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Considerations for Building Safety into Metal Forming Machines

To help prevent injuries and increase productivity for end users, machine builders are incorporating safety into the design of metal forming and bending machines. Safer machines make operators more confident and faster in their work; safer machines dramatically reduce the number of injuries, which saves companies time and money. The old way of thinking, that safety harms productivity, has changed.

Recently a simple analogy explained why it is better to procure metal forming machines already installed with the needed safety solutions rather than adding them on later at the customer's request. Buying a vehicle with a factory installed stereo system is guaranteed by the manufacturer, it is cosmetically more appealing, and it has a consistent best-practice installation process. Stories of bad installations after the purchase run rampant; the same is true with metal forming and bending machines. Even if the "update" by various installers and integrators technically works, the aesthetics and safety results may not be as reliable or fit seamlessly with the existing machine design.

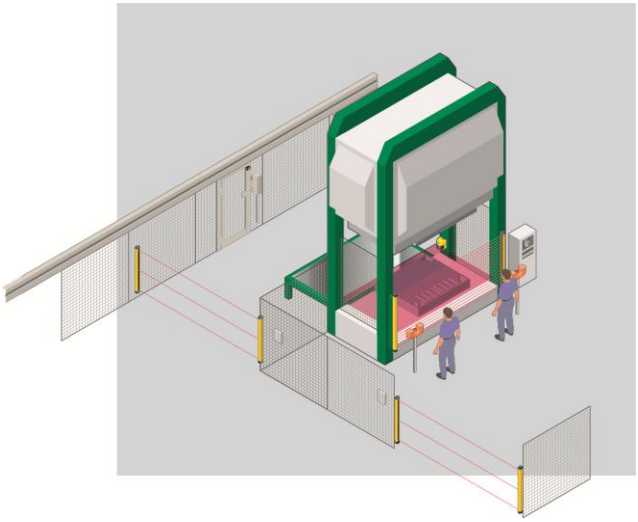
Workplace fatalities, injuries, and illnesses cost the country billions of dollars every year. The U.S. Department of Labor and Occupational Safety and Health Administration (OSHA) reports that machinery users suffer 18,000 amputations, lacerations, crushing injuries, and abrasions annually; over 800 machinery users are killed per year. Employers often find that process and other changes made to improve workplace safety and health may result in significant improvements to their organization's productivity and profitability.

There is a direct positive correlation between investment in safety, health, and environmental performance and its subsequent return on investment according to the American Society of Safety Engineers (ASSE). Machine builders often do what is "required" by the governing safety standards. Unless requested by the end user, machine builders may not build safety into the machine. Increasingly, however, there is a case for machine builders to design the safety solution into the machine, producing an integrated solution that saves the machine builder design costs.

OSHA identified hazards associated with mechanical power presses. According to the OSHA Safety and Health Information Bulletin, the most common type of injury associated with mechanical power presses is amputation. Control reliability means the system's components are integrated and function together as a unit; if one system component fails, the press will not initiate a successive stroke until the failure is corrected. Fabricators and metalworkers must know the operation area and safeguard the presence sensing device (PSD). Failure means the control was unreliable because the machine should have stopped operating.

Machine builders must ensure machines comply with the latest safety regulations. As safety standards continue to evolve, more machine builders are choosing to incorporate safety into machine designs on the front-end. Safety is a way to improve productivity as well as justify an increase in the sell price of the machine. Safety technology also leads to more satisfied customers, reduces costs when safety risks are assessed during the design phase (rather than after the machine is placed on the plant floor of the end user.) Lean manufacturing principles have had an impact on the technologies developed to safeguard machines and employees. Safety component manufacturers are looking at ways to design their safety offering to better meet the requirements of lean best-practices.

Challenges machine builders face when incorporating safety into metal forming and bending machines are significant and include fast speed, dangerous movements, and cost concerns. Injuries from press machines increase downtime. Frequent operator involvement means metal forming machines represent a significant safety risk when proper safeguards are not instituted from the start. Because U.S. fabricators and metal working manufacturers are increasingly Engineer-to-Order (ETO) in North America, the safety systems for dealing with custom jobs require more flexibility and increase the likelihood of frequent part changeovers.



Considerations for Designing a Safe Machine

<u>Point-of-operation safeguarding</u>

Point-of-operation safeguarding products generate a safety stop signal based on the detection of a finger or hand. These safeguards are used to protect the operator from being exposed to a hazardous motion where material is positioned and a process is performed.

Applications for point of operation safeguarding include press brakes, welding and assembly lines, and hydraulic and mechanical presses. Presses in the metal, plastic, rubber and brick industries along with punches in the metal, plastic and textile processing industries are best designed with these safeguarding products at the manufacturing level. Safety light curtains are frequently used at the point of operation.

<u>Perimeter safeguarding</u>

Perimeter safeguarding products generate a safety stop signal based on the detection of a body/torso or arm breaking a defined perimeter. Typical solutions include safety light grids and single beam safety sensors, which are generally used to protect the operator from hazardous motion occurring within an area. Special applications exist, such as muting. Muting is the

temporary automatic suspension of the safety function during the non-hazardous portion of the machine or process cycle. This allows material to be fed into a machine or personnel to enter an area without issuing a protective safety stop command. Muting should not be confused with "bypassing" or "overriding," which is initiated by an individual who manually suspends the normal function of a safeguard. See ANSI B11.19 for additional information about muting.

Applications for perimeter safeguarding often include work cells, palletizers, conveyors, gantry cranes, and automation lines where metal forming equipment is used.

Hazardous area protection

Hazardous area protection and mobile hazardous protection allows manufacturers of metalworking machinery to evaluate the response time and safety distance required as well as the reliability of the safety functions. By increasing machine safety, compliance with the relevant ISO norms is improved, while achieving a reduction of liability risk. During the early phase of the machine-building project, compliance with directives and laws is an integral aspect of project planning. Adding this functionality after the fact often leads to over-dimensioning, minimized effectiveness and competitiveness.

Solutions included in these safeguards must have the ability to differentiate between man and material. The maintenance and service life of the solution must also be considered.

Other Factors

Environmental factors unique to designing a safe machine include electromagnetic interference. The machine and the components selected and verified must be immune to the expected interference upon manufacture of the metalworking equipment, creating increased requirements to safety components. Electromagnetic interference can be caused by fast, transient, electrical disturbances (burst), surge voltages, lightning strikes to the grid, electromagnetic fields, high-frequency interference, or Electro Static Discharge (ESD). The industrial sector interference requirements for susceptibility are higher.

Ambient light is another environmental factor, which is resolved with the use of tamper-proof sensors, ensuring inconspicuous and non-distracting operation through the use of infrared light. High ambient light immunity also increases machine reliability, improving productivity. Vibration and shock are other environmental factors that must be dealt with up-front, rather than an after-the-fact consideration.

Human variables must also be carefully considered, including the qualifications of the operator, the expected number of people in the area, as well as foreseeable misuse. Securing and maintaining compliance standards such as ISO 10218, ANSI / RIA R15.06 2011-2012 must be evaluated when designing safety into a metalworking machine.

Types of Safety Solutions Available for Fabricating and Metalworking Machines

Opto-electronic protective devices include safety laser scanners, perimeter guards, safety light curtains and safety controllers.

- Safety laser scanners are used for non-contact safeguarding in work cells. These scanners use time-of-flight technology to scan their surroundings and detect intrusions into predefined areas. After manual work in the hazardous area, an operator must manually restart the machine. When used with a safety controller, up to four simultaneous protective fields can monitor two hazardous areas at the same time.

- Safety light curtains and perimeter guards and are typically used for hazardous point protection and perimeter guarding. Single beam safety photoelectric switches can be used in single or multiple beam systems to ensure that the necessary distance for safety is observed in front of a machine, according to the space available at the site. Multiple light beam devices are used for providing access protection to machines.

- Safety controllers are used to connect all safety devices. Safety switches, emergency stop pushbuttons and optoelectronic safety devices can be connected to safety controllers. When used with safe motion control devices, this enables safe implementation of a speed monitoring system.

- Physical fixed or movable guards or fences provide safety solutions as well as mats. They are generally less expensive initially, but can cost more over time due to a higher rate of replacement and are less flexible.

Benefits of a Safe Design in Fabricating and Metalworking Machinery

Reduced injuries and deaths are the most obvious benefits to ensuring safety elements are designed into the machinery on the front-end. Muting features reduce downtime since robots can pass through the hazardous area without shutting down the machine. Ultimately, reliable communication is achieved using safety controllers.

Metalworking shops, job shops, and fabricating plants insist that safety technology is essential, not a mere afterthought. The value in metal forming machines built with safety planning in advance, far exceeds the liability exposure of just one more amputation or death. Economically as well as responsibly, it makes sense to get it right the first time.

For more information, contact Steve Aamodt, Safety Division Manager, SICK. Email steve.aamodt@sick.com or call 800-325-7425. Visit our web site at www.sickusa.com.