

Process Safety for the Common Folk

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Presented at the 2011 Mary Kay O'Connor Process Safety International Symposium

September 2011

ABSTRACT

Process safety is a discipline that requires a relatively high degree of competence in engineering and as such sometimes it gets misapplied, or even worse, not used at all because of that lack of knowledge. This seems to be prevalent in smaller and medium-sized companies whose resources are more limited than at large companies, although during tough economic times not enough resources are applied even in those larger companies. The effect is a potentially very serious impact on the employees' health and well being as well as on others, such as the neighboring communities. Because of the lack of resources there is a tendency to either ignore the regulations hoping to be under the radar of the regulatory agencies, or to water down the process safety program, artificially reducing the number of safety recommendations, undertaking changes without a good safety review, reducing training, and skimping on equipment maintenance. The resulting increased risk is not well understood by management until it is too large. This leads to a need of simple tools for understanding, measuring, and managing risk in facilities where there is nobody with that knowledge, and a need for uncomplicated tools to manage necessary process safety activities in those and other facilities. A description of what can be done, where the priorities should be put, and proposed tools will be discussed.

A Dearth of Resources

During tough economic times many companies reduce their staff either by layoffs or by not replacing personnel that have retired or quit. One of the most affected areas is process safety since the function of the PSM manager or coordinator is not viewed as critical, but rather as an increment to process safety performance that will reduce the probability of a regulatory mishap, provide a better corporate image and sometimes reduce the chances of having an incident. There is some truth in this statement as process safety should be fully integrated into the fabric of the company and be line management's responsibility.

But the reality is that process safety is technical in nature, requiring a knowledgeable professional that has also some program management skills. Although day-to-day application of process safety principles is line management's responsibility, the how and why of some intermittent activities require specialized knowledge that may not be part of line management's set of tools. PHAs, the safety analysis of MOCs and incident

investigations come immediately to mind. Emergency planning and response is oft times linked to the potential consequences of a release in the process.

There is then a need for a safety process professional that can tie all these elements together and whose knowledge may prevent the lack of a significant component which otherwise would lead to a catastrophic event.

For large, and some medium sized companies, there are the advantages of scale as a PSM coordinator may be shared among many sites. In lean times the coordinator may be pressed to address all the requests and some shortcuts may be taken at some sites, but in general also the number of projects will diminish during those times. All in all, the situation is not optimal but it is tolerable. In addition, even in tough times very large companies will retain their experts which impart knowledge across the corporation, and this will be a help to the harried PSM coordinator.

For the small and some medium sized companies, the lack of resources can be dire. PSM may be a part-time occupation already as the PSM coordinator may also be the Environmental, Health and Safety (EHS) coordinator, or just a process engineer with some knowledge of process safety. In tough times, the extra process engineer may disappear and/or the EHS position may be downgraded to a clerical position instead of being handled by an engineer.

Underperforming in Process Safety

Even during normal economic times, many small companies will not dedicate enough resources to process safety as it is viewed as non-essential to the business. In many instances it is considered as a regulatory burden that somehow needs to be addressed. Some very small companies prefer to not address it in any case and just try to stay under OSHA's radar. This is due to a lack of understanding of the potential impact of not following an process safety program and a fear of the expenses that would be involved in following such a program. This fear is not unfounded since through looking at the existing literature, talking with the process safety or attending seminars and symposia, the requirements seem onerous and the necessary expertise unattainable. The result is underperformance in process safety with a high potential for catastrophic results.

Conversely, large companies with significant resources not only endeavor to maintain a superior process safety system but contribute to its advancement for the general public. These contributions are made through pooling resources with other companies and working through consortia such as AIChE's Center for Chemical Process Safety (CCPS), collaboration with centers of excellence such as the Mary Kay O'Connor Process Safety Center (MKOPSC) and attendance and presentations in global forums such as AIChE's Global Congress on Process Safety. All these activities add to the body of knowledge in process safety, create a leading edge for applicability and

determine an optimal infrastructure for PSM performance. This is good and should continue unabated.

In spite of all this progress significant incidents continue to occur in the petrochemical industry. Could it be that the bar has been raised so much that some companies don't even attempt to meet it and revert to a defensive position of regulatory compliance? The problem gets compounded as regulatory agencies look at the leading edge and try to dictate it throughout the industry without regard to its costs. It is the author's experience through consulting with many companies of all sizes that this could be the case. We need means to help the companies that don't have the high expertise, have sometimes meager resources, in order to achieve good process safety management – help for the common folk.

There are approximately 8,000 facilities in the U.S. that have submitted Program 3 Risk Management Plans (RMP) to EPA [1]. In 2010 there were about 800,000 chemical workers [1] in the U.S. There are about 170 'major' chemical companies in the U.S. [3] meaning that there are still many small to medium sized companies that need to have process safety and may not be performing as well as the majors in that area.

Priority Areas of Attention

The most common deficiencies in process safety that affect small companies (although they don't seem to be specific to small companies) are:

- Deficient or non-existing Management of Change (MOC)
 - Perfunctory safety analyses, overextended temporary changes, others.
- Poorly executed Process Hazards Analyses (PHAs)
 - Poor hazard identification, poor risk evaluation, others.
- No refresher training
 - Although procedures may exist, refresher training is absent.
- Poor Process Safety Information (PSI)
 - Information not found, incorrect or not kept up to date.

Another area where everybody seems to be deficient to a certain degree is the Mechanical Integrity (MI) area [4]. This is still a common underlying cause of many incidents.

Although all PSM areas require attention these areas should be prioritized and receive constant attention. How to manage everything with few resources is what needs to be addressed.

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In order to ensure smooth operation of a petrochemical facility on a daily basis, the minimum required is:

- Operating procedures – the plant can't run without operators knowing what to do
- Trained operators – operating procedures are needed to do the training
- Good maintenance – minimizes outages and maximizes production
- Safety practices – lockout/tagout, hot-work permits, and other practices that prevent incidents and injuries during regular work
- Contractor selection – well trained and safety-conscious contractors

A good manager will put resources into these areas without question. The other areas related to process safety may receive less or no attention because they do not seem necessary to the daily running of the plant. So, how do we maximize process safety with minimum resources given that the manager may be reluctant to hire people to perform the necessary activities?

The way to do it is by integrating process safety into operations. Process safety needs to be a line responsibility and since the operations manager is responsible for running the plant this is where the responsibility should lie. The manager will have to become knowledgeable in what is needed to avoid incidents that could injure people and/or damage the facility, both of which will affect his main responsibility. This doesn't mean that the manager will have all the technical details on how to implement this process safety program.

Although if the resources are available, it would be good to have a process safety coordinator to provide the expertise and coordinate all the activities, it is not an absolute necessity. In the absence of sufficient resources to maintain a permanent staff, the following details how the needs of a process safety program would be fulfilled on a continuous basis.

1. **Mechanical Integrity.** Even though the maintenance component of mechanical integrity may be well taken care of, the inspections component requires expertise and continuous application. There are firms that provide this service and also take care of the documentation that would satisfy the regulatory requirements.
2. **Management of Change (MOC).** This is an area of effort that that needs to be well executed in order not to create or increase risk to the facility. The MOC program can be well managed with few resources if implement correctly and the proper tools are used. These tools should provide for automatic management of the mechanics of the system and provide immediate, easy to understand feedback, thus allowing site management to concentrate on the quality of the system [5].
3. **Process Hazards Analyses (PHA).** The company may not have the expertise to perform a PHA. It should be contracted out to a facilitator but the plant should be able to allocate the time of an experienced engineer and an experienced operator to fully participate in the PHA if it is to be successful. The

recommendations coming out of the PHA should be addressed immediately and any accepted changes to the plant put in the work order system. Lingering action items can only increase risk to the facility.

4. **Process Safety Information (PSI).** The PSI should build on the maintenance files and the existing P&IDs. Good documentation should be a requirement as part of each contracted activity to allow maintaining the system in the long term. The MOC system described above should be self-documenting to the point that all the information could be stored in it. P&ID and equipment files updating would be the endeavor requiring the largest effort in maintain the PSI. This could also be contracted out as it wouldn't be expected for a small facility to have a large number of changes. For a company with many changes and limited resources, a document management system could provide the answer [6, 7]. With today's technology these systems are within the means of small companies.
5. **Safety Culture.** By establishing a good safety culture in the facility, the effort of managing process safety should actually be less since everybody will be involved and be able to help in maintaining the system. Integration of process safety into operations and having line management responsible for everyday and long-term safety shows that management is "walking the walk and not just talking the talk" (in a well-run facility).
6. **Regulations.** The PSM system in the plant should be run with the purpose of having a safe plant in the short and long terms and not just because regulation requires it. Implementing a good PSM system will lead to satisfying the regulations but the opposite is not true. Just complying with the regulations may not result in a safe plant. The application of some involved engineering practices just because they are RAGAGEP (Recognized and Regularly Applied Good Engineering Practices) should be done judiciously as their complexity may thwart safety in the absence of sufficient knowledge or resources.

Finally, the other parts of process safety that are less frequently applied such as emergency planning, audits and incident investigation still have to be done but they take much less continuing effort (and if successful there should be no incidents to investigate). These parts can be also contracted out so that local expertise is not required. Of course, personnel will have to be well trained on the emergency plan and participate in the drills.

Conclusions

A well performing process safety system can be established in companies with limited manpower and technical resources by following the guidelines detailed in this paper. With these tools companies that shy away from implementing a PSM system can have one and avoid disasters; and companies that do implement a system will end up with a better system while using fewer resources.

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