

Summary Comments and Overview of Stakeholder Perspectives

Process Safety Management (PSM) Roundtable

Center for Risk Management and Decision Processes
The Wharton School of the University of Pennsylvania

April 22, 2004

- 1) Subject was “Designing and Auditing Management Systems for Safety, Health and Environmental Risks Related to Chemical Processing.” (See Final Agenda attached.)
- 2) The Roundtable dealt with the issue that although there is general agreement that by far the largest root cause of Major Chemical Process Safety Accidents is inadequate process safety management systems, there is no accepted operational definition of what constitutes an “adequate” process management system. Unfortunately, while the CCPS defines the elements of what are believed to be an adequate Process Safety Management System, and EPA RMP and OSHA PSM regulations are based on the CCPS elements, these regulatory requirements are not operationally defined. Therefore, a company’s management system can meet RMP perfunctory requirements and still be inadequate.
- 3) The morning session featured presentation of 2 Process Risk Management approaches by companies that are considered to have above average process safety performance: Dupont and Rohm and Haas. Both presentations addressed the subject well and the Dupont material and presentation was exceptionally thorough and detailed. The subsequent Roundtable discussion revealed that the attendees felt that the elements of both of these companies’ plans had many similar features, though the emphasis in the two plans and their execution was somewhat different.
- 4) The afternoon session featured two presentations that were aimed at addressing the following question: Are ISO, 3rd party, Responsible Care audits or other tools available that would allow stakeholders such as the local public, insurers, government regulators, etc. to arrive at a sound judgment about the effectiveness with which a facility is managing its LP-HC process safety risks?
- 5) Unfortunately, the answer appears to be that no such demonstrated Audit Tools are available, though the CCPS “Pro-Smart” tool appears to be promising. The Risk Center believes that because major process accidents are LP-HC events, an epidemiological approach is the probably the best way to establish what are the essential elements of an effective risk management plan and the validity of an audit tool to distinguish between effective and ineffective plans. Therefore, the Risk Center is developing and seeking support for this epidemiological research objective, in partnership with various parties at this Roundtable. Stay tuned for results on our research on Chemical Process Safety Management systems on the Center Website <http://opim.wharton.upenn.edu/risk/info.html>.

Points Made by Various Stakeholder Groups

The last session of the day was concerned with responding to the basic question of the day on the possibility of specifying a management system standard for process safety which would be effective in promoting process safety and whose assurance could be determined by a properly designed audit. This general issue was addressed by four different groups of stakeholders at the Roundtable. The summary comments of each group are as follows.

Regulators (both Federal and State)

1. As to effective management systems, you know it when you see it.
2. There is no way to judge all programs– no one has detailed enough knowledge in all areas to specify in advance the requirements for process safety and to determine an appropriate audit tool to assure all aspects have been met.
3. A key issue from an audit point of view, beyond compliance with existing regulations, is where is the company not doing what it says it is doing?
4. On the performance dimension of management systems, a tailored system, by sector and by process, is appropriate, getting more sophisticated over time.

Supporting Organizations, Consultants and Audit Service Providers

1. Audits are only one of several inputs, and they have to be considered as part of an overall strategy for managing process safety
2. Lagging and leading indicators are critical in both management issues as well as informing operating personnel of what to watch
3. One of the emerging trends is the construction of a “threat index” which attempts to measure the interaction of operational variables such as capacity utilization and complexity of current operations, and use these as specific indicators of where threats may be higher or lower (e.g., simultaneous drilling and production, construction at the same time as operation, operating close to rated capacity). Such an index would, of course, be dynamic as operating conditions change over time
4. Many specific issues were highlighted today, including the basic drivers of process safety such as mechanical and process integrity; we need to keep these well understood factors clearly in focus as we move to more complicated models and management systems.
5. What may be emerging as a research prospect is the possibility of “risk-based operations” in which dynamic risk indices, such as the “threat index” noted above, are integrated with process safety and operations.

Insurance and Risk-Management Professionals

1. There is a continuing and real need for audits (of various types)
2. The key element we look for is whether a management/employee commitment to PSM exists.
3. One of the largest challenges facing many facilities is the management of change process, including changeover operations, ramp-ups, and especially the integration of new procedures that may arise under mergers and acquisitions
4. Loss prevention is frequently overlooked, and often insurance and risk management functions are separated from loss prevention and operational functions.
5. There is a need to integrate loss prevention across (1) workers, community, property; (2) the extended supply chain (stewardship).

Industry

Goal: More \$, less uncertainty, reduced risk

1. Improve the performance and effectiveness of existing auditing systems
2. Start experimenting with leading indicators – find some more real-time barometer for determining how close to the edge you are
3. Integrate data collection and analysis efforts for performance indicators
4. Calibrate leading indicators with actual performance and audit results
5. Find creative means to communicate performance results in useful ways to decision makers and external stakeholders
6. Determine and evaluate a nested set of learning opportunities for a facility and company

Closing Commentary

Howard Kunreuther (Co-Director, Wharton Risk Center)

This Roundtable has underscored the need to recognize that PSM is part of an enterprise risk management system. In particular, in undertaking PSM we need to be cognizant of the linkages between risk assessment, risk perception and risk management.

Risk Assessment

- Limited data available---need to learn at the lower levels
- Importance of obtaining precursor data---near miss data (Steve Arendt)
- Need a PSM metric “If it can’t be measured it can’t be managed well” (Dave Cummings)
- Q: What role does probability play in the PSM analysis and how does it link with consequence analysis? (Cf. HAZOP, fault tree analysis and failure modes)
- Interdependencies and the role that it plays (e.g. look at partnerships as in the Bhopal example)---Paul Snyder
- Security vs. Process safety (Complementarity vs. competition for resources)

Challenge: Getting better data and analyzing it

- OSHA Fatality Catastrophe Inspection Data (What are true trends?) (Mike Marshall of OSHA underlined this point in his luncheon discussion)
- New RMP Data base (1999-2004)
- Constructing Exceedance probability (EP) curves with confidence intervals

Risk Perception

- How do individuals/managers/public sector organizations perceive the risk?
- How can information be conveyed to firms and regulatory agencies about what activities are currently underway re PSM? (framing makes a difference)
- What role can associations play in conveying information to others?

Risk Management

- Role of inspections as an important element of a PSM (Steve Arendt)
- Auditing systems and the roles it can play
- Certification systems (Role of BEAC/ACC) (Jim Ball)
- Insurance as an economic incentive and signal for safety
- Importance of public private partnerships

Open Questions

- How can we utilize the new RMP database for evaluating and improving PSM?
- What are the appropriate roles of insurance and 1st, 2nd and 3rd party inspections and audits?
- What are the differences between good and poor systems and what criteria should we use to judge good performance systems?
- How can we determine Type I and Type II errors and their costs as part of the PSM process?
- What is the appropriate role of regulations and standards as part of the PSM process and how can they be well enforced through public-private partnerships? (i.e. role of third party inspections, audits and insurance).
- What type of interdependencies exist that need to be considered in PSM?
- What are the appropriate tradeoffs that should be made in developing PSM systems?
- How can we improve learning from past data and past experience (process safety enhancement)?
- What roles can trade associations play in dealing with PSM (e.g. ACC)?

Wharton Risk and Decision Processes Center
ROUNDTABLE DISCUSSION
April 22, 2004 - Room 351 Steinberg-Dietrich Hall

**Designing and Auditing Management Systems for
Safety, Health and Environmental Risks Related to Chemical Processing**

8:30 am **Continental Breakfast**

9:00 am **Welcome and introductions** Howard Kunreuther, Risk Center and Craig Mattheissen, Associate Director of OEPPR, EPA

9:20 am **Introduction of morning presentations and some issues in regard to Process Safety Management Systems.** Irv Rosenthal, Risk Center

1. What factors and system elements have the greatest overall impact on the effectiveness of a company's Process Safety management systems?
2. How do Process Safety and Terrorist Security management systems interact?
3. What tools can a company use to distinguish between effective and ineffective deployment of its process safety management in facilities and processes?
4. What is assumed to be the relationship between management systems and the root causes of process accidents?
5. What factors and system elements in the management system are meant to address the concerns of regulators? Insurers? The local public? Other external stakeholders?
6. Is a 'sound' management system sufficient for ensuring good process safety outcomes? If not, what else is necessary?

9:40 am **Presentation on DuPont Process Safety Management System.**
David E. Cummings, Program Manager, Process Safety Management

10:30 am **Break**

10:45 am **Presentation on Rohm & Haas Process Safety Management System.** Gregory L. Keeperts, Director, Hazard Analysis and Environmental Engineering

11:35am **RoundTable Discussion of Mornings Presentations:** Peter Schmeidler, Risk Center

1. Are the issues and questions raised earlier this morning to stimulate your listening really pertinent?
2. Did the presentations alter previous beliefs?
3. What aspect of each of the two management systems exceeded your expectations? Did not meet them?

- 12:05 pm **Box Lunch: Talk by Richard Fairfax, Director of the Directorate of Compliance Programs, OSHA following introductory remarks by Richard Soltan, Regional Administrator, OSHA**
- 1:10pm **Introduction of afternoon presentations and some issues in regard to auditing Process Safety Management Systems.** James C. Belke, Civil/Environmental Engineer, OEPPR
1. Are there process safety management system audit procedures that will result in two trained auditors arriving at similar ratings of effectiveness about 90% of the time using a rating scale of either Satisfactory or Unsatisfactory?
 2. What new knowledge might be obtained from an epidemiological study of the relationship between the likelihood of a facility having a major accident (RMP*INFO Reportable event) and the quality of its process safety management system?
 3. Are ISO, 3rd party, Responsible Care audits or other tools available that would allow stakeholders such as the local public, insurers, government regulators, etc. to arrive at a sound judgment about the effectiveness with which a facility is managing its LP-HC process safety risks?
- 1:30pm **Audit tools to evaluate the implementation and effectiveness of ISO 14000 Process Safety Management systems.** Jim Ball, Board of Environmental, Health, and Safety Auditor Certifications (BEAC)/Ashland
- 2:15pm **Break**
- 2:30pm **Presentation on use of the CCPS ProSmart audit tool to evaluate the implementation and effectiveness of facility process safety management systems.** Steve Arendt, ABS Consulting
- 3:15 pm **RoundTable Discussion of Afternoon Presentations** Paul Kleindorfer, Risk Center
1. Did the presentations alter previous beliefs?
 2. Could one use either audit tool discussed this morning to identify effective Process Management Systems?
 3. What additional insights did the afternoon's presentations offer on the value of an epidemiological approach using RMP data add to solving the problem of identifying effective process management systems?
 4. What role should the public sector play in the development of effective risk management strategies?
- 3:45pm **Discussion of Conclusions Drawn by Roundtable Participants** Howard Kunreuther and Irv Rosenthal
- 4:15 pm **Close**

Wharton Risk Management & Decision Processes Center
**“Designing and Auditing Management Systems for Safety, Health and
Environmental Risks Related to Chemical Processing”**

April 22, 2004

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