# How to Ensure Safety in Process Plants

**White Paper**

**Gene Niewoehner, MAVERICK Technologies, LLC**

# Introduction

No one can argue against the importance of safety in process plants. These complex and often volatile environments house a variety of potential dangers — putting both people and physical assets at risk. But even though companies uphold safety as a value, accidents continue to happen. Companies must identify and understand the root causes of accidents in order to eliminate them.

First, one must consider how realistic it is to eliminate workplace accidents. Some may assume that accidents are an inherent part of any process plant and that management's role is to mitigate the damage. This reactive mindset will never solve safety problems — but with a proactive approach to plant safety, all accidents are completely preventable.

By eliminating accidents, companies can protect the safety and health of their employees, minimize costly damage to machinery and extend the life of their assets. At the very basic level, machines are replaceable; people are not. And ironically, just as human safety is a primary risk when machines fail, human error is a primary cause of machine failure.

## Online Safety Resources

ANSI
www.ansi.org

ASME
www.asme.org

ISA
www.isa.org

OSHA
www.osha.gov

# Understanding Theories and Standards

In the automation world, safety theories are based on physics, physical attributes, mechanics and chemistry. Certain factors and conditions within process plants cause specific known reactions. The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA), the American National Standards Institute (ANSI), the American Society of Mechanical Engineers (ASME) and the Instrumentation, Systems and Automation Society (ISA) provide detailed standards regarding safety. Although these standards are thoroughly documented and technically accurate, they are limited. They cannot always apply in all situations, and they do not always reflect the most current technology. Finally, all theories and standards require human intervention for proper implementation.

# Human Intervention

Even with advances in process automation, humans still must provide the intelligence needed to keep plants safe. Humans know the process and the materials or ingredients used, which is essential for identifying potential hazards. Humans must also decide how safety standards apply, what methodology to use to control the process, and at what level of control. Smart decisions ensure that the process runs as intended; however, the reality is that many decisions are poorly or hastily made.

For example, workers sometimes jump around, or bypass, the sensors they perceive as unnecessary in order to disable irritating alarms. A simple sensor adjustment may seem minor, but these changes add up over time and eventually contribute to system degradation and accidents. If, for example, a pH meter is disabled or improperly calibrated, the product composition may become hazardous or even explosive farther downstream in the process. The operator may not realize the critical nature of the situation until catastrophic failure occurs.

The best decisions are those that prevent problems before they have a chance to occur. Advances in technology make machines increasingly reliable, but maintenance is still required to some degree. And when equipment does fail, operators must respond quickly and make smart decisions to repair the problems.

Recently, one oil refinery reported an instance in which a worker replaced a failed valve with one of a different style. No one performed a safety risk analysis because the top priority was resuming operation as quickly as possible. This seemingly minor repair eventually led to a fire. What's more, this same refinery found that 80 percent of its accidents resulting in injuries involve workers with less than one year of experience — proving the importance of thorough training.

Finally, the most important aspect of any safety program is buy-in. Everyone at the process plant must put safety first when making decisions at every level of the business — from the plant floor to the boardroom.

## Managing Safety

Operators on the plant floor take their cues from management and cannot be expected to follow safety rules that are not enforced or even established. Managers must convey the importance of safety through communication, action and financial investment. They must promote safe work practices as well as allocate the necessary funds for training and repairing or replacing failed equipment and sensors.

Companies should initiate or rejuvenate their process safety management programs with hazard and operability (HAZOP) studies and process hazard analysis (PHA) meetings. These sessions allow experts of different backgrounds to provide information on a plant's critical systems. A third-party facilitator or an engineering consultant with broad industry experience can add value to these discussions. During the meetings, the team divides the process plant into sections and addresses one unit at a time, identifying hazards and events that could cause injuries and costly damage to critical systems. Each company must define for itself which systems are critical; this designation will vary based on company size and other criteria.

Managers should then review the conclusions from the HAZOP and PHA meetings and ensure that they are applied properly. All plant operators should receive OSHA-mandated awareness training so that they can identify potential hazards, plus any additional job-specific training. Plus, alarms should be established for critical events, and operators should understand the response required for each alarm. Oftentimes, some alarm cleanup is necessary to ensure that the number of alarms is kept to a manageable and critical few. Project engineers must work with process engineers and operations managers throughout this process to ensure complete operator training, proper instrument calibration and listing of all equipment in the maintenance system.

Sometimes conflicts of interest exist among a plant's many organizational groups. The operations group wants to run the process; the maintenance group wants to shut down and make repairs; the engineering group needs time to make improvements; the quality control group wants higher quality; the safety group wants everything done safely; and accounting wants it all done at minimal cost. The groups may not have the time to participate in HAZOP studies or the funds to pay for additional safety measures. But again, if the entire company regards safety as a top priority, everyone will allocate the resources needed to ensure safe operations.

A change management system is a key component in ensuring safety. Such a system requires approval for all changes in logic, software, hardware and other components — thereby preventing operators from making adjustments without understanding the impact, transferring knowledge and properly documenting the change.

### Six Steps to Safety

1. Make safety the top priority at every level of the plant.

2. Organize HAZOP and PHA meetings to analyze potential hazards.

3. Perform awareness training and additional instruction as needed.

4. Install and manage alarms effectively for critical events.

5. Implement a change management system.

6. Review the process safety management program annually.

Finally, companies should perform annual reviews to reevaluate their process safety management programs. During this time, management should verify whether logic has been unknowingly disrupted in spite of the change management system. In addition, the company should consider any new potential hazards that have developed due to the plant's expansion, increased output or age.

## Conclusion

Ultimately, a safe plant is one where safety is deeply ingrained in the culture and human health is the top priority. From the plant floor to upper management, everyone needs to understand the importance of spending the time and money necessary to maintain a safe work environment. And if all safety theories and standards are implemented properly, accidents can be eliminated completely — preserving the well-being of machines as well as the people who operate them.