines how operations are conducted at the workplace,
  - ✓ Promotes safety in design, operations, and maintenance, and
  - ✓ Is agile and continuously improved.

Risk Based Process Safety



Thanks to David Guss, Nexen Inc.

Disciplined Adherence to Standards means using recognized design, operations, and maintenance standards. These standards are followed every time, all the time, and are continually improved.

"What good PSM looks like"

- ✓ Companies identify, document, and diligently follow standards for new designs.
- ✓ Companies also identify, document, and diligently follow a set of standards applicable to existing equipment. These standards for existing equipment set the minimum expectations for design, operations, and maintenance.
- ✓ Companies identify and manage process safety risks arising from gaps against these standards.
- ✓ As industry standards evolve, companies codify significant new learnings in their identified standards for existing equipment.

International Regulations

Country/Region	Process Safety Regulation Reference
Australia	National Standard for Control of Major Hazard Facilities [NOHSC:1014 (1996)]
Canada	Canadian Environmental Protection Act, 1999—Environmental Emergency Plans
European Union	Seveso II Directive 2003/105/EC; ATEX 137 Workplace Directive 1999/92/EC
Mexico	NOM-028-STPS-2004, Occupational organization—Safety in the Processes of Chemical Substances
Singapore	National Environmental Agency (one-time QRA Report for new chemical plants)
South Korea	Industrial Safety and Health Act—Article 20, Preparation of Safety and Health Management Regulations
United Arab Emirates	Federal Law No 8 of 1980 Regulations of Labour Relations; Federal Law No 24 of 1999 for the protection and development of the environment
United Kingdom	U.K. Health & Safety Executive, Control of Major Hazards (COMAH) regulations
United States	29 CFR 1910.119, U.S. Occupational Safety and Health Administration (OSHA) Process Safety Management of Highly Hazardous Chemicals; 40 CFR 68, U.S. Environmental Protection Agency (EPA) Risk Management Program for Chemical Accident Release Prevention

Examples of US RAGAGEP

- API Recommended Practices
- NFPA Fire Codes
- ASME Codes and Standards
- ANSI Standards
- National Board of Boiler and Pressure Vessel Inspectors
- DOT Standards
- CGA (Compressed Gas Association) Standards
- Chlorine Institute Guidelines
- SOCMA Standards
- SEMI Standards
- Insurance Guidelines (e.g. FM Global)
- ISO Standards
- IIAR Int'l Inst. 0f Ammonia Refrigeration Standards
- Fertilizer Institute Guidelines

Intentional Competency Development ensures that all employees who impact process safety are fully capable of meeting the technical and behavioral requirements for their jobs.

"What good PSM looks like"

- ✓ The bottom line: no matter how good the culture or management system is, or how well the company adheres to standards, it takes competent employees to implement those systems and standards.
- ✓ This requires intentional competency development, which includes understanding competency expectations, providing educational resources, and allowing time for people to build competency.
- ✓ Intentional competency development applies to all levels in the organization. Competency includes engineers implementing technical designs, operators knowing their process and safe operating limits, and leaders visibly leading process safety.

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SAChE

Safety+Chemical Engineering Education

AIChE ACADEMY

PROCESS SAFETY FACE TO FACE COURSES

Foundations of Process Safety
CH910 | Basic

CCPS' Inherently Safer Design
CH800 | Intermediate

CCPS' Hazard Identification for Operations and Maintenance Workers
CH166 | Basic

CCPS' Recognizing Catastrophic Incident Warning Signs
CH901 | Intermediate

CCPS' Overview of Risk Based Process Safety
CH925 | Basic

CCPS' Senior Leaders and Process Safety: The Role and The Opportunity
CH902 | Advanced

CCPS' Advanced Concepts for Process Hazard Analysis
CH754 | Advanced

CCPS' HAZOP Studies and Other PHA Techniques for Process Safety and Risk Management
CH157 | Intermediate

CCPS' Process Safety Boot Camp
CH900 | Basic

CCPS' HAZOP Studies, Other Hazard Evaluation Procedures and Advanced Concepts Combo Course
CH759 | Intermediate

PROCESS SAFETY ELEARNING COURSES

CCPS' Layer of Protection Analysis (LOPA)
ELA109 | Intermediate

CCPS' 20 Elements of Risk Based Process Safety (RBPS)
ELA120 | Basic

CCPS' Hazard Identification for Operators and Maintenance Workers
ELA121 | Basic

CCPS' Process Safety Leadership for Front-Line Supervisors
ELA122 | Basic

CCPS' Process Safety Management for Bioethanol
ELA124 | Basic

CCPS' OSHA Process Safety Management Review
ELA150 | Basic

CCPS' What Every New Engineer Needs to know About Process Safety
ELA154 | Basic

CCPS' The Importance of Codes and Standards for Process Safety
ELA155 | Basic

CCPS' Management of Change
ELA156 | Basic

CCPS' Process Safety 101 - Understanding Process Safety
ELA160 | Basic

CCPS' HAZOP Studies
ELS104 | Basic

CCPS' Process Safety Management Overview
ELS105 | Basic

Enhanced Application & Sharing of Lessons Learned communicates critical knowledge in a focused manner that satisfies the thirst for learning.

"What good PSM looks like"

- ✓ To reduce incidents, everyone needs to continually learn. We learn from accidents, near misses, industry benchmarking, and success stories.
  - ✓ First, identify the learnings and recognize the value in sharing it with others.
  - ✓ Second, use a system to efficiently share learnings, without overwhelming the organization.
  - ✓ Third, embed the learning in standards or practices, and check if existing equipment or processes require modification.

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PSID provides a resource for learning from experience of others, without suffering the consequences of the failures, by pooling incident information from member companies and public sources in an easy to use database.

Fires	Explosion	Toxic Release	Near Miss
252	233	288	59

Total Incidents
837

Fires, Explosions, Toxic Releases, and Near Misses

Process safety results will be dramatically improved if a company has:

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1. A committed culture in which the executives are personally involved, managers drive excellent execution every day, and all employees maintain a sense of vulnerability
2. Vibrant management systems ingrained;
3. Disciplined adherence to standards for new and existing equipment;
4. Intentional competency development such that all of their employees have full technical and cultural capability to do their jobs well; and,
5. Enhanced application and sharing of lessons learned including an expectation and thirst for learning from several different types of opportunities.

Four Societal Themes

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"What good PSM looks like"

This Enhanced Stakeholder Knowledge allows the public to effectively challenge industry to prevent process safety incidents. The same holds true for industry challenging the public to understand process safety risks.

- ✓ Enhanced Stakeholder Knowledge starts in high school where students learn the basic concepts of risk.
- ✓ Engaging in science, technology, engineering, and mathematics (STEM) education in business and engineering schools allows university students to absorb technical concepts and understand process safety risk.
- ✓ This Enhanced Stakeholder Knowledge allows the public to effectively challenge industry to prevent process safety incidents. The same holds true for industry challenging the public to understand process safety risks.

Launching Careers with a Rigorous Process Safety Foundation

26 FREE Courses | **On-Demand** | **Interactive** | **Easy-to-Use**

LEVEL ONE COURSES

NEW! An Introduction to Managing Process Safety Hazards
aiche.org/ela953 | Course ID: ELA953

NEW! Introduction to Process Safety
aiche.org/ela950 | Course ID: ELA950

NEW! Lab Safety
aiche.org/ela954l Course ID: ELA954

Chemical Process Safety in the Chemical Process Industries
aiche.org/ela901 | Course ID: ELA901

Dust Explosion Control
aiche.org/ela906 | Course ID: ELA906

NEW! Hazard Recognition
aiche.org/ela951 | Course ID: ELA951

NEW! Identifying & Minimizing Process Safety Hazards
aiche.org/ela952 | Course ID: ELA952

Process Safety Lessons Taught from Experience
aiche.org/ela908 | Course ID: ELA908

Runaway Reactions
aiche.org/ela902 | Course ID: ELA902

LEVEL TWO COURSES

NEW! Chemical Reactivity Hazards
aiche.org/ela962 | Course ID: ELA962

NEW! Explosion Hazards
aiche.org/ela964 | Course ID: ELA964

NEW! Fire Hazards
aiche.org/ela963 | Course ID: ELA963

NEW! Hazards and Risk: Introduction to Pressure Protection
aiche.org/ela971 | Course ID: ELA971

NEW! Hazards and Risk: What Can Go Wrong?
aiche.org/ela970 | Course ID: ELA970

NEW! Hazards and Risk: Safeguards Other Than Relief Systems
aiche.org/ela973 | Course ID: ELA973

NEW! Source Models
aiche.org/ela965 | Course ID: ELA965

NEW! Toxicological Hazards
aiche.org/ela961 | Course ID: ELA961

NEW! Understanding Hazards & Risk
aiche.org/ela969 | Course ID: ELA969

NEW! Process Safety Ethics – A Brief Introduction
aiche.org/ela975 l Course ID: ELA975

NEW! Atmospheric Dispersion
aiche.org/ela967 l Course ID: ELA967

NEW! Hazards and Risk: Introduction to Hazard Identification and Risk Analysis
aiche.org/ela974 l Course ID: ELA974

LEVEL THREE COURSES

NEW! Common Chemicals and Their Major Hazards
aiche.org/ela993 | Course ID: ELA993

NEW! Inherently Safer Design
aiche.org/ela984 | Course ID: ELA984

NEW! Risk Based Process Safety - Manage Risk: Operations
aiche.org/ela997 | Course ID: ELA997

NEW! Risk Review Using LOPA (Layer of Protection Analysis)
aiche.org/ela980 | Course ID: ELA980

NEW! The Role of Inert Gases in Process Safety
aiche.org/ela991 | Course ID: ELA991

Find resources and learn more at
aiche.org/sache

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DOING A WORLD OF GOOD

FOLLOW US: @ChEnected

www.aiche.org/sache

Educating Faculty:

29 Industry Led Faculty Workshops

2016

- Archer Daniels Midland – Decatur, IL
- Cargill – Blair, NE
- Chevron – Richmond, CA
- Annual Meeting – San Francisco, CA

2017

- Dow – Freeport , TX
- WACKER – Charleston, TN
- Archer Daniels Midland – Decatur, IL
- Chevron – Richmond, CA
- Reliance Industries – India
- Annual Meeting – Minneapolis, MN

2018

- LyondellBasell – Houston, TX
- Dow – Freeport, TX
- Chevron – Richmond, CA
- Chemours – Fayetteville, NC
- BASF – Wyandotte, MI
- Covestro (Annual Meeting – Pittsburgh, PA)

2019

- LyondellBasell – Houston, TX
- Dow – Midland, MI
- BASF – Wyandotte, MI
- Bayer – Muscatine, Iowa
- Chevron – Richmond, CA
- LyondellBasell – Houston, TX

2020 (Virtual)

- Chemours
- Dow
- BASF

2021 (Virtual)

- BASF
- Bayer
- Chevron
- Dow

Highlights and Our Impact

(Thru December 2021)

AIChE
The Global Home of Chemical Engineers

DOING A WORLD OF GOOD

226,148

SAFETY CERTIFICATES
awarded to students
since 2015

734

UNIVERSITIES PARTICIPATING
in Undergraduate Process Safety Learning Initiative curriculum

789

NEW FACULTY MEMBERS
educated on process safety since campaign launch

62,008

STUDENTS
using SAChE modules
since 2015

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"What good PSM looks like"

Responsible Collaboration means working together on a common goal of excellent process safety performance.

- ✓ This means seeking to understand each other's point of view and respecting each other's perspective.
- ✓ This includes removing barriers to sharing and learning from incidents, promoting consistent understanding of risks, and maintaining effective process safety.
- ✓ Responsible Collaboration supports a partnership to challenge each other to deliver great process safety performance.

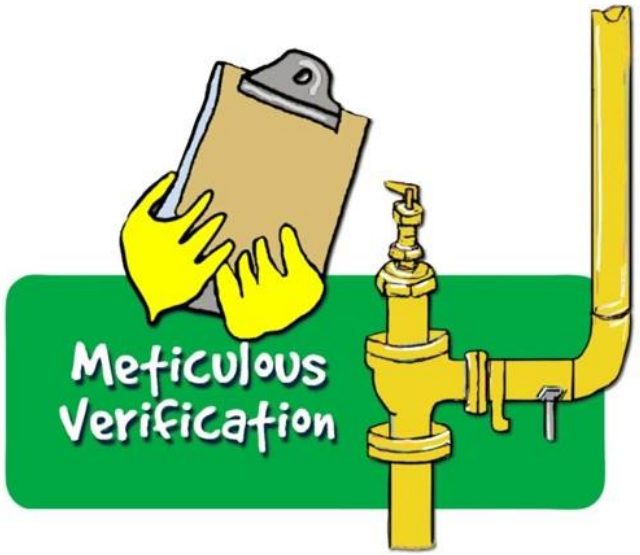
Active Responsible Collaborations

Organization	Collaborating activity
Energy Institute [EI]	Bow Tie Guideline Book + Human Performance
Society of Petroleum Engineers [SPE]	Process Safety for Upstream concept book completed
European Process Safety Center [EPSC]	7th Edition Global Conference of PS + Big Data Conference planned
EPSC + Dow Chemicals	RAST / CHEF Virtual & in-person workshops are very popular
Shenyang Research Inst. of Chem. Ind. Co., Ltd. (SYRICI)	Guidelines for fine chemicals process safety in China
Singapore Chemical Industry Council [SCIC]	Global Summit [2025]
American Chemistry Council [ACC]	Formal Engagement at Membership level + Leadership Workshop
Instituto Brasileiro DePetroleo – IBP	Joint execution of 2020 CCPS Latin America Conference
Instituto Brasilerio Mineracao (IBRAM)	Collaborating at Latin America Process Safety Conference [2022]
Jordanian Engineers Association [JEA]	MOU signed, JEA also became a CCPS member
Egyptian Ministry of Petroleum	MOU being processed, major collaborative plan in the works
Chemical Safety Board [CSB]	Collaborative support on mutually important process safety programs

Harmonized standards provide consistent guidance for design, operations, and maintenance, to support effective understanding of process safety risk.

"What good PSM looks like"

- ✓ It is important to communicate requirements consistently … down the street, across the country, and around the world.
- ✓ Currently, a variety of standards may apply to a single operation, including local, industry, national, and international, which have the potential to conflict with each other.
- ✓ Harmonization of Standards leads to efficiency in conforming to applicable standards in local, national, and global commerce.

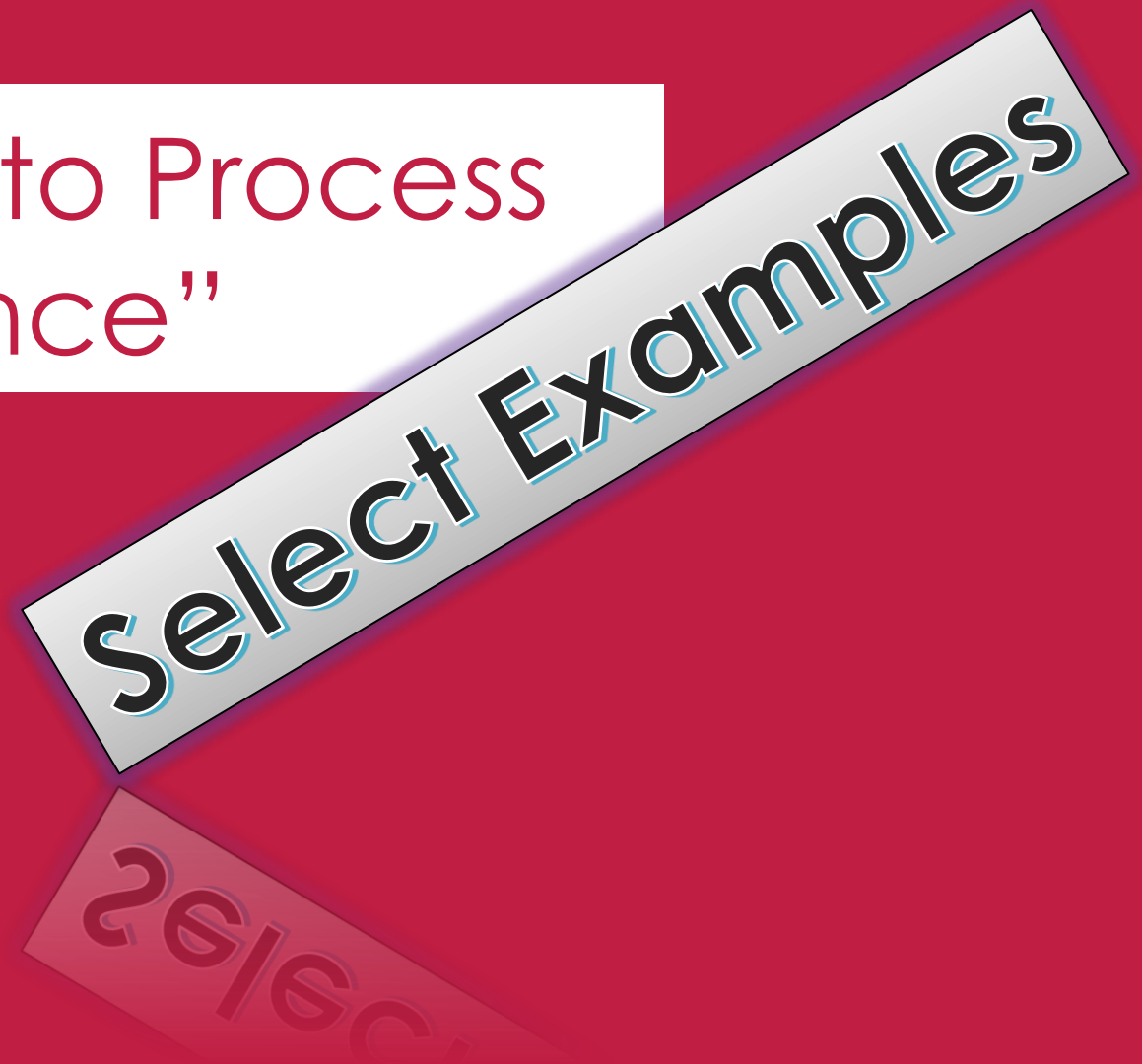


Companies use various assessment techniques to assure their process safety management systems are working as intended.

"What good PSM looks like"

- ✓ It will become standard practice for companies to supplement internal audits with competent third-party verification of their engineered systems and process safety management systems.
- ✓ Third-party technical experts verify specific technical details.
- ✓ Public and non-governmental organizations evaluate implementation of company process safety programs.
- ✓ Meticulous Verification supports a partnership to challenge each other to deliver great process safety performance.

Tools for "Roadmap to Process Safety Excellence"



Five Industry Tenets

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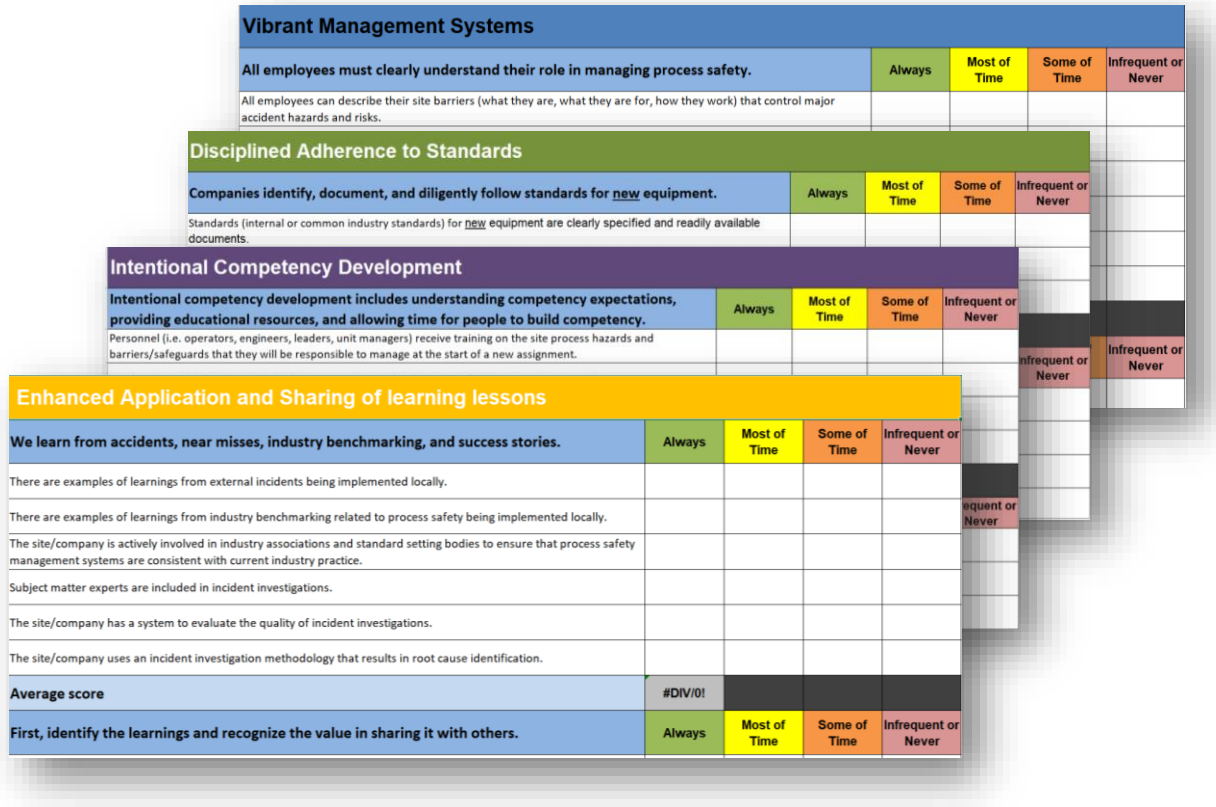
Committed Culture				
Executives personally and visibly lead process safety.	**Always**	**Most of Time**	**Some of Time**	**Infrequent or Never**
Executives review industry and company incidents and review their own operations for similar hazards.				
Process Safety topics are regular agenda items at board/executive meetings.				
Executives have personal Process Safety performance goals and objectives (beyond stating metric goals).				
Process safety lagging metrics are tracked at the site and company level.				
Process safety leading metrics are tracked at the site and company level.				
Executives commit a meaningful amount of time personally involved in process safety activities (e.g. risk mitigation planning, discussing incident investigations, and actively monitoring action item tracking).				
Executives and senior managers respond to poor process safety performance with the intent to identify and address root causes.				
Executives and senior managers reward good process safety performance and identify learnings to leverage across the site/company.				
Executives and senior managers talk knowledgeably about the major hazards and risks at each site (as applicable) and the associated critical barriers.				
Process safety activities are included in annual operating plans and budgets.				
Process safety metrics directly impact executive compensation.				
The annual report discusses process safety activities and leading process safety metrics.				
Executive leadership routinely visits production units and have meaningful discussions regarding process safety related issues with operations and maintenance personnel.				
Executives personally follow-up with site operations and technical personnel regarding potentially significant process safety incidents.				
Executives and leadership positively recognize individuals for raising concerns regarding process safety.				
Average score	**#DIV/0!**			
Operators and mechanics diligently follow procedures and speak up when they suspect a problem or see an opportunity for improvement.	**Always**	**Most of Time**	**Some of Time**	**Infrequent or Never**
Operators and mechanics fully follow and properly complete procedural checklists.				
Operators and mechanics freely raise process safety concerns to supervision and management.				
Process safety improvements exist or are ongoing based on concerns/suggestions raised by operators/mechanics				
Operators and mechanics consistently report process safety near misses.				
Average score	**#DIV/0!**			



RESOURCES									
Committed Culture - In a Committed Culture, executives involve themselves personally, managers and supervisors drive excellent execution every day, and all employees maintain a sense of vigilance and vulnerability.	Tool	Book Summaries/ Summaries	Article/Journal	PPT	Video	Free Webinars	Webinars $	External Web Resources	SACHE Modules
https://www.aiche.org/sites/default/files/docs/pages/mccavit_10th_gcps_vision_2020_paper_final.pdf	X								
https://www.aiche.org/ccps/resources/vision-2020/presentation/2014				X					
https://www.aiche.org/sites/default/files/docs/pages/8403a_web_v1.pdf	X								
https://www.aiche.org/resources/publications/cep/2016/november/process-safety-visions-committed-culture	X								
PSM Mindsets for Everyday Use									
Communicating the Hazard (A Critical Mindset for Any Process Safety Culture)									

Four Societal Themes

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Responsible Collaboration - Societal Theme				
The process safety management system includes requirements to ensure engagement with external and internal stakeholders.	Always	Most of Time	Some of Time	Infrequent or Never
Learnings from external process safety incidents are shared and actions are taken to prevent similar incidents across the organization.	Always	Most of Time	Some of Time	Infrequent or Never
Colleagues participate in industry conferences and professional organizations to share lessons learned and best practices.	Always	Most of Time	Some of Time	Infrequent or Never
A formal system exists that ensures the sharing of process incident investigation findings and other process safety information with colleagues across the organization.	Always	Most of Time	Some of Time	Infrequent or Never

RESOURCES

Responsible Collaboration - Responsible Collaboration means working together on a common goal of excellent process safety performance.	Tool	Book Summaries/ Summaries	Article/Journal	PPT	Video	Free Webinars	Webinars $	External Web Resources	SACHE Modules
https://www.aiche.org/sites/default/files/docs/pages/mccavit_10th_gcps_vision_2020_paper_final.pdf	X								
https://www.aiche.org/ccps/resources/vision-2020/presentation/2014				X					
https://www.aiche.org/sites/default/files/docs/pages/8403a_web_v1.pdf	X								
https://www.aiche.org/resources/publications/cep/2017/september/process-safety-visions-responsible-collaboration	X								

Enhanced Stakeholder Knowledge - Societal Theme				
Company/location shares risk concepts with primary and secondary educators.	Always	Most of Time	Some of Time	Infrequent or Never
Company/location shares risk concepts with STEM educators at busniess and engineering schools.	Always	Most of Time	Some of Time	Infrequent or Never
Civic leaders and first responders are aware of the hazards at our facilities and the control measures taken to manage risk.	Always	Most of Time	Some of Time	Infrequent or Never
Company/location is engaged in the development of industry standards and regulations that reduce societal risk.	Always	Most of Time	Some of Time	Infrequent or Never

RESOURCES

Enhanced Stakeholder Knowledge - Enhanced Stakeholder Knowledge allows the public to effectively challenge industry to prevent process safety incidents. The same holds true for industry challenging the public to understand process safety risks.	Tool	Book Summaries/ Summaries	Article/Journal	PPT	Video	Free Webinars	Webinars $	External Web Resources	SACHE Modules
https://www.aiche.org/sites/default/files/docs/pages/mccavit_10th_gcps_vision_2020_paper_final.pdf	X								
https://www.aiche.org/ccps/resources/vision-2020/presentation/2014				X					
https://www.aiche.org/sites/default/files/docs/pages/8403a_web_v1.pdf	X								
https://www.aiche.org/resources/publications/cep/2017/july/process-safety-visions-enhanced-stakeholder-knowledge	X								

Harmonization of Standards - Societal Theme				
The intent of assessment measures have been developed.	Always	Most of Time	Some of Time	Infrequent or Never
Work process assessment measures have been developed.	Always	Most of Time	Some of Time	Infrequent or Never
Results assessment measures have been developed.	Always	Most of Time	Some of Time	Infrequent or Never

RESOURCES

Harmonization of Standards - Harmonized standards provide consistent guidance for design, operations, and maintenance, to support effective understanding of process safety risk leading to efficiency in conforming to applicable standards in local, national, and global commerce.	Tool	Book Summaries/ Summaries	Article/Journal	PPT	Video	Free Webinars	Webinars $	External Web Resources	SACHE Modules
https://www.aiche.org/sites/default/files/docs/pages/mccavit_10th_gcps_vision_2020_paper_final.pdf	X								
https://www.aiche.org/ccps/resources/vision-2020/presentation/2014				X					
https://www.aiche.org/sites/default/files/docs/pages/8403a_web_v1.pdf	X								
https://www.aiche.org/resources/publications/cep/2017/october/process-safety-visions-harmonization-standards	X								

Meticulous Verification - Societal Theme				
Internal audits are supplemented by third-party verification of process safety management systems.	Always	Most of Time	Some of Time	Infrequent or Never
Company/facility uses benchmarking to guage process safety performance and acts on identified deficiencies.	Always	Most of Time	Some of Time	Infrequent or Never
Lessons learned are shared with other entities outside the organization.	Always	Most of Time	Some of Time	Infrequent or Never
RAGAGEP used for the verification of process safety systems is defined.	Always	Most of Time	Some of Time	Infrequent or Never

RESOURCES

Meticulous Verification	Tool	Book Summaries/ Summaries	Article/Journal	PPT	Video	Free Webinars	Webinars $	External Web Resources	SACHE Modules
https://www.aiche.org/sites/default/files/docs/pages/mccavit_10th_gcps_vision_2020_paper_final.pdf	X								
https://www.aiche.org/ccps/resources/vision-2020/presentation/2014				X					
https://www.aiche.org/sites/default/files/docs/pages/8403a_web_v1.pdf	X								
https://www.aiche.org/resources/publications/cep/2017/december/process-safety-visions-meticulous-verification	X								

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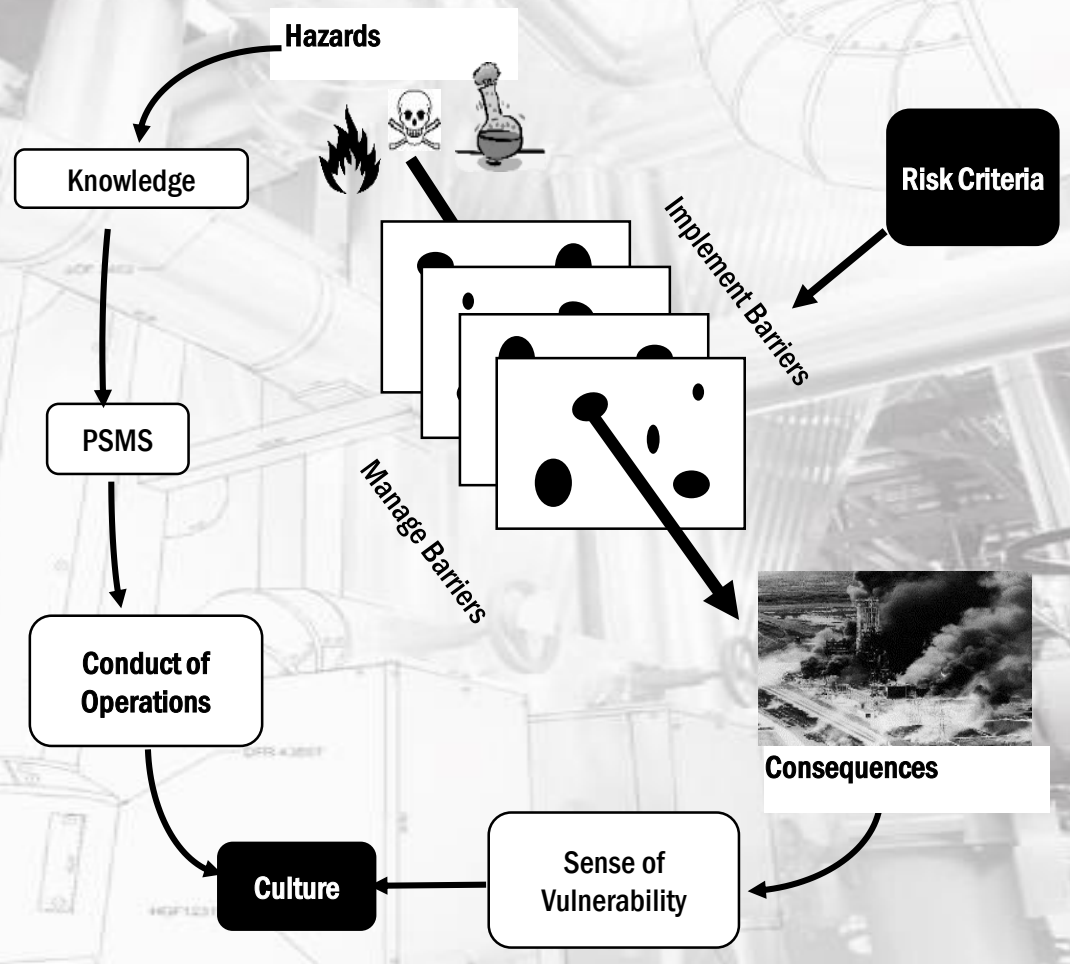
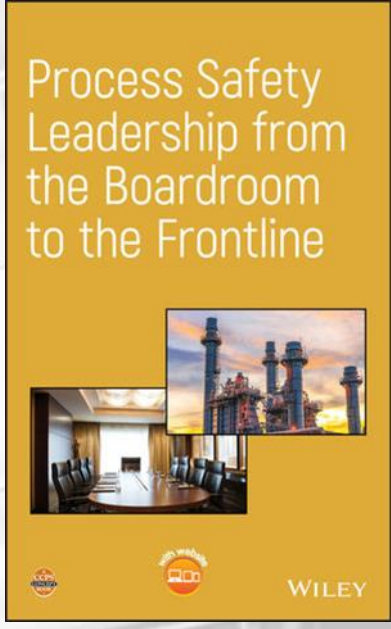
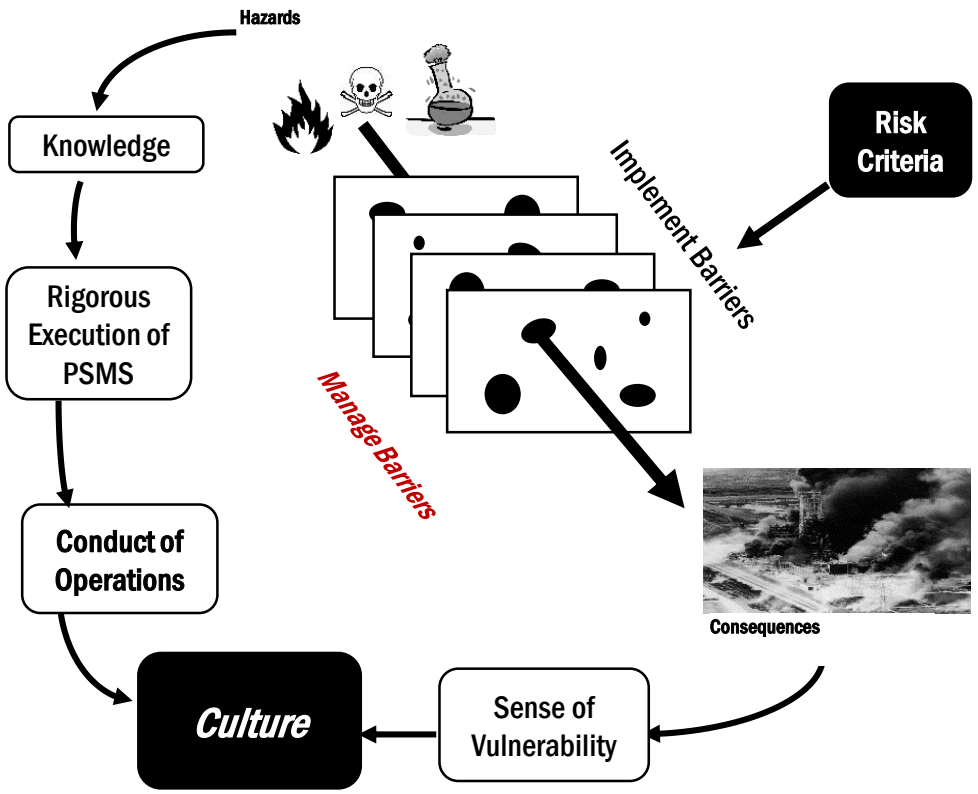
CCPS Process Safety Leadership Workshop





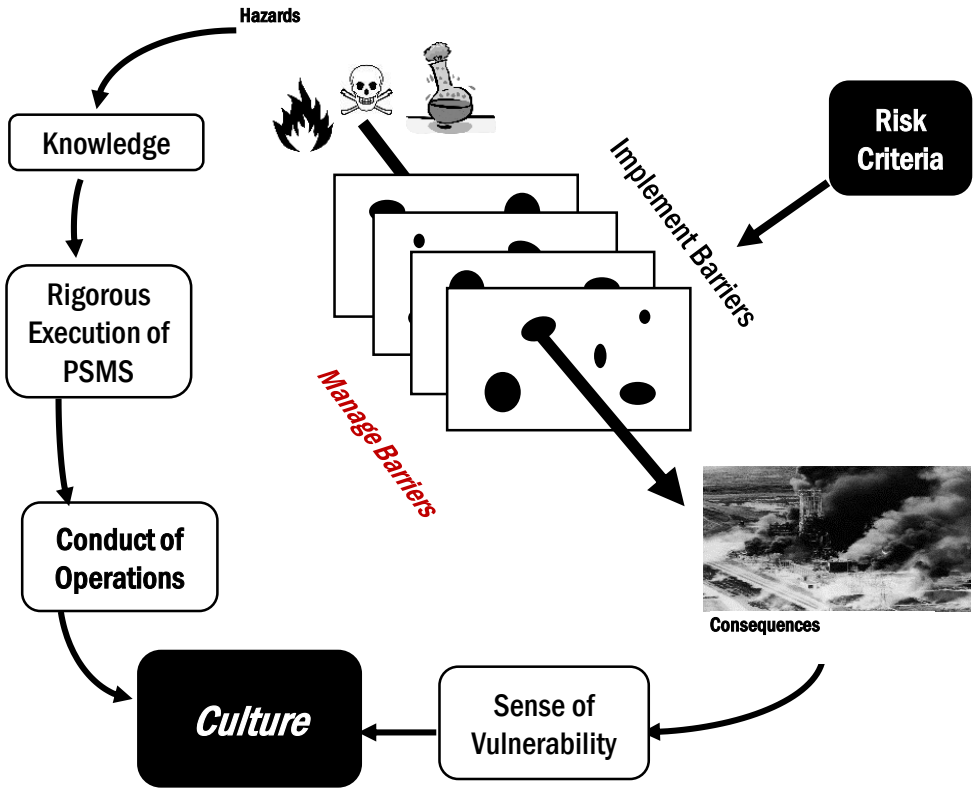
Process Safety Leadership



- Hazards always exist
- Barriers prevent hazards from leading to consequences
- You need enough of the right kind of barriers to meet your risk criteria
- Senior leaders set risk criteria

Leaders drive proactive culture & continuous improvement

Process Safety Leadership



- Leaders must:
  - ***Ensure barriers are always effective***
  - Ensure corporate competency and knowledge
  - Establish a management system (PSMS)
  - Lead conduct of operations to provide operational discipline
  - Instill a sense of vulnerability
  - **Drive the culture**

Leaders drive proactive culture & continuous improvement

CCPS Risk Based Process Safety Framework

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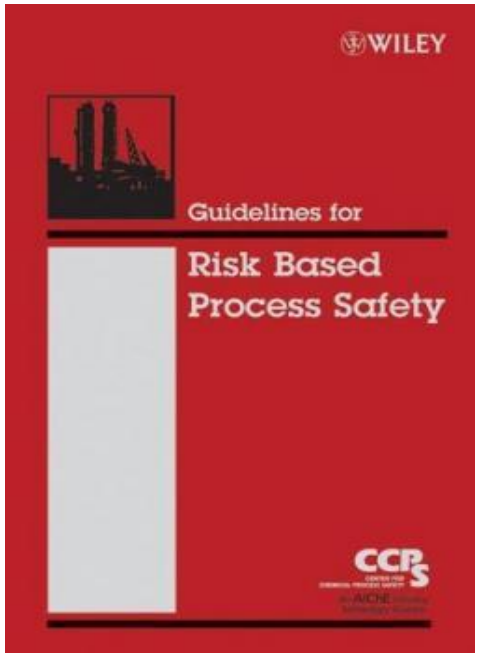
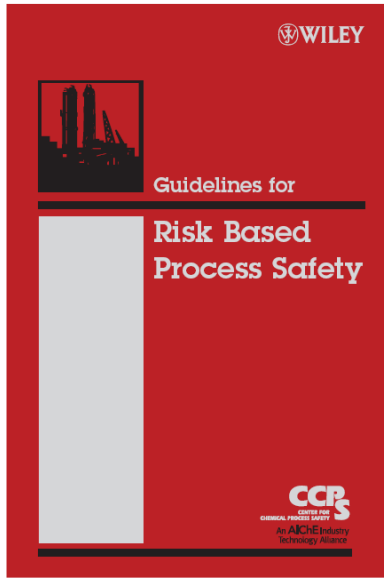
Center for Chemical Process Safety

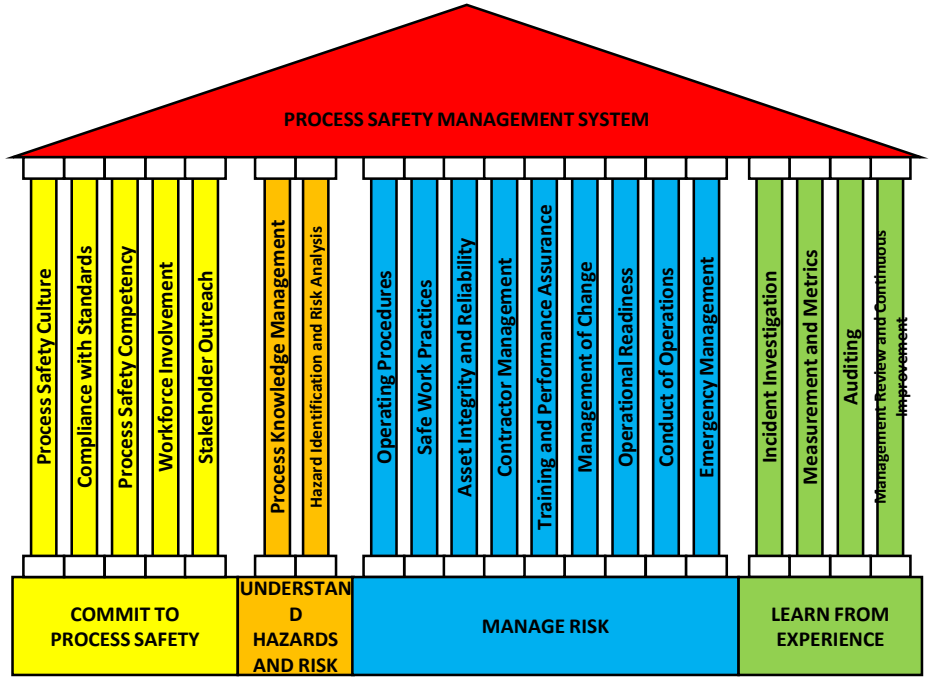
In a risk-based process safety management approach, organizations use lessons learned from experience with lagging indicators & use risk information with leading indicators to guide process safety program.

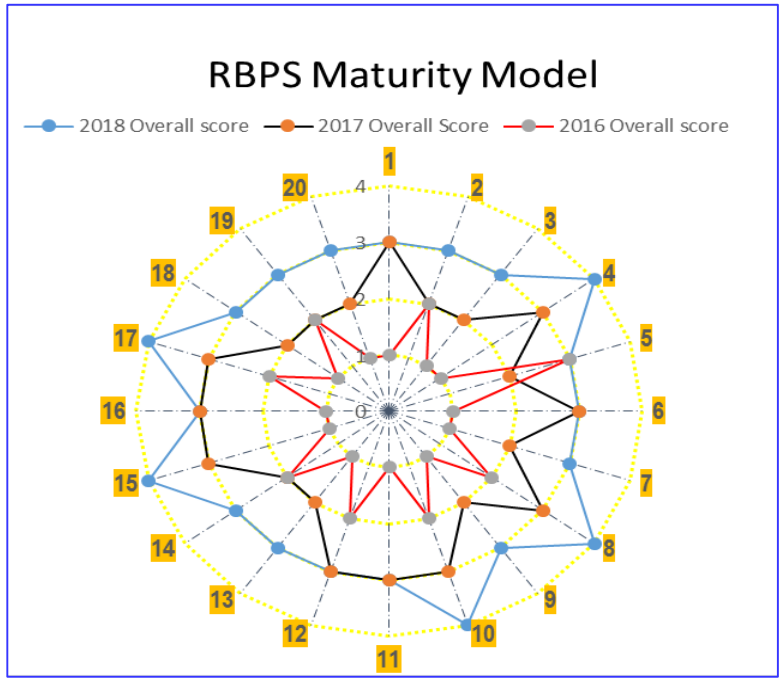


- Why Risk Based Process Safety?
  - All hazards and risks in a facility are not equal
  - Using same practices to manage every hazard is inefficient use of resources
  - Risk-based approach reduces potential for assigning an undue amount of resources to manage lower-risk activities, thereby freeing up resources for tasks for higher-risk activities

Where are you on the Continuum?



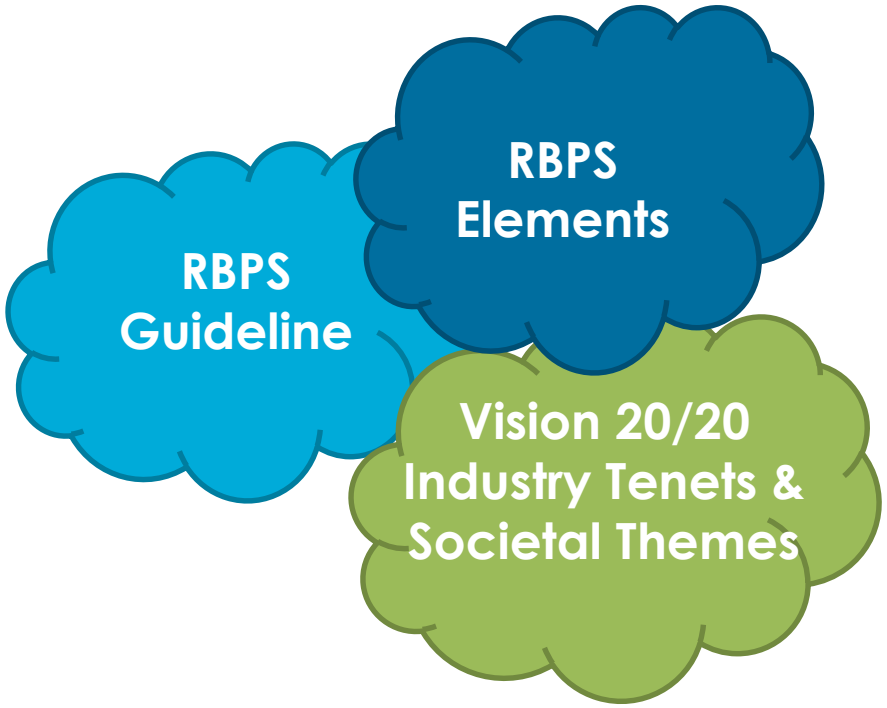


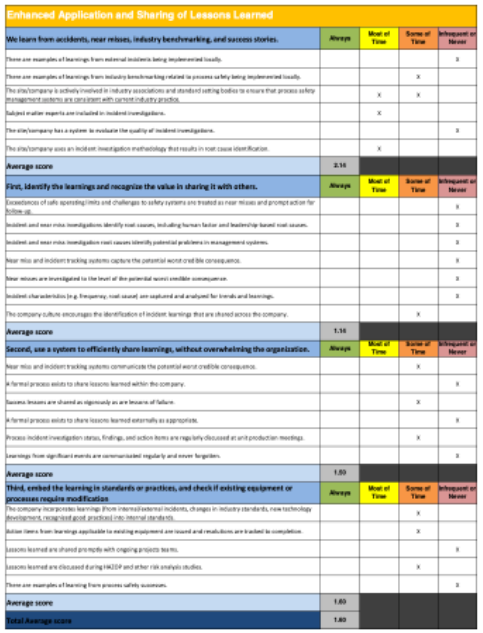


RBPS Guidelines **Assessing Maturity** **Improving performance**

Risk Based Maturity Model

Roadmap to Process Safety Excellence





Enhanced Application and Sharing of Lessons Learned				
We learn from accidents, near misses, industry benchmarking, and success stories.	Always	Most of Time	Some of Time	Infrequent or Never
There are examples of learnings from external incidents being implemented locally.				X
There are examples of learnings from industry benchmarking related to process safety being implemented locally.			X	
The site/company is actively involved in industry associations and standard setting bodies to ensure that process safety management systems are consistent with current industry practice.		X	X	
Subject matter experts are included in incident investigations.		X		
The site/company has a system to evaluate the quality of incident investigations.				X
The site/company uses an incident investigation methodology that results in root cause identification.		X		
Average score	2.16			
First, identify the learnings and recognize the value in sharing it with others.	Always	Most of Time	Some of Time	Infrequent or Never
Exceedances of safe operating limits and challenges to safety systems are treated as near misses and prompt action for follow up.				X
Incident and near miss investigations identify root causes, including human factor and leadership based root causes.				X
Incident and near miss investigation root causes identify potential problems in management systems.				X
Near miss and incident tracking systems capture the potential worst credible consequence.				X
Near misses are investigated to the level of the potential worst credible consequence.				X
Incident characteristics (e.g. frequency, root cause) are captured and analyzed for trends and learnings.				X
The company culture encourages the identification of incident learnings that are shared across the company.			X	
Average score	1.16			
Second, use a system to efficiently share learnings, without overwhelming the organization.	Always	Most of Time	Some of Time	Infrequent or Never
Near miss and incident tracking systems communicate the potential worst credible consequence.			X	
A formal process exists to share lessons learned within the company.				X
Success lessons are shared as vigorously as are lessons of failure.			X	
A formal process exists to share lessons learned externally as appropriate.				X
Process incident investigation status, findings, and action items are regularly discussed at unit production meetings.			X	
Learnings from significant events are communicated regularly and never forgotten.				X
Average score	1.50			
Third, embed the learning in standards or practices, and check if existing equipment or processes require modification	Always	Most of Time	Some of Time	Infrequent or Never
The company incorporates learnings (from internal/external incidents, changes in industry standards, new technology development, recognized good practices) into internal standards.			X	
Action items from learnings applicable to existing equipment are issued and resolutions are tracked to completion.			X	
Lessons learned are shared promptly with ongoing projects teams.				X
Lessons learned are discussed during HAZOP and other risk analysis studies.			X	
There are examples of learning from process safety successes.				X
Average score	1.83			
Total Average score	1.83			

What do I need to do?

How am I doing?

Where do I start?

Thanks!

shakeel@aiche.org