

Key Strategies for Successful Process Safety Management

Della Wong & Reid McPhail, Aon Reed Stenhouse Inc.

CSCHE 2004 PSM Conference

October 3-6/2004

Calgary, AB

In many chemical manufacturing facilities, Process Safety Management (PSM) has fostered an ethic of stewardship for safe and reliable operation. Many of these facilities believe that the link between sustainable operation and hence, protection of shareholder value, lies with a good Loss Prevention / PSM program. They believe that integration of PSM into their company's operation is the key to their competitive positioning and to their ability to achieve long term strategic objectives. In today's economy of financial constraints, partnerships and increasing regulations, many of these same companies are re-evaluating their systems and are asking questions such as, "how can we reduce our loss exposures?", "what are the traits of a good PSM system?", "why are we not more effective in delivering Process Safety results?" and "where do we not excel at PSM?". These questions are all valid in the pursuit of continuous improvement as we meet the business challenges ahead. Examples of different systems will be brought forth to illustrate how Process Safety is applied to a range of management philosophies.

In the 1980's, there was one landmark process safety incident that rendered changes that manifested changes in Engineering approaches towards Process Design of Plants in the Chemical industry. The Bhopal India incident where 25 tons of methyl isocyanate was accidentally released to the atmosphere imposed financial damages and long term health impacts long after the chemical was isolated and back in containment. Shortly thereafter, Process Safety Management and Loss Control Engineering became a recognized requirement in chemical operating companies. This specialization of engineering is actually a multidisciplinary function which crosses electrical, civil, mechanical and chemical.

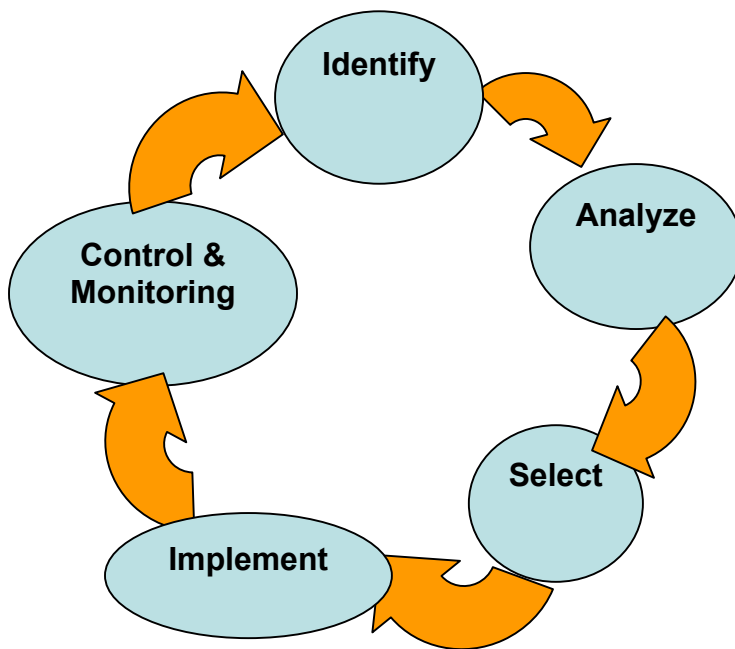
Gerry Phillips, Vice President of CsChe's PSM division has said that Process Safety Management boils down to the company's Management of Change (MOC) program and is succinctly defined by their "Operational Safety" status. The core Process Safety Management program must address the 68 components of Process Safety in order to address Process Safety risks. These components define what is typically known in industry as the 12 elements of Process Safety Management and therefore, give detailed guidance in identifying the characteristics of each of the 12 elements.

The question of how good a facility may be at PSM, can be determined by utilizing the Hazard Self Assessment tool available on the CsCHE website. This tool is a factor to be considered. As companies move away from compliance targets and towards performance criteria, process safety related incidents should decrease. By taking the Assessment,

chemical companies can identify hot spots / issues readily. This would be the first step in the PSM cycle (as in Figure 1).

An effective PSM program is deemed 'Excellent' when all 68 components can be shown to move through the management cycle as depicted in Figure 1. There are 5 steps for deploying an effective PSM program. The first step is to identify the PSM program status. This requires Management's commitment. In the next step, analysis of the shortfalls coaches the company to place appropriate resources to improve select areas. Implementation of a strategy directs plant personnel into changing the status-quo. Continuous improvement may appear incremental but the long term rewards are exponential because the culture of PSM becomes transparent.

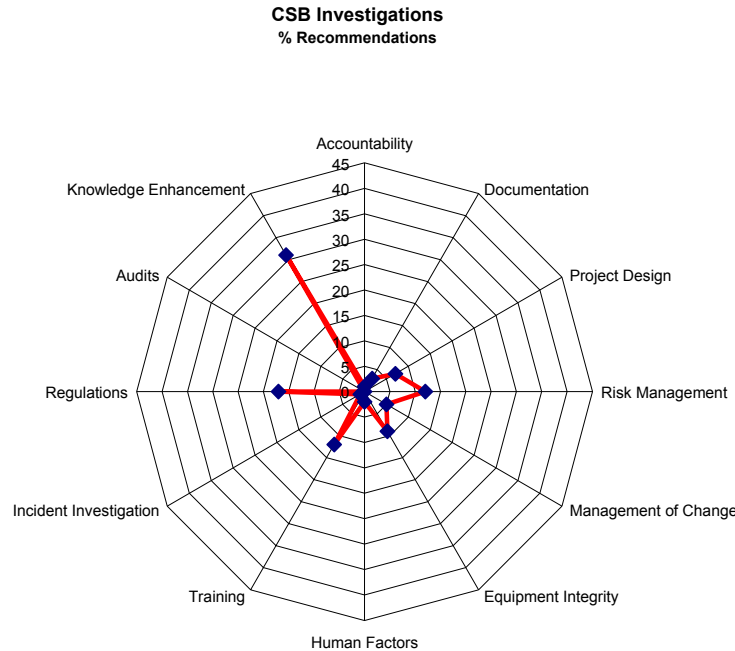
Figure 1



We found that the Risk Management Lifecycle generally works well at the engineering project level post-EDS, i.e., the detailed engineering level. This may well be a result of HazOp (a hazard review method) being ingrained into Engineering Design over the past 20 years. However, companies also need to utilize this lifecycle process at a higher level, at an Enterprise Risk level. This is in effect, a high level portfolio overview of the operating company's process risks to ensure the inherent risks continue to be monitored. There is a cliché, "can't see the forest for all those trees" which may help provide an analogy to the hypothesis. The effort of managing all the process risks of each individual tree may appear complete because of all the minute, tedious details associated with each tree. However, companies can easily miss the enterprise risks imposed by the accumulation of the trees.

If we review fairly recent U.S. Chemical and Safety Investigation Board cases, it is interesting to see that communication of process risks is the most frequent shortfall. In Figure 2, although all of the 12 key elements appear as causation components in their incidents, there is a clear need at the ‘forest’ level, to educate people on process safety hazards.

Figure 2¹



Loss prevention skills have simply got to become a commodity rather than a rarity.

Dissemination of process safety information is only one of the 12 PSM elements. PSM requires management of all 12 elements. Here is an example of a company who lacked a preventive maintenance (PM) program (another element) for all their equipment², when their vacuum dryer exploded. As part of the company’s operations, granular benzoyl peroxide had to be dried. This was conducted in a vacuum dryer that was not included in their PM program.

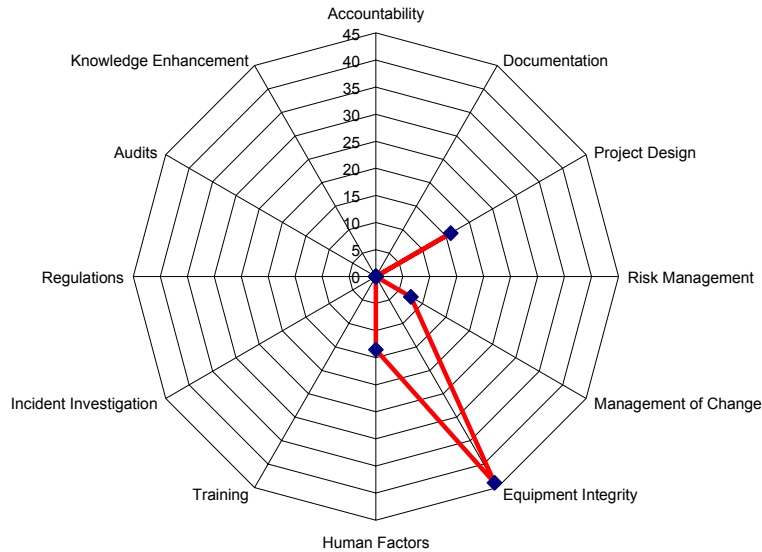
This PSM element requires significant attention as it also appears as a significant contributor in a Canadian process related incident database. Process Related Incidents Measure (PRIM) is a tool available for operating companies to record their PSM performance. This is a method to track lagging indication of PSM performance. The PRIM data (see Figure 3) shows that membership Canadian firms are attributing 40% of process safety related losses to a deficiency in their Mechanical Integrity program.

¹ U.S. Chemical and Safety Hazard Investigation Board, Completed Investigations, 1998 – August 2004

² Catalyst Systems Inc., Benzoyl Peroxide Explosion

Figure 3³

PRIM Data 2003
% Root Cause



Extension to more detailed material is especially important in making fully informed decisions. Benchmarking within your own firm and against those in the same industry provides an assessment scale with respect to PSM. An inventory of your PSM program against the 68 components by listing the program, process, tools, training and guides help companies make intelligent, informed and rational decisions with respect to Loss Control.

In conclusion, we see the best PSM companies having these attributes:

1. Process Safety Champions who affiliate themselves with multiple disciplines (e.g., EHS, Engineering, Operations, Insurance) to work collaboratively,
2. Functionally having 2 platforms to identify, analyze, select, implement, control & monitor process; i.e., worst case (top down) and more frequent events (bottom up),
3. Regularly conduct reviews of their PSM program against the 68 components (e.g., benchmark, audits) utilizing the Risk Management Lifecycle, and
4. Especially promote risk engineering at in the conceptual engineering design phase.

References

³ Process Safety Management Committee, 2003

1. U.S. Chemical and Safety Hazard Investigation Board, Completed Investigations, 1998 – August 2004.
2. U.S. Chemical and Safety Hazard Investigation Board, Fire and Explosion No. 2003-03-C-OH.
3. Process Safety Management Committee, CCPA, PRIM database, 2003.