

The Growing Demand for Process Safety Management in Malaysia



by Ir. Abdul Aziz bin Salim

PROCESS safety's main objective is basically to prevent fires, explosions and accidental chemical releases in chemical process facilities or other facilities dealing with hazardous materials such as refineries, and oil and gas (onshore and offshore) production installations.

History has recorded many catastrophic process accidents such as the 1974 Flixborough explosion where 28 people were killed, the 1984 Bhopal leak where 2,259 people were killed, the 1986 Chernobyl leak where more than 4,000 people were killed and the recent Fukushima nuclear leaks. These accidents alone are enough to remind us just how important process safety management (PSM) is.

The occupational safety and health (OSH) law enforced in this country (OSHA 1994) covers mainly the general aspects of safety management, and primarily focuses on the duty of the employer, employee and other parties. In industries where highly hazardous chemical processes are involved, the OSH management alone may not be sufficient to address the issues (even though at times, well developed management safety systems may do so).

The tools, techniques and programmes required to manage both the process and occupational safety can sometimes be the same (for example, a Work Permit system), while in other cases, it may have very different approaches. For example, LOPC (Loss of Primary Containment) or QRA (Quantified Risk Assessment) focuses on process safety, whereas Personal Protective Equipment (PPE) or Operating Procedures (OP) is very much an occupational safety issue.

ELEMENTS OF PSM

Within its PSM regulations, OSHA (US) lists 14 separate elements:

1. Employee Participation
2. Process Safety Information (PSI)
3. Process Hazard Analysis (PHA)
4. Operating Procedures (OP)
5. Training
6. Contractors
7. Pre-Startup Safety Review (PSSR), also known as PASR
8. Mechanical Integrity (MI)
9. Hot Work Permits
10. Management of Change (MOC)
11. Incident Investigation
12. Emergency Planning and Response (ERP)
13. Compliance Audits
14. Trade Secrets or Proprietary Licenses
15. Technology Assessment (PLTA)

Out of these 14 elements, some aspects or elements have already been incorporated into the existing OSH management systems practised by the industries concerned. These elements are employee participation, training, contractors, hot work permits, incident investigations, ERP and audits.

This leaves behind seven elements. And by adding the element of Design Integrity (DI), this makes a total of eight elements which are used or adopted by most organisations when it comes to PSM implementation.

A most important or crucial PSM element is the Process Hazard Analysis, or PHA. A PHA is basically a systematic evaluation of the hazards involved prior to initiation of a process, and should be carried out at least once every five years thereafter or whenever there is a change in the process. The evaluation team should be multi-disciplinary, and include maintenance, operations and engineering.

There are various methods that can be used to conduct a PHA including the What-if, Hazard and Operability Studies (HAZOP), and Failure Mode and Effect Analysis (FMEA). The method selected will depend on the maturity of the process and operational experience in addition to the process size and complexity. The facilitator of the PHA must be trained in the methodology being used. That person can then select the method which he or she finds suitable within that particular industry.

The next important element is the Process Safety Information (PSI). For a proper conduct of PHA, the PSI must be as complete as possible. Under this element, complete and accurate written information concerning process chemicals, process technology and equipment should be prepared. Process technology includes Process Flow Diagrams (PFDs), Piping and Instrumentation Diagrams (P&IDs), operating and storage conditions as well as operating procedures and operating history. Process equipment information should include the underlying codes and standards relied upon.

PROCESS SAFETY INCIDENTS

In our country, the incidence of process safety-related accidents is considered low. However, in recent years, a number of process safety-related incidents have occurred and have been investigated by the Department of Occupational Safety and Health DOSH (Table 1). These incidents show us that there are some weaknesses in the PSM being implemented. The PSM aspects that are seen to be of concern are PHA, MI and OP.

Table 1: Illustration for the type of process safety incidents investigated by DOSH in recent years

No	Aspects of PSM Concerned	Incident Summary
1.	PHA,MI	Fire started from leaking pipeline caught from hot equipment nearby.
2.	OP, PHA, Mi	Pipelines on fire during depressurisation.
3.	DL,MI	Fire in a reactor process unit.
4.	PLTA, OP, PHA	Vessel containing chemical compound experienced exothermic reaction thus causing the pressure to build up and explode.
5.	OP, PHA	Furnace experienced external fire due to positive draft.

While the importance of PHA has already been discussed, MI requires employers to have a written programme to ensure the integrity of processes and equipment.

Aspects include listing applicable equipment, training maintenance personnel, inspection and testing, and the maintenance of systems such as controls, vessels, piping, relieve valves and emergency systems. Any development and modification to the mechanical integrity programme should be made based on operational experience, relevant codes and industry standards.

The OP, on the other hand, includes not only the steps for normal operations, but also for upset conditions, temporary operations, start-up and shutdown when most of the incidents are likely or prone to occur. More importantly, safety information must also be included in operating procedures. Such information includes the basic hazards of exceeding operational limits, appropriate response to upset conditions, safety and health information, and emergency operations. The procedures need to be revised regularly.

CURRENT SCENARIO OF PSM

DOSH has conducted preliminary audits on the chemical process industry. From this survey, it was found that, for multinational companies, they have already embarked on PSM quite convincingly whereas others are still lagging behind and lack the right knowledge and expertise. It is common for the process owners surveyed to assume that PSM is adequate by doing or conducting HAZOP without understanding that it is only one of the sub-elements of the PHA itself.

Most of the process industries (which are using considerable amount of hazardous chemicals) surveyed is in the stage of establishing and executing the PSM within their organisations. The effort is done mainly to comply with OSHA 1994, particularly the Control of Industrial Major Accident Hazards (CIMAH) regulations, 1996.

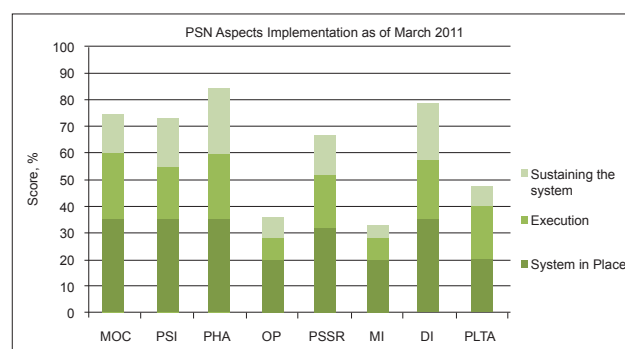


Figure 1: PSM Implementation status by one sample organisation (Source: DOSH)

FUTURE DEVELOPMENTS

The process industry, especially the oil and gas sector, is a major contributor to our country's economic growth. This is expected to continue until the year 2020.

In a recent development, our Prime Minister had unveiled plans by a leading oil and gas company to build a new RM60 billion integrated refinery and petrochemical complex in Pengerang, Johor.

Upon completion, the new complex, called RAPID (Refinery and Petrochemicals Integrated Development), will consist of a 300,000bbl/day crude oil refinery, a naphtha cracker that will produce about 3 million tonnes of ethylene, propylene, C4 and C5 olefins each year, and a petrochemical and polymer complex plus a liquefied natural gas (LNG) receiving and regasification terminal within the RAPID complex to support its overall operations. This and other projects will require thorough planning and implementation of PSM.

CONCLUSION

Considering the current and future development of process industries in this country, it is important for every party involved to take necessary action to address the issue of PSM. Employers or companies which have already established such systems may further enhance them, while the authorities, on the other hand, should produce at least some sort of guidelines (if not regulations per se) to assist the smaller industries in implementing PSM and to set the minimum standards for the process industries to follow through.

PSM can be an effective tool for increasing not only the safety to an operation, but also its efficiency, cost-effectiveness and quality, and is increasingly becoming the standard to which the industry is being held. PSM is an instrument for developing, implementing and maintaining a safe and efficient process as well. ■

REFERENCES

- [1] The Occupational Safety and Health Act (OSHA), 1994
- [2] Department of Occupational Safety and Health (DOSH) Report on PSM initial audits (unpublished), 2011
- [3] The Occupational Safety and Health (OSHA, US) 3133 Process Safety Management Guidelines for Compliance, 2000
- [4] Process Safety Management of Highly Hazardous Chemicals Standard, Title 29, Code of Federal Regulations (CFR) Part 1910.119, 1992

ANNOUNCEMENT

Non IEM Event

10 October 2012

Adjudication Conference 2012 on “Transformation by Statute: Compulsory Adjudication in the Construction Industry”

Venue : Kuala Lumpur

Contact Person : Ms. Alia

E-mail : events@klrca.org.my

Website : www.rcakl.org.my

(Call for registration)

CONDOLENCES

With deep regret, we wish to inform that **Allahyarham Ir. Hj. Mohamad Naguib bin Mahfodz (M 04906)** and **Ir. Hong Nga Siang (M 11585)** had passed away on 23 January 2012 and 25 May 2011 respectively. On behalf of the IEM Council and management, we wish to convey our condolences to their families.