Updated OSHA Lockout/Tagout May Increase Productivity

Hazards are ever-present in the steel plant environment, and a heightened awareness and emphasis on safety is a necessary priority for our industry. This monthly column, coordinated by members of the AIST Safety & Health Technology Committee, focuses on procedures and practices to promote a safe working environment for everyone.

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Comments are welcome. If you have questions about this topic or other safety issues, please contact safetyfirst@aist.org. Please include your full name, company name, mailing address and email in all correspondence.

Safety is a challenge that all companies face and many still think adding safety devices or safety systems to machinery reduces productivity. This can be true in many cases because, quite often, important steps are overlooked in the implementation process. Unfortunately, it is not uncommon for safety system designers to have a knee-jerk reaction and implement safety solutions that limit access and prevent personnel from doing their jobs. This often results in bypassed safety solutions that are ultimately removed and ignored. The same is true for lockout/tagout (LOTO) solutions. As a matter of fact, lockout/tagout violations are always on the top 10 list of U.S. Occupational Safety and Health Administration (OSHA) violations, as shown in Fig. 1.

Some companies are starting to implement modern safety control solutions to improve safety and productivity, and they are using these alternative solutions to enhance their manufacturing processes. Solutions include energy isolation systems that isolate multiple sources of hazardous energy such as pneumatic, hydraulic and electric. There have been a number of OSHA letters of interpretation allowing systems like these to be used as an alternative measure or method to lockout/tagout for specific tasks. However, anyone who is familiar with OSHA, lockout/tagout, alternative measures and machine guarding knows there is a gray area for what is allowable without obtaining a variance from OSHA. This leads many companies to err on the side of caution, perhaps leading to more downtime due to the complexity of their lockout/tagout procedure, start-up issues and/or guarding that can make safe operator access difficult.

Unfortunately, these are some of the very reasons that lockout/tagout is not always used, used incorrectly, or machine guards and safety systems are bypassed.

On 20 May 2019, OSHA posted a request for information (RFI) to help with its investigation into the use of control circuits in the lockout/tagout process:

"This RFI seeks information regarding two areas where modernizing the lockout/tagout standard might better promote worker safety without additional burdens to employers: control circuit–type devices and robotics. OSHA's lockout/tagout standard currently requires that all sources of energy, including energy stored in the machine itself, be controlled during servicing and maintenance of machines and equipment using an energy-isolating device (EID). Control circuit–type devices are specifically excluded from OSHA's definition of an EID and are thus not a compliant method of controlling hazardous energy during service and maintenance activities. But technological advances since the standard was issued in 1989 suggest that, at least in some circumstances, control circuit–type devices may be at least as safe as EIDs. OSHA requests information, data and comments that would assist the agency in determining under what conditions control circuit–type devices could safely be used for the control of hazardous energy."[1]

For background, OSHA listed a recent Nucor Steel Connecticut Inc. variance from April 2016 which involved a trapped key solution and it was specifically stated that:

"OSHA evaluated whether the device provided an equivalent level of employee personal control over

machine re-energization, ability to account for exposed employees and verification of isolation to that required by the OSHA standard. OSHA reached three conclusions.

First, OSHA concluded that the alternate device allowed energy control measures to remain under the personal control of the exposed employee through control of the trapped key using a group lockbox. Second, OSHA concluded that employees were able to verify de-energization. Third, OSHA concluded that authorized employees were easily identified before equipment restart."[1]

Figure 1

The top 10 list of U.S. Occupational Safety and Health Administration's most cited violations.

OSHA then provided a list of 33 questions regarding the use of control-type devices, what special considerations should be taken when using robots, what types of tasks should be allowed when using control systems for energy isolation instead of lockout/tagout, and what the cost and training impacts would be from use of these types of systems. Replies were due by 19 August 2019 and 87 replies were submitted from manufacturing organizations, companies and a number of individuals.

Most public comments were in favor of OSHA updating the 1989 standard: 29 CFR 1910.147, The Control of Hazardous Energy (lockout/tagout). Many cited the use of modern safety control systems, which did not exist in 1989, and have since been recognized in various consensus standards, such as ANSI/ASSP Z244.1-2016.

Other common themes in the comments were that while OSHA wrote about control devices, it was really control "systems" that they were referencing. Any control system that is used to control hazardous energy sources must be part of a redundant safety system that is designed to be fail-safe. These "safety control systems" must be designed with consideration of the function, reliability and failure modes of all the input, logic and output devices in the system. In keeping with the classic tenets of lockout/tagout, each employee that is exposed to a hazard must have exclusive control of the machine through some sort of trapped key, lock or presence-sensing device.

As it stands, lockout/tagout is an administrative control whose effectiveness is entirely dependent upon workers correctly following the procedure in order to safely perform the task(s) in question. Properly designed alternative measures for hazardous energy control (safety control systems) cause the machinery to go to the safe condition when required or requested and prevent workers from overlooking an energy source due to inadvertently or deliberately missing a step. There also are concerns over things such as task creep (performing tasks not authorized for the alternative measure) or utilizing safety systems that have not been verified and validated against the safety system requirements. These are existing issues and will still have to be dealt with through the use of administrative controls (procedures).

Public Comments Submitted to OSHA

American Forest & Paper Association (by Stan Lancey) — "The current LOTO standard has a substantial inherent weakness because the primary control measures are all behavior dependent. Protective measures that are heavily and repetitively behavior dependent suffer from tremendous variability and are far less reliable than engineered safety control systems."[2]

Design Safety Engineering Inc. (by Bruce Main) — Apfeld (2011) references a 2006 German study and expands on the content as follows: "It is a well-known fact that protective devices on machinery are bypassed. The HVBG report entitled "Bypassing of Protective Devices on Machinery" was the first to deliver reliable statistics, data and facts on the phenomenon. It has now been shown that approximately 37% of all protective devices on metalworking machines are bypassed in this way. The machines concerned present a substantially increased risk of hazard and likelihood and severity of accidents. Ultimately, the bypassing of protective devices can be avoided only if

machines are designed such that defeating offers no benefits, i.e., no incentive exists. Whether these data are universal or not, the current research indicates that bypassing or defeating risk reduction measures is a primary cause of harm to persons, rather than control system failures. The implication of this research is that the quality or reliability of the control systems is not a primary cause of workplace injuries, but a failure to provide workers with practical means to safely perform certain tasks may well be. Safety systems that prevent tasks from being performed, or are cumbersome to use, do not fare well in practice."[3]

PMMI — The Association for Packaging and Processing Technologies (by Bryan Griffin) — "Companies in the packaging industry, and likely many other industries, struggle with how to comply with outdated OSHA standards, yet by necessity make use of alternative methods. Updated regulatory requirements that allow the use of alternative methods are sorely needed. Experiences in the packaging industry have shown that alternative methods are a very effective means to prevent injury because they do not rely on employee actions."[5]

Rockwell Automation (by Jake Thatcher) — "Many of the above safety issues are rooted in a lack of confidence about how to interpret the regulation and lack of a framework to justify the decisions made about safeguarding. The methodology for controlling hazardous energy outlined in ANSI Z244.1 (2016) provides this framework, but perceived conflict with the language in the regulation and focus on the type of task being performed prevents many employers from applying it."[4]

Potential Improvements

The reality is that many companies are embracing ANSI and ISO standards for designing safety control systems that allow faster access for tasks they know will be acceptable to OSHA, but many are still using traditional lockout/tagout for tasks that fall into the gray area. They do this because they are reluctant to tempt fate and are afraid of taking on the process of obtaining a variance from OSHA, which can take years and possibly invite unwanted scrutiny. What companies want and need from OSHA is a clear process, clear requirements and clear limitations as to when alternative measures cannot be used.

Where and why would these systems be used? Safety control systems can be used on any machine where safe access is required repetitively as part of the production process, where setup requires power, where lockout/tagout is time-consuming or difficult, where lockout/tagout can create other hazards, or where multiple zones of control are required. A number of submissions included data on injuries and downtime to provide uptime/productivity data. Many injuries are recorded for not following lockout/tagout or for bypassing safety systems, but not many for safety

Figure 2

Manual energy isolation lockout valve.

Figure 3

Redundant (dual channel). Pneumatic safety exhaust double valve.

Figure 4

Redundant (dual channel). Hydraulic safety block and bleed valve system.

control system failures. Uptime is highly dependent on the time required to perform lockout/tagout versus using an alternative measure, and on commute times from lockout points and access points on the machine.

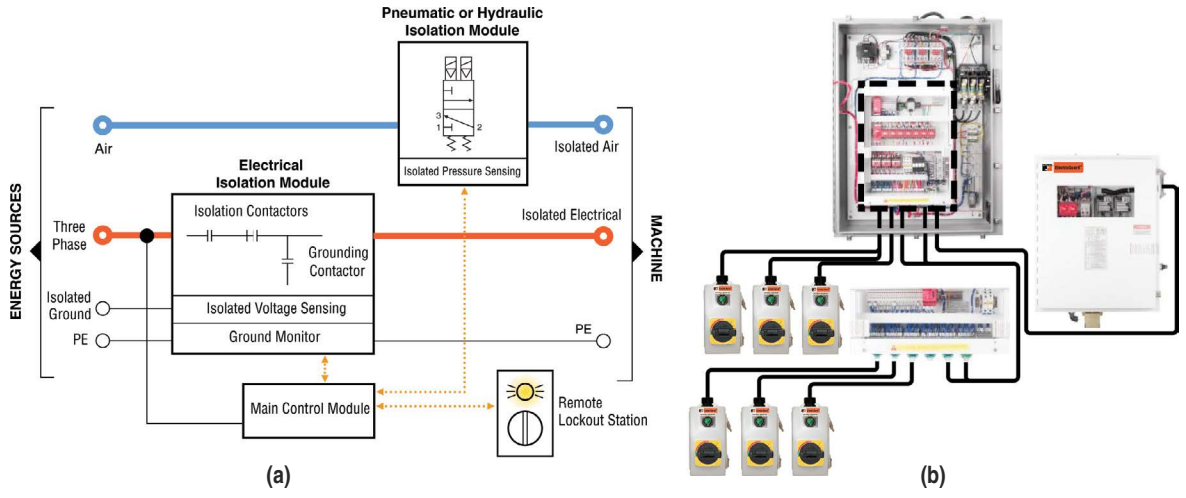
The steel industry is a perfect place for these types of systems to be implemented due to the size of the machinery, the various energy sources, and the inability to simply lock out an entire machine for tasks that must be accomplished quickly and thoroughly on a repetitive basis. As more companies take Nucor's approach, they will find more and more opportunities to implement advanced safety control systems. Companies that are interested in finding areas for improvement may likely find examples in their facilities where their employees are currently working on machinery with single-channel safety systems that do not meet state-of-the-art standard requirements regarding redundancy and monitoring for control of electrical, pneumatic and hydraulic energy sources, and as such, are potentially putting themselves at risk.

In the past, OSHA has required the isolation of pneumatic and/or hydraulic energy to be done only through the use of direct-operated, lockable manual valves like the one shown in Fig. 2. This would continue to be the case because, for tasks that require disassembly of machinery, removal of guards, and/or bypassing of safety devices, this type of energy isolation device is the best possible device to use. However, the hope is that OSHA will see that for the multitude of other minor servicing and setup tasks that need to be done, there is great benefit in the expanded use of safety control systems for the control of hazardous energy.

Safety control systems should include pneumatic and/or hydraulic safety valves that block supply pressure and exhaust/bleed energy from the machine resulting in a "zero energy" state (where needed). Today, there are new technologies that accomplish the lockout/tagout process in a repeatable, controlled and systematic manner. These systems use remote-controlled energy isolation devices in combination with remote lockout stations and control logic to "automate" the lockout/tagout process. Exclusive control is still provided through the use of remote lockout stations (RLS) that are lockable. The RLS stations are connected to safety relays and/or safety programmable logic controllers (PLCs) that monitor the status of the inputs and outputs of the system to control associated energy isolating devices like electrical contractors (that disconnect the electrical energy) as well as pneumatic and hydraulic safety valves that "block and bleed" the fluid power energy. Below is an example of such a system.

Systems like the one shown in Fig. 5 utilize a remote lockout station at each access point on the machine to reduce the travel times from the access point to the lockout point for each energy source to reduce the number of steps in the lockout/tagout process by locking out multiple energy sources from a single lockout point. These remote lockout stations tell the monitoring safety relay or safety PLC to start the isolation process. The safety relays/PLC tells each energy isolating device to de-actuate and relieve all energy. Monitoring switches, sensors and feedback circuits tell the safety relays/PLC that a safe state has been achieved. Then, the safety relays/PLC turns on the "Energy Isolated" light on the remote lockout station

Figure 5



There are a number of qualified safety integrators in the market that can provide steel mills with design and implementation assistance for this type of modern safety control system: example circuit (a) and example of hardware and software (b).

letting the operator know that it is safe to enter the machine.

The use of remote technologies like these reduce:

- Walking distance.
- Missed procedural steps.
- The temptation to bypass a cumbersome lockout/tagout process.

The use of remote technologies like these improve:

- Adherence to company policies.
- The number of steps in the lockout/tagout process.
- Uptime and productivity.

American Foundry Society – AFS (by Juliette Garesche) — "If OSHA were to allow the use of control circuit devices, their use would increase greatly. Newer machines are already being designed with such technology. Control circuit technology will not eliminate the need for physical disconnects in all situations, but where it can be used it has several advantages. For example, its use can reduce the incentive to defeat or bypass safety systems and it can make restart of complex operations easier, faster and safer."[6]

Every company wants to comply with safety requirements, but they also want to be competitive. With the use of modern safety solutions, safety is enhanced while productivity is increased. Step by step, the perception that safety costs companies time and money is changing for the better. OSHA can play a positive role in safety and productivity improvements as they review and update the 1989 lockout/tagout standard.

References

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