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Bypassing a Safety System Can Have Serious Consequences

Safety systems are designed to prevent unsafe operations from occurring, as well as to safely shut down an operation if an unsafe condition does occur. The goal of a safety system is to prevent loss of containment and protect people, property, and the environment.

Safety interlocks and emergency shutdown (ESD) systems are critical and should be connected and operable whenever a process is in operation. In a very small number of scenarios, however, it may be necessary to bypass or inactivate a safety interlock or ESD system for a short period of time using fully reviewed and approved procedures that implement alternative safeguards.

For example, during a process unit startup, it may be necessary to bypass safeguards until certain operating conditions are reached. This action is incorporated into an approved startup procedure and alternative safeguards are implemented. The procedures typically specify the limiting conditions required for operation without critical safeguards and indicate stringent limits on duration and operating conditions.

Examples of situations where it is appropriate to bypass a safety system are few and in each scenario alternative safeguards are put in place. Bypassing a layer of safety removes protective measures, and the consequences can be devastating.

I learned firsthand of the severe consequences of overriding a safety interlock early in my career. During a holiday weekend, when most of the site managers were at home, an operator responsible for running the reactor system used a supervisor's password to override the safety system. The subsequent incident caused an explosion and fire that severely burned the young operator, and he ultimately died from his injuries.

Safety system bypass contributed to an incident at the Formosa Plastics facility in Illiopolis, IL, in April 2004 that caused five fatalities, three serious injuries, and the closure of the site. The site made polyvinyl chloride (PVC) in 24 reactors, arranged in groups of four. Approximately 8,000 lb of flammable and toxic vinyl chloride monomer (VCM) was released when an interlock on the bottom valve of a pressurized reactor (#310) in mid-cycle was manually bypassed.

The interlock was designed to block the air supply to the valve's actuator and prevent a release during operation. The

operator may have mistakenly opened the bottom valve and drain valve on reactor #310 when he intended to open the bottom valve and drain valve on reactor #306, which was being cleaned. Better operating practices and equipment design could have reduced the possibility of human error. The site also failed to follow up on recommendations after previous incidents.

These two incidents illustrate the importance of understanding and respecting all safety interlocks, as well as regularly inspecting and maintaining equipment and instrumentation so that it is available for use as intended and when needed. Process hazard analyses (PHAs) and risk assessments (RAs) should be performed regularly. Findings from these investigations should be followed up on to ensure hazards are controlled and contained. PHAs and RAs are particularly important after taking over a newly purchased facility or restarting a plant after extended downtime.

To prevent or protect against unsafe safety system bypasses at your facility:

- Use interlocks and other protective systems as designed. Ensure the system is calibrated and maintained appropriately.
- Report a failure of a critical instrument or alarm immediately so that the appropriate actions can be taken.
- Carry out a management of change (MOC) review before attempting to bypass a safety system.
- Follow procedures as written. If you find that a procedure is incorrect, take the necessary steps to have it corrected.
- During a PHA or other safety review, verify that automatic shutoff systems work effectively and ensure all personnel understand the purpose of the safety systems.
- If a valve will not operate using its control system, do not force it to operate by connecting the actuator to air or another power supply.
- Maintain the confidentiality of passwords for overriding safety systems. Sharing this information with an unauthorized person could be grounds for termination.

Every protective device has a purpose, and it is critical that you understand that purpose. Know what protective actions you need to take before operating equipment. Read the June 2013, June 2003, and March 2002 CCPS Process Safety Beacons for more tips on safety systems.

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