Best Practices for Machine Guarding

Scope

The scope of this best practice is to provide guidelines for injury prevention using proper machine guarding. Machine guarding is used to protect the machine operator and other employees in the work area from hazards created by ingoing nip points, rotating parts, flying chips, and sparks. Machine guarding is covered by 29 CFR Part 1910 Subpart O - Machinery and Machine Guarding and the reader must be thoroughly familiar with this regulation.

Key Points

- Verify that new equipment has adequate guarding provided by the vendor. There are numerous cases where such guarding has proven to be insufficient.
- Periodic inspections and safety reviews should ensure machine guarding is in place, that there is good housekeeping around machinery, and that there is adequate access for normal operation and maintenance.
- Ensure, to the extent practical, that routine activities such as lubrication, vibration monitoring, etc. can be performed with guards in place. For example, extend grease fittings outside of the guard for easy servicing.

General Information

In the Pine Chemicals industry, machine components requiring guarding can be found in maintenance shops (e.g. drill presses, grinders, table saws) or in the operating areas (e.g. pump and motor shafts, pulleys, belt and roller conveyors, palletizers, automatic drum filling machines, fan blades).

All machines consist of three fundamental areas: the point of operation, the power transmission device, and the operating controls. Despite all machines having the same basic components, their safeguarding needs widely differ due to varying physical characteristics and operator involvement.

- Point of Operation - The point of operation is where work is performed on the material, such as cutting, shaping, boring, or forming of stock.
- Power Transmission Device - The power transmission apparatus transmits energy to the part of the machine performing the work and includes motors, flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks, shafts, and gears.
- Operating Controls - Mechanical or electrical power controls should be provided on each machine to make it possible for the operator to cut off the power at the point of operation from each machine without leaving his/her position.

Requirements for Safeguards

Safeguards must meet these minimum general requirements:

- **Prevent contact:** The safeguard must prevent hands, arms, and any other part of a worker's body from making contact with dangerous moving parts. A good safeguarding

system eliminates the possibility of the operator or another worker placing parts of their bodies near hazardous moving parts.

- **Secure:** Workers should not be able to easily remove or tamper with the safeguard, because a safeguard that can easily be made ineffective is no safeguard at all. Guards and safety devices should be made of durable material that will withstand the conditions of normal use. They must firmly be secured to the machine.
- **Protect from falling objects:** The safeguard should ensure that no objects can fall into moving parts. A small tool which is dropped into a cycling machine could easily become a projectile that could strike and injure someone.
- **Create no new hazards:** A safeguard defeats its own purpose if it creates a hazard of its own such as a shear point, a jagged edge, or an unfinished surface which can cause a laceration. The edges of guards. for instance, should be rolled or bolted in such a way that they eliminate sharp edges.
- C**reate no interference:** Any safeguard which impedes a worker from performing the job quickly and comfortably might soon be overridden or disregarded. Also, when observation or rotation checks are required, consider expanded metal guards, versus solid metal ones. Proper safeguarding can actually enhance efficiency as it can relieve the worker's apprehensions about injury.
- **Allow safe lubrication:** If possible, machine lubrication points should be accessible without removing the safeguards. Locating oil reservoirs outside the guard, with a line leading to the lubrication point, and extending grease fittings to outside the guard, will reduce the need for the operator or maintenance worker to enter the hazardous area.

<u>Types of Safeguards</u>

Guards - Guards are barriers which prevent access to danger areas. There are four general types of guards:

- Fixed
- Interlocked (e.g. automatically shuts off or disengages the device when the guard is removed and prevents re-starting/re-engaging until the guard is back in place.)
- Adjustable (e.g. adjustable to accommodate various sizes of stock)
- Self-adjusting

Devices - A safety device may perform one or more different functions. It may stop the machine if a hand or any part of the body is inadvertently placed in the danger area; restrain or withdraw the operator's hands from the danger area during operation; require the operator to use both hands on machine controls, thus keeping both hands and body out of danger; or provide a barrier which is synchronized with the operating cycle of the machine in order to prevent entry to the danger area during the hazardous part of the cycle. Devices can include:

- Photoelectric (optical)
- Radiofrequency (capacitance)
- Electromechanical
- Pullback

- Restraint (holdback)
- Safety Trip Controls (pressure-sensitive body bar, safety tripod, safety tripwire)
- Two-Hand Control
- Two-Hand Trip
- Gate

Purchase of New Equipment

While most new equipment from the manufacturer will be designed and built with proper guarding/safety devices, best practice is to inspect guarding/safety devices on new equipment to ensure it is adequate. There are numerous cases of inadequate guarding being provided by the equipment manufacturer.

Equipment Repair

After equipment repair, it is essential that any guards that had been removed are reinstalled Best practice is to have a post-maintenance checklist that includes ensuring machine guarding is restored.

General Safety Considerations

Safety programs should include procedures and standards for employee apparel, housekeeping practices, hazard assessments, inspections, and employee training to promote safety around machinery. See the details below.

Safe Work Procedures - Safe work procedures are formal, written instructions which describe how a task is to be performed. These procedures should incorporate appropriate safe work practices, such as prohibiting employees from wearing loose clothing or jewelry and requiring the securing of long hair with nets or caps. Clothing, jewelry, long hair, and even gloves can get entangled in moving machine parts. The safe work procedures should also address good housekeeping around machinery to promote safe working conditions.

Hazard Assessments of New and Existing Equipment – Best practice is to conduct prestartup safety reviews (PSSR) and/or job safety/hazard analysis (JSA/JHA) before new or modified equipment is placed in operation. These reviews should include consideration of machine guarding and adequate access to the equipment for normal operation, lubrication, and maintenance.

Periodic Inspections - Best practice is to conduct periodic machine guarding inspections of the facility. Based on the findings and trends, corrective steps can be taken. With some basic training, these inspections can effectively be conducted by operating and maintenance personnel In addition, best practice is to test safety devices, such as interlocks, on a regular frequency.

Lockout - OSHA's lockout/tagout (LOTO) standard, 29 CFR 1910.147, establishes minimum performance requirements for controlling hazardous energy, and it is intended to complement

and augment machine safeguarding practices. The lockout/tagout standard applies if employees are exposed to hazardous energy during servicing/maintenance activities. Best practice is not to use machine guarding as a substitute for lockout/tagout during servicing or maintenance work. If possible, machine design should permit routine lubrication and adjustment without removal of safeguards. But when safeguards must be removed, and the machine serviced, the lockout procedure of 29 CFR 1910.147 must be adhered to. The maintenance and repair crew must never fail to replace the guards before the job is considered finished and the machine released from lockout. See additional details, Best Practice for Control of Hazardous Energy.

Training

Best practice is to conduct initial training on general machine guarding, recurring training at least every three years, and when job positions or conditions change. In addition, specific and detailed training is a crucial part of any effort to provide safeguarding against machine-related hazards. Thorough training should involve instruction or hands-on training in the following:

1. a description and identification of the hazards associated with particular machines;
2. the safeguards themselves, how they provide protection, and the hazards for which they are intended;
3. how to use the safeguards and why;
4. how and under what circumstances safeguards can be removed, and by whom (in most cases, repair or maintenance personnel only); and
5. when a lockout/tagout program is required.
6. what to do (e.g., contact the supervisor) if a safeguard is damaged, missing, or unable to provide adequate protection.