An AIChE Technology Alliance

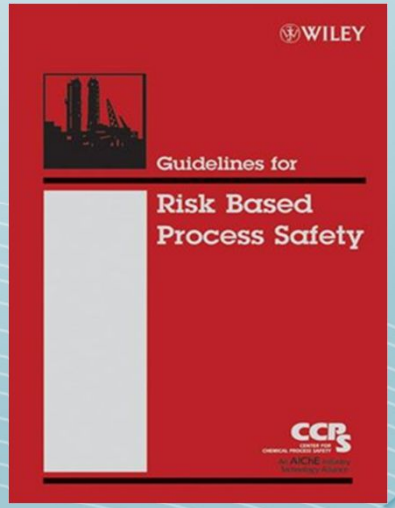
CCPS

Center for Chemical Process Safety

Best Practices in Process Safety
It's Not Just for Chemical Plants & Refineries

Richard W. Sarnie, CSP, P.E., ARM-E

richs@aiche.org



Speaker's Technical Biography

Richard W. Sarnie, CSP, P.E., ARM-E
richs@aiche.org

Rich Sarnie is AIChE's Director of CCPS Projects and has over 30 years of risk management & safety experience in the manufacturing, transportation, mining and retail service industries.

Rich has a B.S. in Chemical Engineering from the University of Lowell (MA) and an MBA from Western New England College.

Rich is a Board Certified Safety Professional (CSP), a Licensed Professional Engineer (P.E) in Safety, an Associate in Risk Management with an Enterprise Risk Management Designation (ARM-E), a Construction Risk & Insurance Specialist (CRIS), and a Management Liability Insurance Specialist (MLIS).

Rich is licensed in New Jersey as a Producer of Property & Casualty Insurance.

Rich is a professional member of the American Society of Safety Engineers (ASSE) and the American Institute of Chemical Engineers (AIChE).

Center for Chemical Process Safety
Vision

In order to protect people, property and the environment …..

…. CCPS is committed to bringing the best process safety knowledge and practices to industry, academia, the governments and the public around the world through collective wisdom, tools, training and expertise.

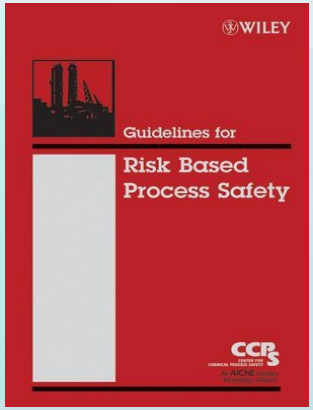
AIChE Center for Chemical Process Safety

Mission is to help eliminate catastrophic process industry accidents, by:

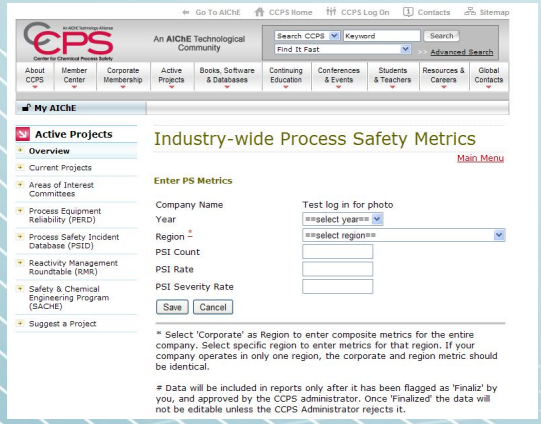
- **PROMOTING** process safety as a key societal value and expectation.
- **ESTABLISHING** process safety as the foundation for responsible operation.
- **SERVING** as the premier world-wide resource for process safety and the development of the “state-of-the-art solutions”.
- **FOSTERING** knowledge, understanding and implementation of process safety by executives, management, technicians, engineers, students, government officials and the public.
- **ADVANCING** process safety technology, culture and management practices.

For 30 Years CCPS Has Been Leading Process Safety

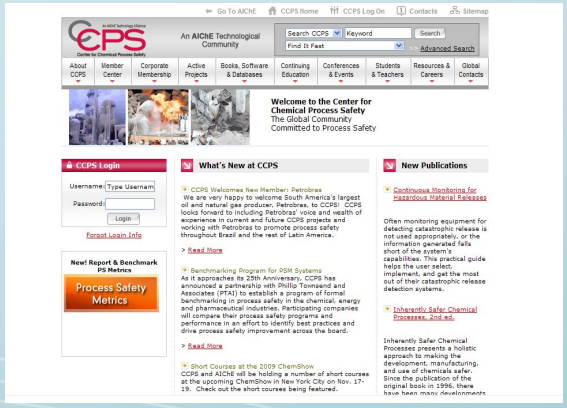
Creating Books and Publications



Creating Industry-wide Tools, Programs and Guidelines



Sharing Best Practices and Learning from Others



Conducting Global Conferences and Training

What is Chemical Process Safety?

Chemical Process Safety is a technical and management systems discipline that focuses primarily on prevention of loss of containment.

However it also addresses the mitigation of possible consequences of accidental chemical releases, fires, and explosions.

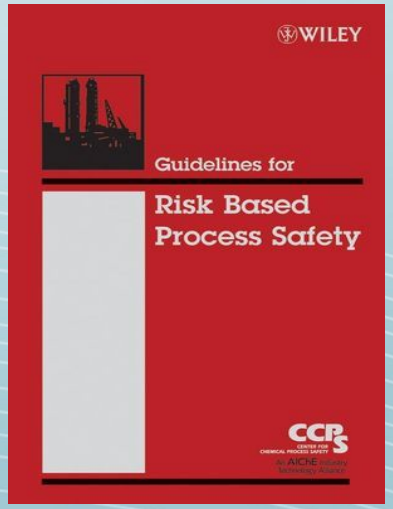
Purpose and Scope

- This presentation includes:
  - A discussion of the continuing movement by many organizations to more formal and comprehensive enterprise wide risk management systems
  - A review of some examples of incidents in non-chemical industries
  - A review of the typical steps or phases an organization may take in developing and improving management system processes

Purpose and Scope

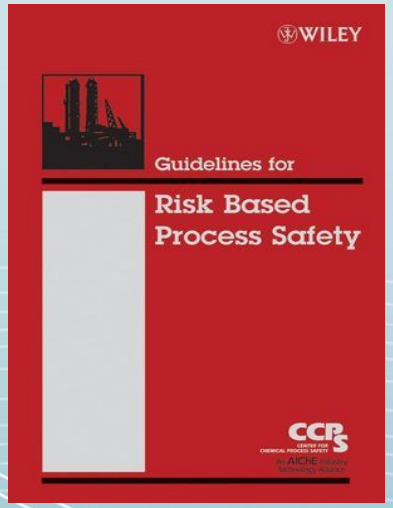
– An overview of a risk based process safety management system recommended by the AIChE Center for Chemical Process Safety (CCPS) and based on global chemical industry best practices.

- Note: CCPS guidelines books shown in this presentations are listed on the publisher's website:

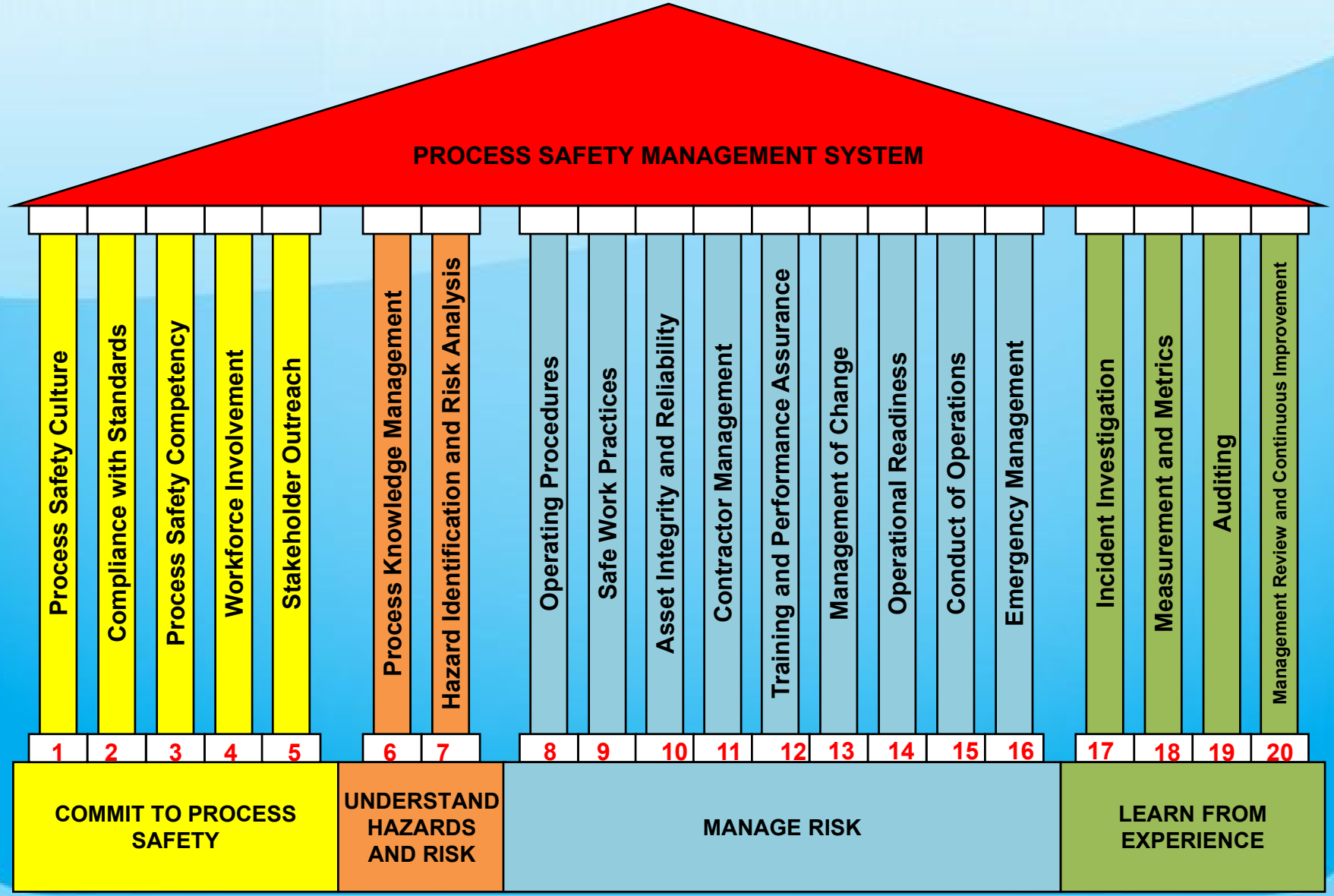


Purpose and Scope

- Present a rationale as to why a **risk-based** rather than **regulatory-based** approach to managing process safety and other risk exposures is prudent



Risk Based Process Safety Management Structure



Thanks to David Guss, Nexen Inc.

AIChE CCPS Risk Based PSM System Elements

20 Elements

- **Commit to Process Safety**
  - *Process Safety Culture*
  - Compliance with Standards
  - *Process Safety Competency*
  - Workforce Involvement
  - *Stakeholder Outreach*
- **Understanding Hazards & Risks**
  - Process Knowledge Management
  - Hazard Identification & Risk Management
- **Manage Risk**
  - Operating Procedures
  - Safe Work Practices
  - Asset Integrity & Reliability
  - Contractor Management
  - Training & Performance Assurance
  - Management of Change
  - Operational Readiness
  - *Conduct of Operations*
  - Emergency Management
- **Learn from Experience**
  - Incident Investigation
  - *Measures & Metrics*
  - Auditing
  - *Management Review & continuous Improvement*

Food

Anhydrous Ammonia release – Millard Refrigerated Services – Theodore, AL (August, 2010)

- 130 people hospitalized

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Dust

Sugar dust explosion--Imperial Sugar Plant - Savannah GA (Feb. 2008)

- 14 workers killed
- Several serious burn injuries
- Facility destroyed

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Why Process Safety in the Food Industry?

- Are these Statistics Acceptable?
  - Over the last 20 years (Average)
    - Ammonia Releases: 60 per year
    - Dust Explosions : 10 per year

Other Non-Chemical Plants

Do They Need Process Safety?

Fertilizer

Ammonium Nitrate explosion in West Texas in April 2013.

15 killed and 260 injured.

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Regulations Don't Fully Address Key Risk Exposures

- The CSB identified 281 combustible dust incidents in the US between 1980 and 2005 that killed 119 workers and injured 718, and extensively damaged industrial facilities.
  - However, NO comprehensive federal OSHA standard exists to control the risk of dust explosions in general industry.
- PSM not fully understood by the majority of "non-chemical" manufacturers "We make food, not chemicals"
- Ammonium Nitrate not listed as a PSM Chemical

What did these incidents all have in common?

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A Breakdown or Lack of Process Safety Management System

And

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A Reliance on **Regulatory** Based Process Safety Management System

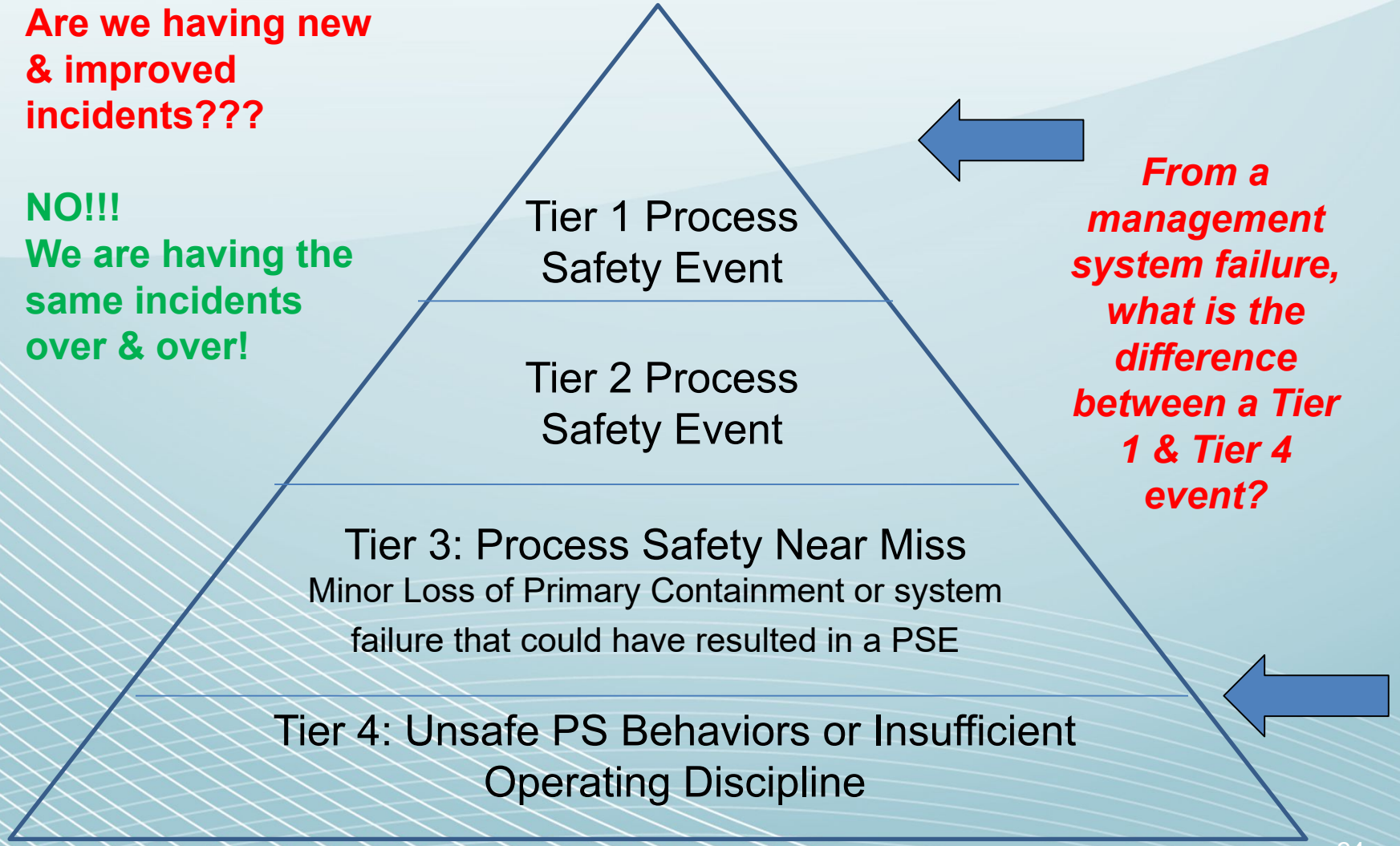
Versus

Risk Based Approach

Process Safety Incident Pyramid

Are we having new & improved incidents???

NO!!!
We are having the same incidents over & over!



From a management system failure, what is the difference between a Tier 1 & Tier 4 event?

Why Risk Based Process Safety?

Avoidance of major losses – people and property

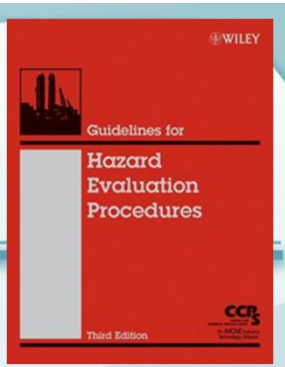
- Creation of positive business value
- Provides a license to operate
- Freedom to manage the business

A Risk-Based Process Safety Management System

Goal: To design, implement, correct, and improve process safety management activities based on consideration of the risk exposures.

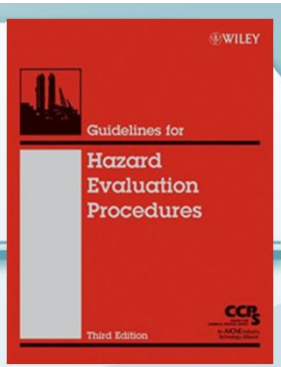
- A risk-based process safety management system allocates resources for specific business processes, implementation tactics and activities commensurate with the process safety risk exposures.
- Risk-based analysis and decision making need to be core competencies.

Comparison



CCPS	OSHA
• Commit to Process Safety	
– *Process Safety Culture*	
– Compliance with Standards	⟵ RAGAGEP
– *Process Safety Competency*	
– Workforce Involvement	⟵ Employee Participation
– *Stakeholder Outreach*	
• Understanding Hazards & Risks	
– Process Knowledge Management	⟵ Process Safety Information (PSI)
– Hazard Identification & Risk Management	⟵ Process Hazard Analysis (PHA)
– **(No CCPS Element)**	⟵ Trade Secrets

Comparison



CCPS	OSHA
Manage Risk	
– Operating Procedures	← Operating Procedures
– Safe Work Practices	← Hot Work Permit
– Asset Integrity & Reliability	← Mechanical Integrity
– Contractor Management	← Contractors
– Training & Perf. Assurance	← Training
– Management of Change	← Management of Change
– Operational Readiness	← Pre-startup Safety Review
– *Conduct of Operations*	
– Emergency Management	← Emergency Planning
Learn from Experience	
– Incident Investigation	← Incident Investigation
– *Measures & Metrics*	
– Auditing	← Compliance Audit
– *Management Review & Continuous Improvement*	

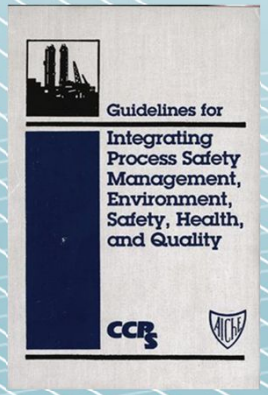
No Matching OSHA Elements for Six RBPS Elements – CCPS vs OSHA

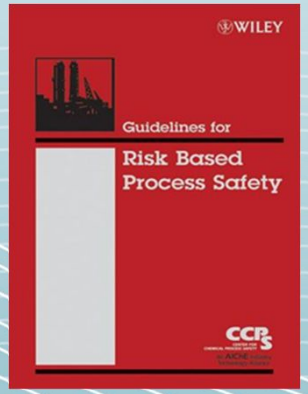
- *Process safety culture*
- *Process safety competency*
- *Stakeholder outreach*
- *Conduct of operations*
- *Measures & metrics*
- *Management review & continuous improvement*

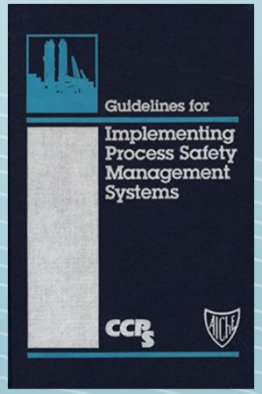
The Bottom Line is The Bottom Line -Integrating Management Systems is Good Business

"For risk based process safety (RBPS) to work most effectively, companies should integrate it practices with elements of other management systems so that RBPS is totally consistent with manufacturing operations; safety, health, an environmental controls; security; and related technical and business areas."

Source: AIChE CCPS Guidelines for Risk Based Process Safety, page ii (2007)







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What's New at CCPS?

CCPS Certified Process Safety Professional

Launched April 10, 2016

AIChE Process Safety Workshop for University Faculty

Purpose: To provide an introduction to engineering faculty on how process safety impacts the management, design and operation of a chemical plant.

Outcomes: The workshop will enable faculty to teach process safety in their undergraduate and graduate curricula so that graduating students will have a basic understanding of process safety for their careers in industry.

Scope: The course will provide an overview of basic concepts in risk management systems and technical competencies required to prevent loss of containment of highly hazardous chemicals and materials.

Target Audience: All faculty in chemical, biochemical, materials, and mechanical engineering.

- **Workshop Duration: 3 days**
- **Expected # of Attendees: 20-30 faculty**
- **Total Cost: $40K**

AIChE Students Process Safety Boot Camp

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Purpose: To provide an introduction to engineering students on how leading companies across a variety of chemical process industry (CPI) sectors manage Process Safety so as to prevent catastrophic accidents involving toxic, highly reactive, and flammable materials.

Scope: The course will provide an overview of basic concepts in risk management systems and technical competencies required to prevent loss of containment of highly hazardous chemicals and materials.

Target Audience: Undergraduate students in their junior or senior year and graduate students in chemical, biochemical, materials, and mechanical engineering who hope to work in CPI process/plant design and manufacturing operations in the oil and gas/refining sectors, food manufacturing/storage, commodity chemicals and polymers, pharmaceuticals / nutraceutical, pulp and paper, or specialty chemicals sectors.

- **Boot Camp Duration: 2 days**
- **Each Boot Camp instructor has over 30 years of experience in the chemical, petrochemical, food or pharmaceutical industries**
- **Expected # of Attendees: 20-30 students**
- **Total Cost: $25K**

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THANK YOU VERY MUCH

FOR MORE INFORMATION
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