ABS Group

Ten Years of Living Risk Based Process Safety

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Steve Arendt, P.E., Vice President - Global Oil, Gas, and Chemicals

- 40 years in process safety and risk assessment
- Conducted 100s of PSM system design/implementations, audits, incident investigations, HAZID/HAZOP/LOPA/QRAs, best practice reviews, and safety culture evaluations
- ABS Group manager for the BP-Baker Panel PSM reviews
- 80+ articles and books on PSM and risk management, including CCPS Guidelines on
  - **Risk Based Process Safety**
  - **Implementing PSM, 2nd edition**
  - **Management of Change**
  - **Guidelines for Hazard Evaluation Procedures, 2nd Edition**
- CCPS Fellow and recipient of MKOPSC Merit Award

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Discussion Outline

- RBPS background
- Essence of RBPS
- Ways RBPS has been used
- Misconceptions, misuse and possible future improvements
- Closing remarks

RBPS Background

- CCPS published its original 12 PSM elements in 1989 and followed it with 3 other management system books thru 1994
- A lot of experience and lessons were learned from then thru 2005; CCPS wanted to update its PSM framework to be useful to industry as a thought and action leader for the next 20 years
- RBPS came about for two reasons:
  - **To be able to generate better results with fewer resources**
  - **To provide a "target" and an approach for companies of all needs to implement, correct, and improve PSM systems**

RBPS Development Process

- 20 subcommittee members representing the process industry
- 16 peer reviewers
- 2+ year effort that:
  - Surveyed PSM/ESH systems from around the world to identify good features
  - Benchmarked with over 60 companies in three workshops to compile leading practices, improvement idea, and metrics
- 760-page guideline written by a team from ABS Consulting

RBPS Subcommittee and Co-Authors

Subcommittee

Jack McCavit	*CCPS Emeritus, Committee Chair*
Bob G. Perry	*Center for Chemical Process Safety*
Don Abrahamson	*Celanese Chemical*
Steve Arendt	*ABS Consulting*
Tim Blackford	*Chevron Energy Technology Company*
John Herber	*3M Company*
Dan Isaacson	*The Lubrizol Corporation*
Shakeel Kadri	*Air Products and Chemicals, Inc.*
Greg Keeports	*Rohm and Haas Company*
Jim Klein	*DuPont*
Pete Lodal	*Eastman Chemical Company*
Bill Marshall	*Eli Lilly and Company*
Darren Martin	*Shell Chemical Company*
Neil Maxson	*Bayer Material Science*
Lisa Morrison	*BP*
Karen Tancredi	*DuPont*
Tony Thompson	*Monsanto Company, Retired*
Scott Wallace	*Olin Corporation*
Roy Winkler	*INEOS Olefins and Polymers USA*
Gary York	*Rhodia, Inc., Retired*

Co-Authors

Steve Arendt
Bill Bradshaw, *Project Manager*
Walt Frank
Don Lorenzo
Lee Vanden Heuvel

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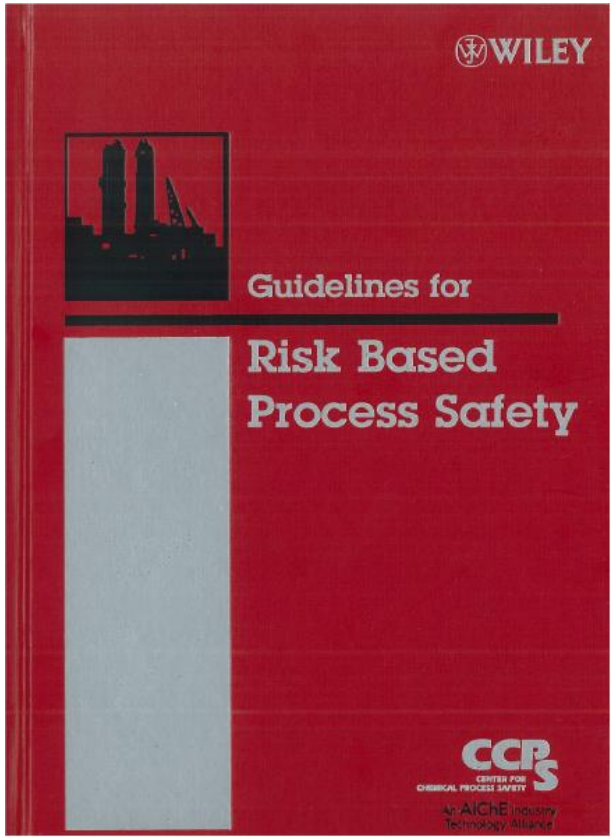
Guidelines for *Risk Based Process Safety*



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The Essence of Risk Based Process Safety

- Management systems should be the simplest that they can be while still being fit-for-purpose
- Consider the following when determining management system “rigor”
  - **Perception of complexity, hazard, and risk**
  - **Demand for the system results and the resources required to deliver them**
  - **Current company/facility culture**
- To design, correct, and improve process safety management activities
- RBPS elements can be used throughout the company, plant or project life-cycle

RBPS System Element Resources

- Element
  - **Key Principles**
    - Essential Features
      - **Possible Work Activities**
        - Implementation Examples
          - **Performance Improvement Practice**
          - **Efficiency Improvement Practice**
      - **List of metrics – LEADING and lagging**
      - **Management review items**

RBPS Elements – Relationship to OSHA PSM

RBPS Element	New Element	Expanded Scope	Improved Practices
Process Safety Culture	✓		
Compliance to Standards	✓		
Process Safety Competency	✓		
Workforce Involvement		✓	✓
Stakeholder Outreach	✓		
Process Knowledge Management		✓	✓
Hazard Identification and Risk Analysis		✓	✓
Operating Procedures			✓
Safe Work Practices			✓
Asset Integrity and Reliability		✓	✓
Contractor Management			✓
Training and Performance			✓
Management of Change		✓	✓
Operational Readiness		✓	✓
Conduct of Operations	✓		
Emergency Management			✓
Incident Investigation			✓
Measurement and Metrics	✓		
Auditing			✓
Management Review and Continuous Improvement	✓		

Applications of RBPS during First 10 Years

- Ways that RBPS has been used
- Most frequently adopted new elements/practices
- Most under-used elements and practices
- Uncertainties from companies about how/whether certain PS aspects are addressed
- Ideas on how to improve RBPS framework and approach

Ways that RBPS Has Been Used

- Improve/optimize HSE/PS Management Systems
  - Design/implement new system
  - Add new elements/upgrade existing elements with new element activities
  - Fix broken system – metrics, work activities and implementation options
  - Improve existing system – improvement and Management Review ideas
- As primary PSM framework
- As a Process Safety competency training program framework
- As best practice assessment/audit protocol
- As organizational culture assessment basis
- Basis for RCA structure
- Built detailed key process workflow diagrams
- Translated into other languages – Portuguese, Spanish, Chinese
- Other applications? - Benchmarking Risk Based Process Safety Egg (RBPS Temple + 2 Universes) Against "The Art of War"

Most Frequent

Occasional Use

Rare

Misconceptions/Uncertainties

- Use of "max" implementation options as basis for audit protocol
  - Elements Possible Work Activities were defined with a range of implementation option from minimal to very detailed
  - Some who developed audit protocol used the most detailed option as the implementation standard for determining nonconformance – not taking into consideration the hazard/risk/complexity, resources and culture needs of the specific company/plant circumstances
- How leadership commitment is addressed in RBPS – part of culture element
- How Human Factors is addressed in RBPS – put into relevant elements, not as a single “cross-cutting” element by itself
- Use of “all/many” element metrics provided in ach element chapter

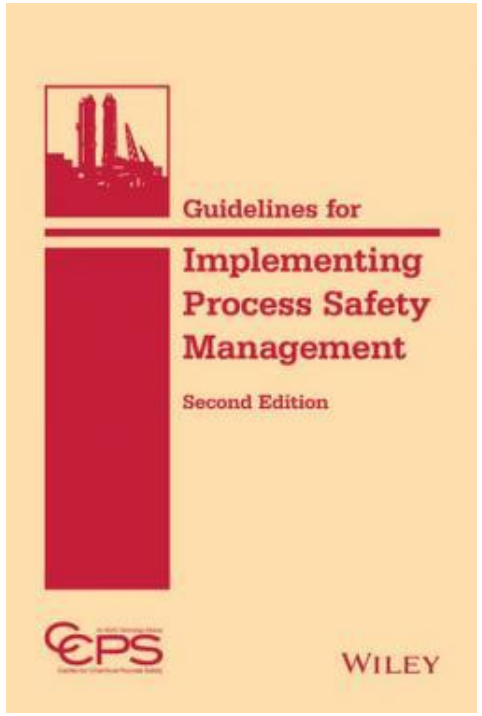
Underused Elements/Aspects

- Process Knowledge Management – applying for knowledge
- Stakeholder Outreach
- Conduct of Operations (CONOPs)
  - For explicit list is areas where workforce Operational Discipline is key
  - Especially for management operational discipline
- Efficiency improvement ideas contained in each element chapter
- Develop a key process/workflow for each HSE/PSM element using RBPS work activities as design toolbox
  - Good for a specific company or facility
  - Difficult for an industry/organization to if need “spectrum” in broad

Improvement Ideas for the RBPS 2nd Edition

- Update/streamline leading indicator metrics
- Update performance improvement ideas
- Update efficiency improvement ideas
- Address Cybersecurity and resilience somehow – other new elements?
- More explicit use for design organizations and capital project management
- Direct toward use as a means for achieving Operational Excellence
- When will RBPS 2.0 be needed?
  - Probably not for a few years; the current edition is “still being discovered” by certain regions and industries

CCPS Guidelines for *Implementing PSM 2nd Ed*



Laundry

- Commit to Process Safety
- Understand Hazards & Risk
- Manage Risk
- Learn from Experience

RBPS Design Criteria

- Hazard/complexity/risk
- Resources
- Initial culture

Elements

- Key principles
- Essential features
- Work activities
- Implementation options
- Improvement ideas
- Metrics and MR

Gas Station

- Safety information
- Hazard analysis/JSA
- Procedures
- Training
- Emergency
- Investigation
- Audits

Low Hazard/Simple

- Ensure management cares/resources
- Ensure employees care
- Demonstrate stakeholder commitment

- Know what you operate
- Reduce or eliminate hazards
- risk
- idual risk

- Know how to operate
- Know how to maintain
- Control changes
- Prepare/respond/manage incidents

- Monitor/act on internal learning
- Monitor/act on external sources

High Hazard/Complex

- Culture
- Standards
- Competency
- Involvement
- Outreach

- Knowledge
- Hazards/Risk

- Procedures
- SW Practices
- Integrity
- actors
- Performance
- MOC
- Readiness
- Discipline
- Emergencies

- Investigations
- Metrics
- Auditing
- Management Review

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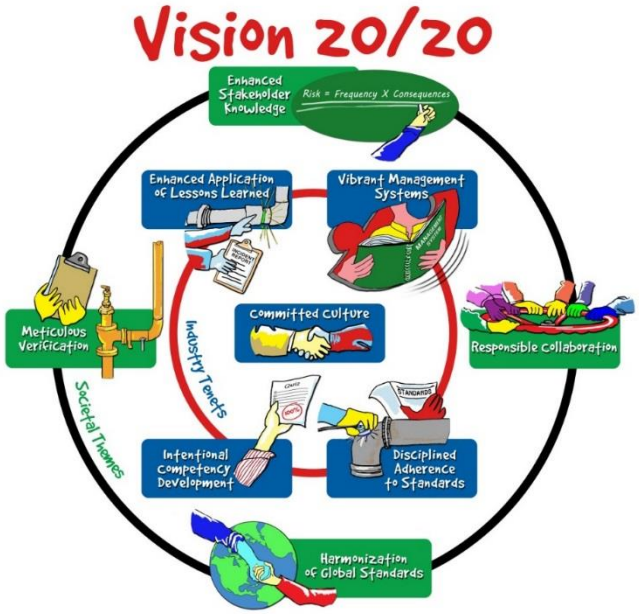
VISION 20/20 | CCPS

An AIChE Technology Alliance

Center for Chemical Process Safety



- **Industry Tenets**
- Committed culture
- Vibrant management systems
- Disciplined adherence to standards
- Intentional competency development
- Enhanced application and sharing of lessons learned

Societal Themes

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

Assessment Tool

Vision 20/20, developed by the Center for Chemical Process Safety (CCPS), 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 the five industry tenets; and enhanced by the four global societal themes.

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Implementing the Industry Tenets…

Prepare	Assess	Plan	Perform	*Achieve*	Sustain
Present V20/20 to PSM Colleagues and Management	Complete the V20/20 Assessment Tool	Reinforce and Use Strong Elements as Building Blocks	Implement Action Plans	Complete Action Plans	Verify Management System Improvements
Make V20/20 a Regular Topic at PSM-Related Meetings	Identify Weak and Strong Sub-Elements (<2.5 or >3.5 Respectively)	Identify the Specific Improvements Needed	Monitor Status of Action Plan Implementation	Re-Assess V20/20 Implementation Status with the Assessment Tool	Develop Action Plans for Weak Sub-Elements and Individual Items
"Sprinkle" V20/20 into PSM Conversations	Report Results; Management Commits to Improve	Research Options to Improve (Reference Industry Documents)	Evaluate Effectiveness of Actions	Report & Celebrate Improvements	Implement Action Plans and Monitor Performance
Use V20/20 Logo on Internal Communications	Communicate Results Within Organization	Develop Specific Action Plans to Address Weak Areas	Capture & Communicate Learnings	Identify New Weak Sub-Elements and Weak Individual Items (<2)	Continual Improvement… Continue the Journey!

Today → *2020*

RBPS Trivia

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Index Terms	219
Improvement Ideas	306
Metrics	319
Essential Features	319
Work Activities	622
Pages	760
Implementation Options	2,042
Paragraphs	9,017
Lines	29,604
Words	254,233
Characters	1,450,964
Spaces	1,703,022
MSWord File Bytes	5,253,632
Priceless	RBPS source

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Dedication

Guidelines for Risk Based Process Safety

Dedicated to the memory of

Lester H. Wittenberg
1929 – 2002

Les was among the first employees of the Center for Chemical Process Safety and was a major contributor to its success. All who knew and worked with Les remember him for his knowledge, his courage, and for his love of life. Although he is gone, his smile is still with us.

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Closing Comments

- Use RBPS to help “Manage generational change” in Process Safety
- Rediscover use of the RBPS toolbox
- Recommend CCPS implement online RBPS use/needs survey for near future to capture needs and improvement ideas for RBPS 2.0 or …whatever…

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