Focus Article

Top 10 Rules for Process Safety

Executive Summary

A key component of any successful Process Safety Management (PSM) program is continual improvement, going above and beyond the minimum requirements. A useful tool for many organizations to start this conversation is DEKRA's Top 10 Rules for Process Safety. The rules can help organizations better manage their PSM efforts by establishing different ways to look at process safety.

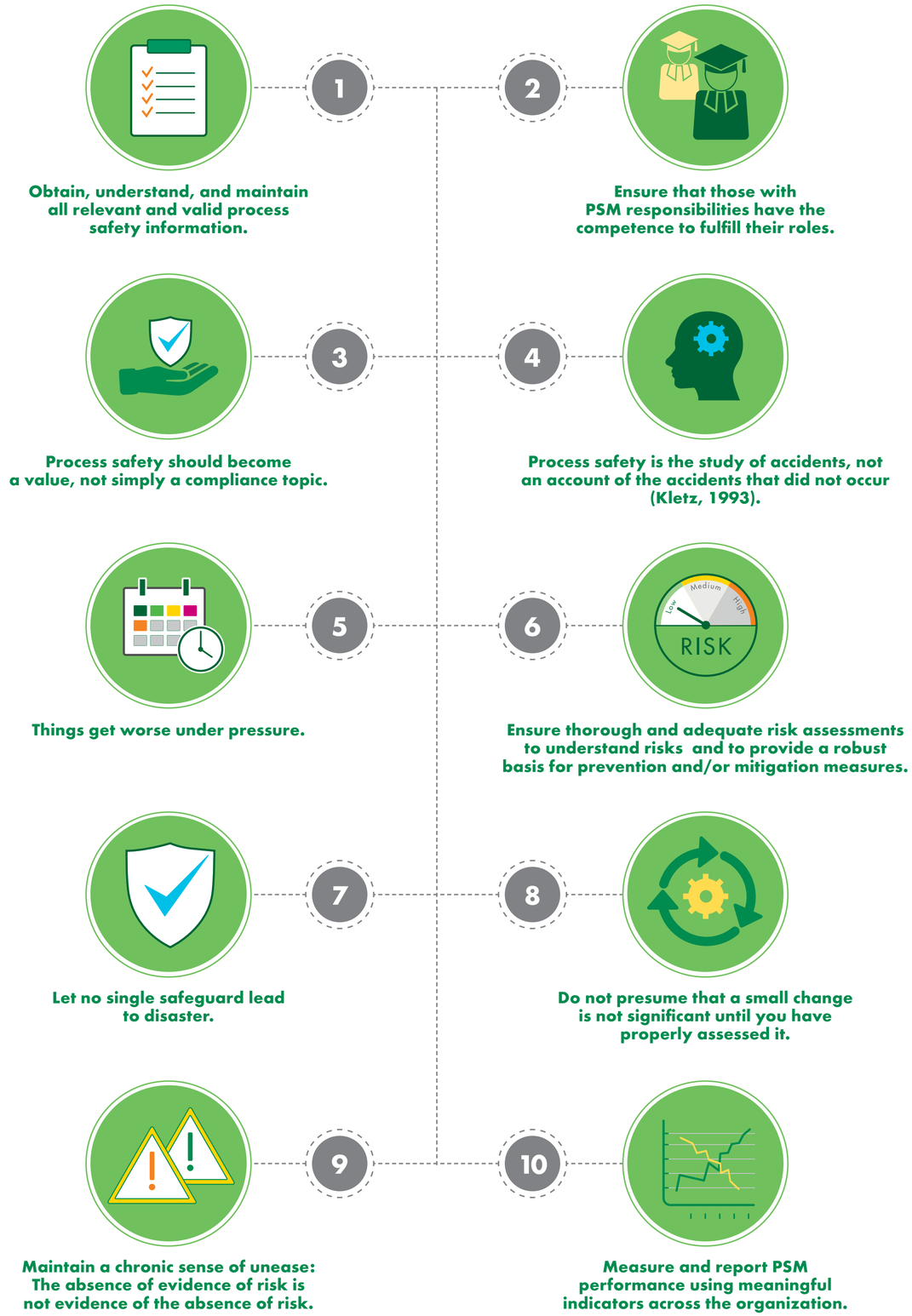
How to improve process safety performance must be a recurring discussion in organizations. Today, even with all the safety systems that have been developed, industries around the world are experiencing severe process safety incidents. Events involving the release of highly hazardous materials have resulted in many catastrophic events.

This series of 10 essential rules is targeted to process safety professionals. It gives a fresh perspective on what should be considered to better manage process safety risks at various levels of your organization. More importantly, it allows organizations a place to start a conversation and to consider improvements.

1. Obtain, understand, and maintain all relevant and valid process safety information

The first rule is the foundation of a PSM program. It relates to process safety information (PSI). PSI is not just having the relevant safety data, such as Piping & Instrument Diagrams (P&IDs), Safety Data Sheets (SDSs), design calculations, and relief valve calculations. It also means ensuring that personnel understand and use the information. Important components of a robust PSI program include the following:

- **Obtain**: Collect all relevant data. Ensure process safety information for the process is written, fully developed, and readily available to those that need it, when and where it is needed.
- **Understand**: Prior to conducting any process hazard analysis, there must be a clear understanding of the process chemicals, process technology, and process equipment. This information should be contained within the PSI.
- **Maintain**: Process safety information must be maintained and periodically reviewed for accuracy. Determine a frequency to periodically review the documentation. PSI review and updates are also required after every change. The management of change process must trigger PSI reviews and updates for all relevant changes.



2. Ensure that those with PSM responsibilities have the competence to fulfill their roles.

The competence of those who impact process safety is critical for industries with processes handling hazardous materials. It is important to embed the experience that people have gained in the organization into training offered at all levels of the organization. It is also important that personnel have access to the right information, have the right knowledge, and possess the right skills to perform their job duties. A **Process Safety Competency** program identifies and determines:

- Roles and responsibilities for process safety.
- The process safety knowledge and skills needed for each role.
- How workers access information, and the expertise needed to make critical decisions.
- The clearly established goals and objectives the facility intends to achieve to ensure personnel have the knowledge, skills, and experience required to safely perform their roles.

It is important to consider the following:

- Make process safety lessons practical and visual, and use hands-on demonstrations.
- Training is often most effective when it combines the use of presentations, reading, and hands-on activities.
- Provide training that is applicable to everyday work in the facility.
- Ensure that roles provide experiences that will build lifelong lessons they will use during their careers.
- Ensure training is refreshed periodically and that lessons learned are not forgotten.
- Confirm that all levels of the organization have access to critical process safety information and experts who can help employees make critical decisions for their roles.

3. Process safety should become a value, not simply a compliance topic.

Culture is what people do within an organization, and what they consider to be typical or normal behavior. Each facility must develop and maintain a strong process safety culture.

Process safety cannot be a burden or just a compliance issue. Facilities must ensure that the right process safety culture is developed and maintained. Ensure that a visible focus on process safety is part of facility activities and that every employee is involved. Process safety extends over the process life cycle, and there must be continual improvement.

4. Process safety is the study of accidents, not an account of the accidents that did not occur.

Trevor Kletz stated in "Lessons from Disaster" that "accidents happen on plant, not in the design department." Studying and analyzing incidents and near misses is another fundamental brick of the process safety wall. Studying means reading, sharing, evaluating the root causes, and reporting and sharing the lessons. Some key components of studying accidents are:

- Reviewing and taking actions to incidents in similar industries.
- Reviewing and determining how near misses can be prevented.
- Determining how the lessons learned can be applied to your process/industry.
- Implementing corrective actions in a timely manner.

5. Things get worse under pressure.

There is always time to do each job correctly. This is a key component of operational discipline. Being under pressure includes physical pressure, peer pressure, organizational pressure, economic pressure, and production pressure. The facility must consider factors that can lead to mistakes being made by an employee who is under pressure. This includes fatigue management, stress, and anxiety—all of which can lead to mistakes and human errors.

Facilities must train their employees on how to resist pressure and to stop and think before each task. Being able to anticipate the impact of pressure is key. Simple things such as ensuring that systems are designed to be user-friendly and easy to read and react to are important. Another thing to consider is providing training for what to do when something goes wrong, not just normal operations.

6. Ensure thorough and adequate risk assessments to understand risks and to provide a robust basis for prevention and/or mitigation measures.

Analyzing the risks by performing **Process Hazard Analyses (PHA)** and risk assessments helps identify the key areas of risk and appropriate safeguards to protect the facility.

While it's not possible to completely eliminate process safety risk, there are many options to ensure that the safeguards for a scenario reduce the risk to "as low as reasonably practicable," or ALARP. The ALARP principle is that the residual risk shall be reduced as much as is reasonably practicable.

Two key words to remember about completing thorough and adequate risk assessments are:

- **Adequate**: This relates not only to the PHA methodology being used but also the criteria associated with the PHA process, including Rule 1 about process safety Information.
- **Thorough**: We mean here everything that relates to the quality of the PHA. PHAs are not simply a desktop exercise. PHAs must be performed with enough depth and discussion involving competent team members to ensure that risks are reliably identified.

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7. Let no single safeguard lead to disaster.

This rule is used in conjunction with Rule 6 for mitigation. There must be redundant safety controls in place for highly hazardous processes, and they must be tested on a set frequency as part of the mechanical (asset) integrity program to ensure that they will work reliably.

A safety control that is not tested can be worse than one that does not exist. The assumption is that if there is a safeguard in place, the safety control will work on demand. However, if the safety control is not routinely tested, operators are essentially relying on safeguards that may not function.

All equipment must be operated within the operating parameters of the equipment design. All safety controls must be included in the facility asset integrity program and must include that all specified testing programs be maintained. Some of the things a facility can do to ensure a robust asset integrity program are:

- Operate and maintain equipment to recognized and generally accepted good engineering practices (RAGAGEP), including codes, standards, and manufacturer's recommendations.
- Utilize a risk-based approach, such as risk-based inspections (RBI).
- Determine if the asset integrity program measures and inspects the reliability of each critical safeguard.
- Test and audit safety critical elements of the asset integrity program.

8. Do not presume that a small change is not significant until you have properly assessed it.

Management of change (MOC) is required for evaluating and controlling modifications to process design, operation, process chemicals, and the organization itself. The MOC system must address changes that range from minor modifications to existing assets to major capital projects. The system must also consider the impact of temporary and emergency changes.

The most obvious changes occur when a new plant, or a major addition to an existing one, is constructed. Other more subtle changes can occur when new suppliers are hired, when procedures are modified, when plant staffing is revised, and when equipment is repaired or replaced.

If a change is not an exact replacement in kind, then an MOC must be completed. Some examples of when an MOC is needed:

- Replacement of equipment
- Different size
- Different material of construction
- Different chemical or concentration
- Modifications made to the physical plant
- Changes to process unit operations or procedures
- Changes to critical alarm and interlock settings
- Changes in critical personnel and staffing

Some of the most catastrophic accidents have occurred because a facility failed to consider how a change that was made could affect process safety.

9. Maintain a chronic sense of unease: The absence of evidence of risk is not evidence of the absence of risk.

Rule 9 refers to the saying "We have not had a process safety incident in the last 20 years, so why do we need to do this?" We are also familiar with the saying "I've always done it this way. Why do I need to change now?" For process safety professionals, it is important to help others understand that just because something has not happened yet, does not mean it cannot happen. Having a sense of vulnerability to process safety incidents is a key component of a robust process safety system. Process safety incidents are rare. They happen at a lower frequency than occupational safety incidents, and this can result in more focus on reducing occupational injuries and less on spending resources to reduce process safety risk. Process safety and personal safety must both be actively managed. Using the same management techniques for both, or assuming that controlling one also controls the other, can lead to disaster.

10. Measure and report PSM performance using meaningful indicators across the organization.

Rule 10 refers to metrics used in process safety. One key thing to remember is "you don't improve what you don't measure" (CCPS, 2011). Process safety performance indicators (PSPIs) or process safety key performance indicators (PSKPIs) are performance metrics that are used to indicate when the risk of a process safety accident is increasing. PSPIs/PSKPIs can be categorized as either leading or lagging indicators. The occurrence of near-miss incidents is also an indicator that should be tracked, and it is included as one of the lagging indicators. A leading indicator is an active indicator of process safety performance/activity, while a lagging indicator is a reactive indicator of process safety performance. While near misses, typically, go under the lagging indicator category, a near miss is a good indicator of conditions that could lead to a more severe incident.

Utilizing process safety leading and lagging indicators helps identify where potential risks may exist. Examples of meaningful metrics that could be used for process safety are:

- Mechanical (asset) integrity inspection on-time performance and number of deficiencies
- Number of hazardous material releases and fires
- Number of times a critical safeguard (interlock or pressure relief device) activation events
- On-time completion of process hazard assessments according to their revalidation schedule
- On-time completion of process safety audit and incident investigation findings
- Number of worker suggestions to improve management system elements, such as hot work, operating procedures, or training

Conclusion

While certainly not comprehensive, the Top 10 Rules for process safety can focus attention on some of the most important aspects of an effective Process Safety Management program. We hope these rules start a conversation that helps your organization set goals to improve your program. For a one-page version of the Top 10 Rules, go to **https://www.dekra.us/en/faq-sheet-top-10-rules-poster/**

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Email us: process-safety-usa@dekra.com

Website: www.dekra.us/process-safety

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