Implementing an Effective Operational Discipline Program to Help Improve Process Safety Performance[1]

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People, evenly highly trained people, make mistakes. It could be: (1) a manager making an ill-advised decision; (2) an engineer making a poor design choice; (3) an operator operating equipment incorrectly; or (4) a mechanic not completing a maintenance task correctly. Some mistakes have minor consequences, and some can potentially lead to catastrophic incidents, especially in a high-hazard process. We know that people make mistakes, and an effective process safety management (PSM) program anticipates that. As shown in Figure 1, an effective PSM program includes: (1) process safety systems that describe how work should be done safely and correctly; (2) a focus on safety culture and leadership; and (3) an operational discipline (OD) program to help make sure that system requirements and cultural priorities are executed correctly every time.

OD is essential to achieve excellent process safety performance. Excellent performance means (1) well-designed process safety systems that function day-to-day as intended and that (2) incidents leading to fatalities, serious injuries, business interruption, and environmental harm are prevented or effectively mitigated. Of course, if process safety systems have been poorly designed or implemented or an organization has a weaker safety culture, an OD program may not be of much assistance.

The OSHA PSM regulation is over 25 years old and many companies in the United States and elsewhere have implemented PSM systems. For several years, companies have also focused on safety culture and leadership to help achieve their process safety goals. OD efforts – the commitment by everyone in an organization to follow the systems and procedures that have been developed, every time – often receive less attention but are essential for reducing human error. If a company is not satisfied with its process safety performance, a new or renewed effort on OD may represent one of the best opportunities for improving performance.

Human Error and Operational Discipline

In an incident investigated by the U.S. Chemical Safety Board (CSB) [2], an operator opened the bottom valve of an operating polymerization reactor, apparently bypassing an active pressure interlock, instead of opening the bottom valve of a nearby reactor that was being cleaned. A large release of flammable material from the reactor ignited, and the resulting explosion led to five fatalities and major damage to the facility. The CSB concluded, among other findings, that the facility "did not adequately address the potential for human error." Of course, human error is often a major contributor to incidents [3-4] as evidenced by industry experience in investigating incidents and near misses. Some of the reasons for human error are shown in Table 1.

Figure 1 – Foundations of an Effective Process Safety Program [1]

Table 1 - Some Causes of Human Error (adapted from [1])

- Human fallibility, capability, complacency, and commitment
- Training issues, including procedure quality and training effectiveness
- Workplace environment, including accessibility of information and distractions
- Familiarity with the work being done and the time since it was last done
- Fitness-for-duty considerations, such as alcohol, drugs, stress, and fatigue
- Urgency for completing a task quickly
- Lack of risk recognition or sense of vulnerability

The reality is that human error should be anticipated, and appropriate systems and safeguards should be provided to make sure that errors do not lead to serious injuries and other consequences, especially if work tasks include higher-risk activities involving significant process hazards. OD is used to describe human behavior in following required systems and procedures correctly, every time, to consistently achieve safer and more reliable operations. Developing an OD program [5-9] intended to support day-to-day commitment by all company personnel, in combination with well-designed process safety systems and a strong safety culture as shown in Figure 1, can help minimize the potential for human error and help confirm process safety (and other) program requirements are rigorously followed. Some of the benefits of a strong OD program are shown in Table 2.

Table 2 - Some Benefits of OD Programs (adapted from [1])

- **Environmental, Health, and Safety (EHS)** – Prevention or reduction of workplace injuries, occupational exposures, process incidents, environmental releases, and associated costs
- **Operations** – Reductions in unscheduled shutdowns, poor process utilization, inefficient use of manpower, downtime related to incidents, and associated costs
- **Quality** – Reductions in off-specification product, rework and waste, lower yields, poor quality, customer complaints, and associated costs

The Safety Triangle, shown in Figure 2, illustrates qualitatively that significant consequences, such as serious injuries or catastrophic incidents (at the top of the triangle) are often (but not always) the result of, or predicted by, a larger number of smaller near-miss events and/or unsafe acts and behaviors (at the bottom of the triangle). Focusing on minimizing or eliminating potential problems can often help prevent the more serious events. An effective OD program works to reduce undesirable actions at the bottom of the triangle by encouraging and supporting correct actions in following program systems and procedures. This is especially important for higher-risk activities involving significant process (or other) hazards, where the base of the triangle may be very narrow, meaning that even one mistake or unsafe action can lead directly to a serious injury or other consequence. Ultimately, OD programs are intended to help reduce the frequency and associated risks of human error.

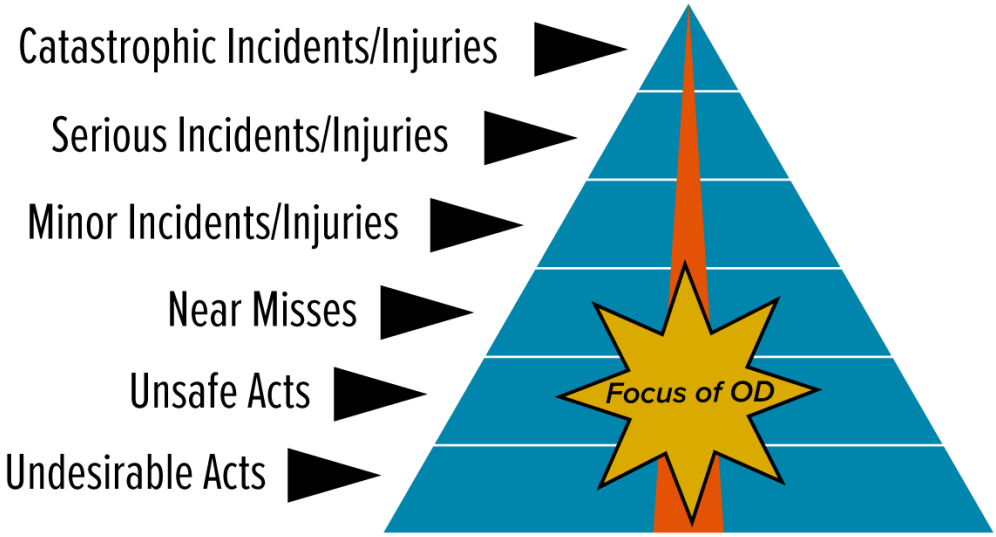

Figure 2 – The Safety Triangle and OD [1]

OD Program Characteristics

An OD program includes a focus on both organizational and personal OD [1,6-7]. Organizational OD characteristics are intended to (1) help company or facility management develop the programs and work environment to support strong operational discipline and (2) provide resources for supporting OD

improvement efforts. Organizational OD efforts are closely related to good safety culture and leadership practices and supplement associated management systems to promote and achieve program goals. Personal OD characteristics target worker activities at all levels of the organization to make sure that workers (1) know what they need to do and (2) do their work correctly and safely every time.

Good OD performance does not happen on its own. It requires continued management attention to: (1) implement and use effective systems; (2) monitor and evaluate actual performance; (3) demonstrate personal attention and dedication; (4) provide appropriate resources, as needed; and (5) develop and support effective processes to facilitate employee understanding, engagement, and follow-through [7]. The benefits of good OD performance, as shown in Table 2, provide a strong basis for engaging leadership to implement and maintain effective OD programs that help achieve excellent process safety, EHS, and operational performance.

Four characteristics of organizational OD are shown in Table 3. While related to safety culture, these characteristics are used to emphasize the OD aspects of effective programs. The foundation of any OD program must be leadership focus, without which priority and support for OD improvement cannot exist. Leadership must also promote strong employee engagement; too many uninvolved or uninterested employees will limit an organization's ability to achieve strong performance. An important part of leadership focus, therefore, is providing the culture and work environment to engage employees at all levels of the organization, involving them as active participants in safety programs and in achieving strong performance. The most visible results of leadership focus and employee engagement are employees (1) following approved systems and procedures and (2) maintaining equipment and work areas in safe operating condition.

Table 3 – Organizational OD Characteristics (adapted from [1])

- **Leadership Focus** – Leaders emphasize and provide a positive work environment, managing processes and resources for effective programs and employee engagement. Leaders are personally involved and passionate for safety and model the behaviors they expect from their organization.
- **Employee Engagement** – Employees understand and value the importance of safe work activities and contribute to organizational programs and activities.
- **Procedure Principles** – Correct ways of doing work are defined and completed as planned, following reviewed and authorized systems and procedures.
- **Housekeeping and Workplace Standards** – Standards are established for maintaining safe equipment, tools, and facilities. Employees are proud of their work environment and consistently maintain high levels of housekeeping.

The three characteristics shown in Table 4 define personal OD. While company and site leadership are accountable for results, ultimately achieving high levels of OD and subsequently excellent safety and operational performance, requires that all employees complete their work tasks correctly and safely every time. Everyone needs to: (1) know how to do their work tasks; (2) do them the correct way without deviations or shortcuts; and (3) anticipate and be prepared for what may be different or could go wrong.

All three personal characteristics, as shown in Figure 3, are essential for achieving high levels of OD performance; a deficit in one area can increase the risk of an error. The goal is to have a prepared, skilled work effort that accounts for the existing work environment rather than an unquestioning focus on strict adherence to procedure when circumstances are different or changing. Of course, inclusion of possible deviations and the correct ways to respond to them should be included in procedures and/or training to help mitigate any potential negative consequences. Efforts on personal OD are necessarily related to other major programs for reducing human error, including human factors analysis, behavior-based safety, human performance technology, and human reliability assessment.

Table 4 – Personal OD Characteristics [6]

- **Knowledge** – I understand how to do my work task correctly and safely.
- **Commitment** – I commit to do my tasks the right way, every time.
- **Awareness** – I anticipate potential problems and recognize unusual situations.

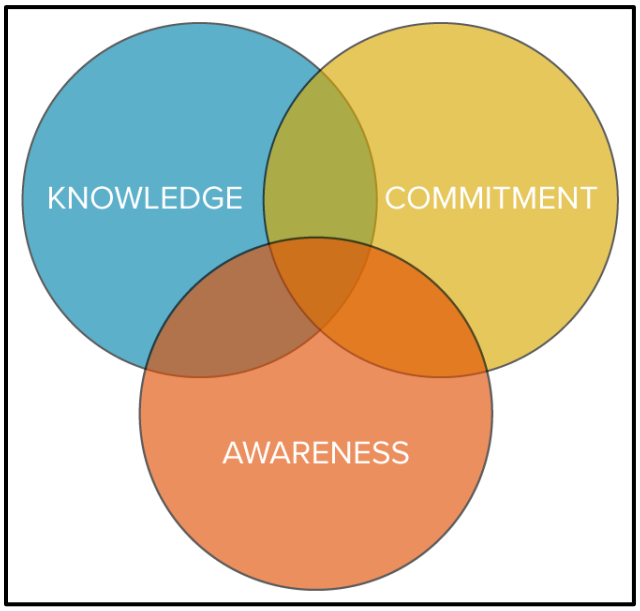

Figure 3 – Personal OD Characteristics [6]

Effective OD Programs

OD issues and problems are typically specific to a local site or organization, often varying in priority widely within the same organization/facility, based on different safety cultures, leadership, work activities, hazards, geographic locations, and other factors. While common issues may exist within a larger organization – for example, no current focus on OD – improvement activities must usually be evaluated locally to help identify and prioritize improvement opportunities and goals. For example, one site may

have poorly developed procedures and another site may not have housekeeping standards. Both factors can affect OD performance, but improvement requires different approaches. Effective OD programs, depending on the size of the organization or site, should consider one umbrella goal, for example, of implementing an OD improvement program, but the details of specific activities for achieving improved OD should be developed, prioritized, and pursued based on specific local conditions and issues, as appropriate.

An approach for developing an effective OD program is shown in Figure 4 [1]. The primary steps include:

- **Focus on OD improvem**ent – Without specific management attention, organizationally and locally, OD is unlikely to improve in a sustained way as discussed under organizational OD. The FLAME model, as discussed in Table 5, outlines specific leadership processes that can be used.
- **Raise OD awareness** – All employees must be introduced to what OD is and why it is important. This can be done by discussing OD with employees in special workshops or meetings, safety meetings, shift meetings, etc., and reinforced day-to-day in the workplace by management attention and practices. Employee input on OD should be solicited to help raise awareness and identify specific issues, causes, and possible solutions for further evaluation.
- **Evaluate OD performance** – Current OD performance should be evaluated to (1) establish a starting point and (2) identify potential OD improvement opportunities, based on review of performance metrics, incident data, audit results, quality data, and potentially targeted surveys.
- **Prioritize OD improvements** – Prioritize OD improvement opportunities to focus on (1) key areas for enhancing performance and (2) opportunities that can produce tangible results quickly. Engage site employees for input, establish specific goals and timing milestones, and provide resources. Given the many competing priorities for resources, it is generally better to limit the initial number of projects to help ensure success. New projects can be identified as projects are completed.
- **Monitor progress** – Establish metrics to monitor progress toward improvement goals, and schedule periodic management reviews to support successful project completion. Also, be aware of the greater work environment and, when appropriate, modify project goals based on new information/conditions. Recognize progress and successful project completion and continue to engage employees to support and provide input on progress.
- **Sustain improvements** – As projects are successfully completed, there will always be additional improvement opportunities. Periodically repeat the previous steps as needed to identify, prioritize, and implement new projects. Ensure that gains that have been made are supported and sustained.

Making significant progress on improving OD takes time. A mix of projects, as discussed, both to make quick and easier improvements as well as longer-term more substantial progress is ideal to establish value for the OD effort and to build momentum. For example, simpler projects, such as developing checklists for higher risk activities, can be completed in a shorter time than larger projects, such as major revision of operating procedures or addition of evaluation of OD in incident investigations or audits.

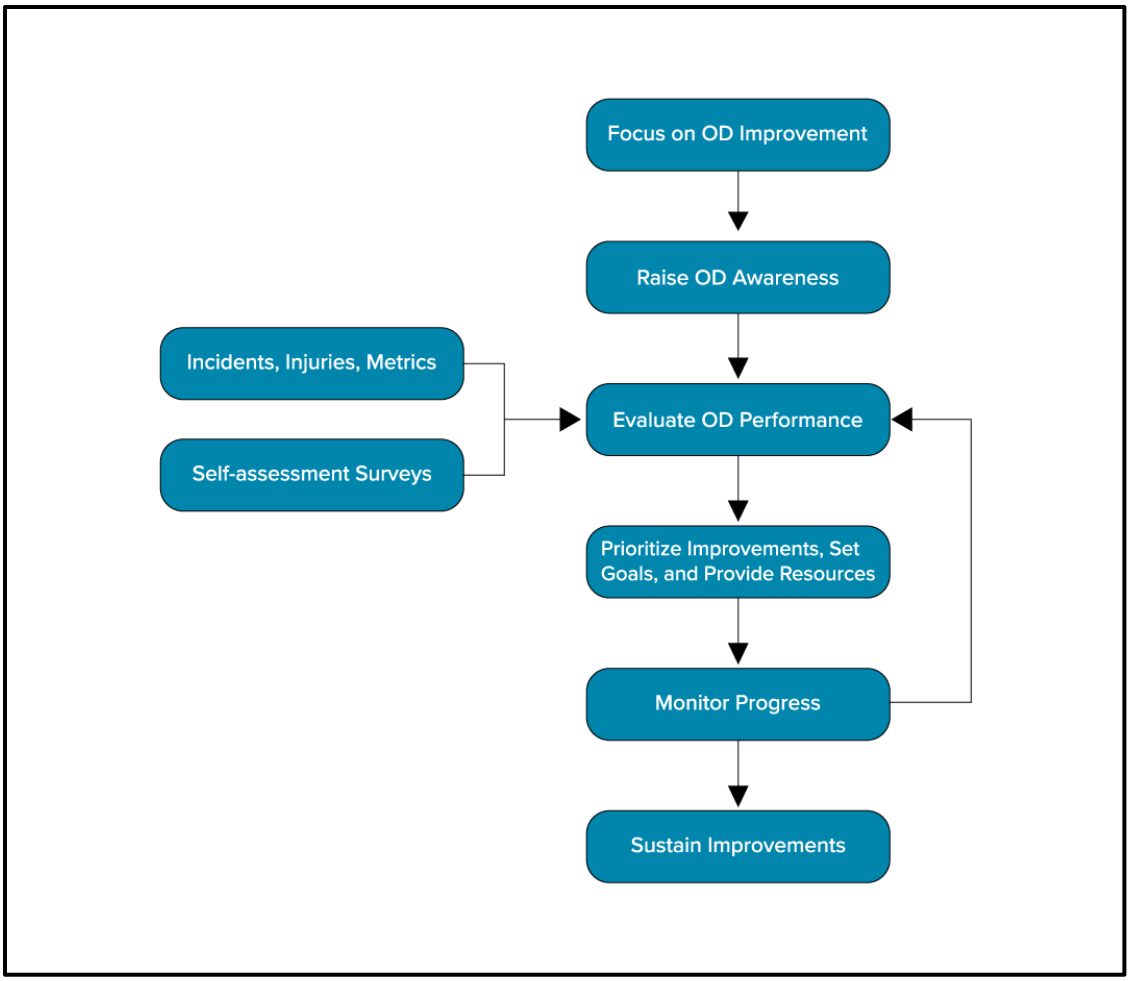

Figure 4 – Steps for Implementing an Effective OD Program [1]

Leading improvement of OD is a fundamental, continuous process. Improvement opportunities must be identified and completed, improvements must be sustained, and new opportunities must be identified in a repeating cycle. Changes to technology, operations, hazards, etc., must be assessed and may provide additional needs for OD program efforts. The FLAME model [1] shown in Table 5 provides best practices for leadership efforts to implement and sustain effective OD programs, although many other similar approaches are available for leading organizational change. It may also be helpful to assign an OD leader to provide additional focus and accountability on achieving an effective program, especially for larger companies or facilities. Ultimately, the OD program should make sure that:

- Tools are provided to document and support effective work practices, such as procedures, checklists, fitness-for-duty programs, management systems, etc.
- Training is provided both initially and as periodic refresher training to: (1) confirm that workers understand how to complete their work correctly and safely; (2) build value and commitment for following established procedures and systems every time; and (3) support workers in anticipating and planning for potential work problems.

- Time is provided for: (1) building capability and experience; (2) completing work in a timely manner; and (3) maintaining awareness of the work environment.

Table 5 – The FLAME Model (adapted from [1])

• **Focus** – A vision has been developed to enable appropriate focus on OD and effectively communicated to develop awareness and engage site personnel, which is supported daily through leadership attention and priorities. • **Leadership** – Leadership acts as role models committed to continuous improvement and excellent OD performance through use of effective, consistent leadership practices. • **Accountability** – Organization, team, and individual goals include a focus on OD with clear expectations on performance, feedback, and recognition as appropriate. • **Measurement** – Metrics, audits, and other tools are defined to periodically assess site activities, performance, and progress toward goals. • **Engagement** – Leaders provide a work environment which supports the engagement and support of site personnel, based on good communication processes, employee input and involvement, and interdependent behaviors. Site personnel know they are important to success and that their contributions are valued.

Conclusion

People make mistakes and the consequences can potentially be catastrophic. Effective process safety programs, built on foundations of safety culture and leadership, management systems, and operational discipline, anticipate and manage the likelihood of human error. As Jim Collins stated in *Good to Great* [11], "Sustained great results depend upon building a culture of self-disciplined people who take disciplined action." If your metrics tell you that improved process safety performance is desirable to meet company goals, then an effective OD effort as part of your process safety program may provide the greatest opportunity for improving performance.

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