Health & Safety Newsletter

Recognition, Evaluation & Control

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In this issue:

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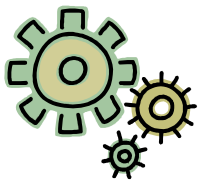
Machine Guarding

In most workplaces there is a wide variety of moving machine parts that pose a hazard to employees. Contact with these moving parts can cause minor injuries but there is a high risk of more severe crushing and amputation injuries. Safeguarding machines to prevent contact with moving parts is an important part of a company's safety program to prevent these types of losses.

There are three main areas were moving parts require safeguarding. These include the point of operation, power transmission equipment and other moving parts. The point of operation is the place where a tool or machine makes contact with a material such as a piece of wood or metal. The tool is used to cut, shape, bore or form a part. The power transmission equipment involves the mechanical system that transmits energy to the point of operation. This includes things like belts, pulleys, rods, flywheels, cams, chains and gears.



Other moving parts include reciprocating, transverse motion or rotating parts associated with operating machines and equipment. Besides the hazards associated with moving parts, employees can also be exposed to potential energy. This includes energy stored in springs or under tension, suspended objects which are under the force of gravity as well as electrical energy stored in capacitors or batteries. Guards also protect workers from electrical, thermal and chemical hazards associated with equipment and processes.

Newer machines usually have these hazardous areas guarded through proper design but older equipment often did not include these safety features. If the company maintenance department makes or modifies equipment, it is also important to incorporate machine guards and other safety features. Even when guards are present, employees often reach around the guards or remove them because they have to access the point of operation to make adjustments. A typical problem involves removal of guards in order to clear parts or jams. Equipment that frequently breaks down is often operated with the guards removed to make access easier. Common causes of injuries include:

- Removing or bypassing guards
- Operating with missing or inoperative guards
- Lack of recognition of the hazards
- Lack of familiarity with the equipment
- Inadequate training
- Loose clothing or long hair

New employees need to be trained in safe operating procedures including operating with guards in place. At the same time more experienced workers may become complacent and forget about the hazards inherent with operating equipment. Training should include:

- Description of hazards of each particular machine
- The safeguards on the machines and how they provide protection
- How to use the safeguards
- How and under what conditions safeguards can be removed and who has the authority to remove the safeguards
- What to do if safeguards are damaged, missing or are unable to provide adequate protection

Adequate supervision and enforcement of company rules and safe work practices are keys to a

successful machine guarding program. Regular inspections should be conducted that include evaluation of machine guarding.

Evaluation of PPE (personal protective equipment) should be done to ensure that PPE does not create additional hazards. Gloves, loose fitting clothing, jewelry and long hair can get caught in operating equipment causing serious injury. Work rules should be developed to control these hazards.

There are two primary methods for safeguarding machines and equipment. These include guards which provide a physical barrier that prevents contact with the hazardous locations of the equipment and safeguarding devices which sense or detect the presence of the operator or part of their body in the hazardous area.

Guards are the preferred control because they are physical barriers. They are typically screwed, bolted or locked in place to make them more difficult to remove or bypass. Guards can be fixed or adjustable so they can be set for a variety of production operations. Self-adjusting guards move according to the size of the stock. Many guards also incorporate interlocking switches. These switches disengage power and prevent machine start-up when guards are open. The machine safeguard program should include testing of the switches to ensure they work properly and are not defeated by the operator.

Safeguarding devices are controls that detect body parts in hazardous locations, restrain or withdraw hands from danger areas as a machine cycles through its operation, require both hands to activate the machine controls or synchronizes a barrier that prevents entry into danger areas as the machine cycles. Safeguarding devices are not as safe as fixed guards since they must be adjusted, installed and designed for proper operation.

The oldest safeguard devices involve the use of cords connected to the operator's wrist that automatically pull the operator's hands back from the point of the operation as the machine cycles. These were typically used on power presses in the past. Light curtains are now used instead of pullback devices in most of these situations since they are easier to use and do not require close supervision to ensure proper adjustment of the restraining cables. Light curtains involve rows of lights and sensors that stop the machine if the operator places any part of their body in the light field. Other presence sensing devices include mats that can be placed on the floor in front of equipment that shut off power if the operators steps on the mat. Two hand controls require concurrent use of both hands to activate the machine. This prevents the operator from activating the machine with one hand while the other hand is in the point of operation. Two hand controls must be placed far enough from the point of operation to make it impossible for the operator to trip the buttons and then reach into the machine.

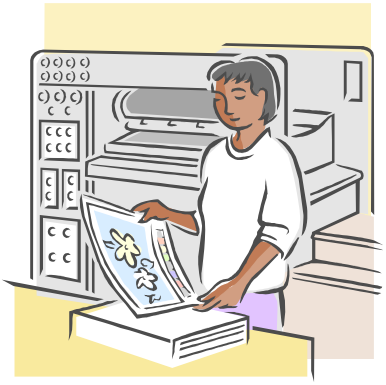
Safeguarding by distance may also be applicable in certain situations. This is accomplished by locating the controls far enough away from the hazardous parts of the machine so that the point of operation cannot be contacted when the machine cycles.

Lockout/Tagout

A lockout/tagout (LO/TO) program goes hand in hand with the machine guarding program. Machine guarding is used to control hazards associated with normal machine operation while LO/TO is used to control energy sources during non-routine activities involving maintenance and service. OSHA's LO/TO standard (29 CFR 1910.147) only applies to these maintenance and servicing activities when unexpected start-up, energization, or the release of stored energy could cause injury. There are a number of energy sources that need to be controlled. They include:

- Kinetic Energy- Energy relating to movement
- Potential Energy- Stored energy including counterweights, springs, and gravity
- Electrical Energy
- Hydraulic Energy
- Pneumatic Energy
- Pressurized liquids and gases

Failure to account for these energy sources can lead to severe or fatal injuries.



LO/TO refers to the specific practices and procedures to safeguard employees during repairs, servicing and maintenance activities. These activities are not normally done by

the operator in most cases. Special skills are usually required so electricians, engineers, steam fitters, set-up persons and/or maintenance staff perform these activities in most instances.

The first step in developing a LO/TO Program is to survey the processes, operations and facilities and determine what service, repairs and maintenance are performed on each piece of equipment. Involve the machine operators, maintenance staff and engineering departments and develop a list of equipment, with maintenance activities along with dates and schedules of routine preventative service. The list should also include activities performed by outside vendors. Keep in mind that not all maintenance activities are scheduled. Maintenance staff and engineers can help identify other types of emergency repairs that have been done in the past.

Once the list of equipment is assembled, the specific energy sources for each piece of equipment along with the magnitude of those hazards should be identified. For example air at 100 psi or electricity of 240V. The hazards of the energy along with the types and locations of isolating devices should be included. Specific procedures for isolating and releasing of stored energy for each piece of equipment should then be incorporated into the plan along with specific LO/TO procedures and operational steps for restarting the equipment after completion of the maintenance activities.

Lockout refers to using a lock to isolate an energy source while tagout refers to placing a warning label on the controls of the energy sources indicating that the control is not to be tampered with. Lockout devices provide positive restraint that cannot be easily removed and therefore are the prefer means of isolating an energy source. Tags are designed to warn employees but do not provide positive restraint. They are easier to remove, provide a false sense of security and provide less protection. Therefore, they should not be used. When isolating devices cannot be locked out, they should be modified or replaced so they are capable of being locked out.

There are many types of devices that are available to lockout and secure equipment. They include valve lockouts, circuit breaker lockouts, cord plug lockouts and other specialty devices. Each employee performing repairs or service must apply their own separately keyed lock to the isolating device. Multiple lockout hasps should be used so employees can all apply their own locks to the devices.

General procedures for performing maintenance with LO involve:

1. Notify personnel- This involves notifying machine operators and others working in the area that the machine is being serviced.
2. Shut down the equipment following procedures in the LO/LO Plan.
3. Isolate energy sources. Follow the procedures in the plan for isolating, dissipating and controlling the energy sources.
4. Apply lock-out devices.
5. Verify energy isolation by clearing the area and trying to activate the equipment.

Once the service work is completed, equipment should be reactivated in a safe manner:

1. Clear the area of tools, materials and personnel.
2. Inspect the equipment and ensure components and guards are in place.
3. Verify that machine operational controls are in “off” position.
4. Remove locks
5. Restore energy
6. Advise affected employees that the equipment is now operational.

The LO/TO program should include procedures for orderly transfer of locks should personnel changes occur during the LO process. Continuity of lockout must not be interrupted. If outside contractors perform service activities, they must be informed of the company’s LO/TO procedures and be monitored to ensure they comply.

The OSHA standard requires that employees be trained based on whether they perform servicing activities with LO/TO (authorized employees) or whether they are affected by LO/TO. Affected employees should be provided with awareness level training including:

- Recognizing when energy control procedures are being used

- The purpose of the procedures
- The importance of not tampering with LO or TO devices and not starting machines under LO/TO.

Authorized employees should have more substantial training since they are actually using LO/TO procedures during servicing and repair activities. Training should include:

- Hazardous energy source recognition
- The types and magnitudes of energy sources in the workplace
- Energy control procedures and methods to isolate and control the energy sources.

OSHA also requires periodic inspection and evaluation of the company's LO/TO procedures. The intent of the inspections is to ensure employees are implementing the energy control procedures properly. The inspections should determine:

- If employees are following the steps in the energy control program
- If the employees know their responsibilities under the program
- If the procedures are adequately protecting employees

Employers are required to certify that the inspections are completed. The certification should include:

- Machine evaluated
- Date
- Names of employees performing work being inspected.
- Name of person performing the inspection.

Specific deficiencies should be noted on the inspection form and a plan for correcting deficiencies should be developed and implemented.

Safety Incentive Programs

Many companies use incentive programs to promote and encourage safety. Typically, programs might include safety bingo, lunches, pizza parties and prizes. Employers must be careful when using safety incentive programs so that they are effective and do not discourage employees from reporting injuries.

Safety incentive programs have been used for many years as a means of improving safety performance because they are often seen as simple, easy, quick solutions to safety problems. In evaluating these programs, OSHA found that they often resulted in unintended consequences such as disincentives to reporting injuries. This is especially a problem where the incentive program participation is only open to those employees who have not reported an injury or where a team receives an award if no members of the team report a recordable injury. In these cases, there is a strong disincentive for employees to report injuries since the injured employee does not want to "mess it up" for the entire group.

A basic tenant of a good safety program is that all injuries and near miss incidents need to be reported so that corrective action can be taken to prevent recurrence. It's only a matter of time before these unreported incidents lead to more costly and potentially debilitating injuries. If employees are not reporting all these incidents and minor injuries, there is a false sense of security. In another type of safety incentive program a single or few valuable prizes are raffled off to eligible employees. The winner may be the most unsafe worker in the plant but through dumb luck has not been injured yet. This discourages those who work safely and follow company rules.

Safety incentives can still be used but they need to be based on other goals rather than recordable incidents and lost-time injury reduction. Safety incentive programs should complement the company's overall safety program and should be positive and reinforce safe behaviors. Incentive programs should be based on things like safe behavior observation, safety meeting attendance and participation, safety suggestions and solutions. Determine what safety behaviors need to be reinforced and base the incentives on these behaviors. Immediate rewards are more effective than rewards at the end of a program or time period. Small rewards with praise and recognition at the time of the desired behavior are the most effective means of changing the safety culture. Other recommendations:

- Avoid money. Money is quickly spent and the reason why it was given is often forgotten
- Personalize the reinforcement so it is more meaningful
- Reinforce immediately
- Don't use single expensive incentives. Use resources to buy more smaller gifts that can be spread around a larger group
- Evaluate the incentive program for effectiveness
- Involve employees in development of the program