SAFETY ON THE FACTORY FLOOR IS EVERYONE'S BUSINESS

By Russ Wood, Application Engineering Manager, Omron Scientific Technologies, Inc.

A risk assessment, reduction planning, and safety integration program secures the best possible working environment for the health and safety of employees.

Accidents can happen at any time, and often where they are least expected. They come from two primary sources, operator misjudgments and equipment hazards. Sufficient operator training can reduce the first, and well-designed equipment can take care of the second. But some kinds of machinery are inherently dangerous, even when well designed. An extra level of effort is needed in these cases to keep operators and pedestrians out of harm's way.

The cost of not safeguarding a risky machine will far exceed the cost of reprisals and safeguarding after an operator is injured or killed. For example, the Liberty Mutual Group reports that 61% of polled executives claim that for every dollar spent on workplace protection, three dollars are saved.

And OSHA goes further to report a savings of four to six dollars for each dollar invested. Most responsible companies take this issue seriously and either have staff to handle risk assessment and risk reduction and implement the safeguarding devices and systems, or hire outside experts to take care of it.

THE SAFEGUARDING PROCESS

The safeguarding process can be described in a general 12-step program (below), with a risk assessment as the key first step.

This should not be minimized or avoided; it provides both parties with a full understanding of the scope of the job and details each hazard point, from the most critical to the least critical. It sets the benchmark for determining when the risk has been reduced to an acceptable level.

The second part deals with the methods, techniques, and devices used to overcome the hazard and reduce the risk. The following steps lead to implementing a machine safeguarding system.

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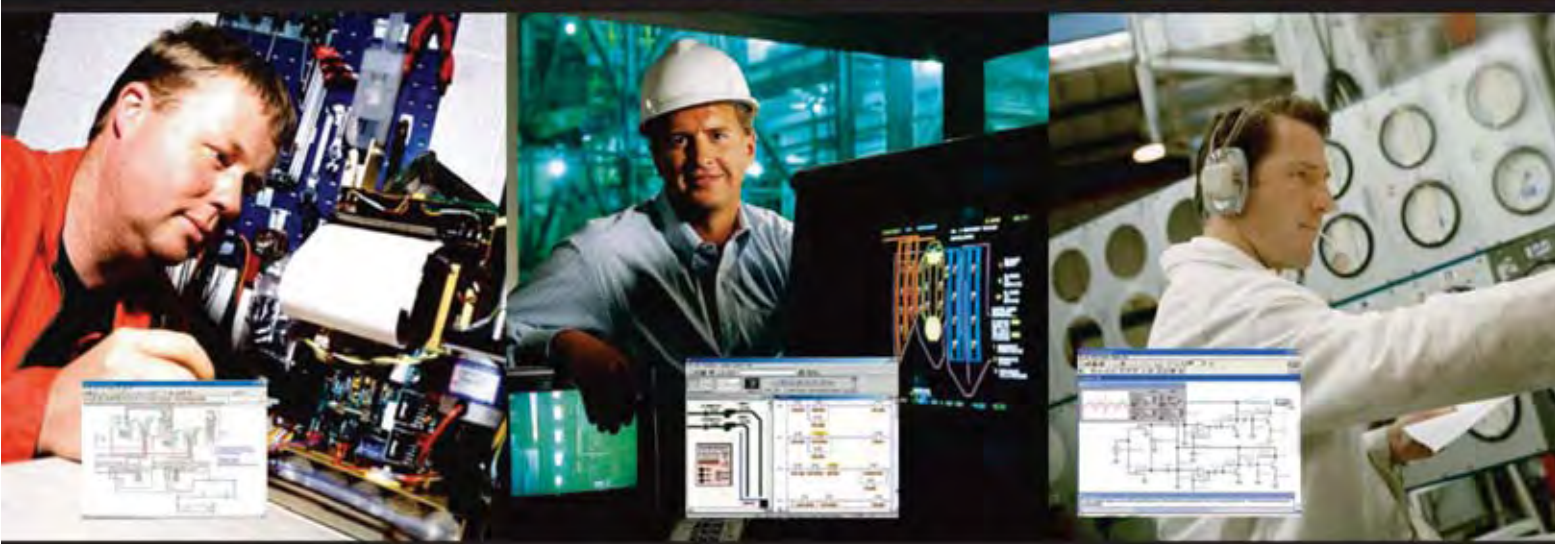

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STEP 1. IDENTIFY CANDIDATE MACHINES AND PROCESSES

The most obvious machines may have already experienced near misses, minor accidents, or even serious accidents. The list of high-risk machines usually includes hand-fed machines such as power presses, and these receive attention first.

STEP 2. COLLECT ACCURATE INFORMATION

Information needed to assess the risk includes the machine's limits, life-cycle requirements, and energy sources. The safety integration specialist will need access to all design drawings, sketches, system descriptions, and other data characterizing the machine under examination, as well as proposed modifications. Previous accident and related health records also aid in the evaluation. Finally, a list of affected personnel should be studied to help the contractor assess extenuating circumstances that could predict future accidents.

STEP 3. ASSEMBLE APPROPRIATE INDIVIDUALS

All those with a stake in the safeguarding process should provide input to the safety specialist, including operators and maintenance personnel. They are the most likely to identify hazards not seen by others. And when they are a part of the investigative process, they are more likely to embrace the outcome and will less likely attempt to defeat any new safety measures.

STEP 4. OBSERVE MACHINES IN USE

Although many machines look alike, they could be modified or programmed to produce widely divergent parts. The way they are used may also make a difference in their unique risk factors. For example, robots can be programmed to handle material, weld, or paint. Each application is unique and has different risk factors. In addition, different operators should be observed to note the different ways the machine is used. Each person may call for a different set of risk factors.

STEP 5. IDENTIFY HAZARDOUS AREAS

One outcome of a task/hazard pair approach is a detailed list of all possible hazardous situations for each task that the machine is capable of handling over its life cycle. The list includes common tasks such as changing tools, loading, unloading, operating, maintaining, troubleshooting, and housekeeping. Less common tasks that also must be addressed include transportation, start up, installation, decommissioning, and disposal.

Some of the more serious hazards that need to be considered and accounted for include in-running nip points, pinch points, crushing, electric shocks, release of stored energy, ergonomic strain, slips, trips, and falls.

STEP 6. IDENTIFY THE RISK LEVEL

The next step is to assign a risk level to each pair of the listed tasks and hazards. Many standards are available from numerous regulatory agencies and sources such as ANSI, ISO, and CSA, to name a few. Most consider the main functions of a hazard, such as the severity of a potential injury, exposure frequency, possible avoidance, and likelihood of a hazard during equipment failure. Team members must agree on the definitions and risk level classifications, usually ranging from high to negligible.

The initial risk assessment is conducted before any safeguards are installed so the evaluation will reveal a risk level that will more accurately identify the proper safeguarding methods required.

STEP 7. EVALUATE THE RISK LEVEL

Each risk level needs to be evaluated. When the risk level is considered tolerable, it may not need special safeguarding measures. This level might be compared to the risk of crossing a busy intersection with a traffic light. It's safe, but still a risk in the path of a negligent driver. In situations where the risk is tolerable, one can skip to step 12. When the risk level needs work, one should continue with step 8.

STEP 8. CREATE AN APPROPRIATE RISK REDUCTION SYSTEM

This is a hierarchy of protective measures for each risk in order from most effective to least effective. The methods that rely on human behavior are at the bottom of the reliability scale. Evaluate the potential solution against factors such as risk reduction benefits, usability, productivity, technological feasibility, economic and ergonomic impact, durability, and maintainability.

Hazard Elimination or Substitution: Where possible, this is the most effective method of reducing risk. When the machine is operating on the floor and a basic design modification is not possible or feasible, the next best thing is to use engineering controls.

Engineering Controls: Select the most appropriate technology, devices and control systems, which include electronic, hydraulic, and pneumatic circuits. The risk-estimation tools listed above usually account for circuit reliability levels. Always defer to the higher level of safety when making a tough decision between two levels.

Another consideration is the location of operator controls. Safety devices that do not physically prevent operators from reaching into a hazardous area must be located far enough away from the machine so the operators can't reach the hazardous area.

Awareness Means: After selecting the appropriate controls, apply means of awareness that can help further reduce risk. This might include signs or other visual devices, and audible alarms. Be sure to consider employee literacy levels, color blindness, and primary language for the visual devices. Audible alarms should be effectively heard above the ambient noise level, and the signs should be located where they are safe and observable.

Administrative Controls: These include training employees and providing them with safe working procedures. Procedures should be geared toward simplifying complex or inherently high-risk procedures. Also consider the employee's skill and work experience, and special training when safeguards must be removed or bypassed during maintenance.

Moreover, provide for alternative safety methods when needed.

Training programs should include all instructions, specifications, recommendations, information, and data available from suppliers, and should be given to all operators, helpers, maintenance people, supervisors and those who may be exposed to the machine's potential hazard(s). Ensure that all people understand the information, and continue to reinforce it. Document the procedures, log the completion dates, and list the participants at the end of each training session. Additional precautions include lockout/tagout, and tryout. Such systems protect personnel from inadvertent expo-

sure to a hazard such as unintended motion, energizing, start-up, or release of stored energy.

Personal Protective Equipment: Sometimes, the safeguards, means of awareness and administrative controls alone are not enough to mitigate a potential hazard. In these cases, personnel are assigned personal protective equipment (PPE) that can include safety glasses, hearing protection, gloves, hard hats, respirators, and foot protection.

STEP 9. ACCURATELY ESTIMATE SYSTEM COSTS

Whether inside or outside personnel implement the safeguarding, all costs must be accurately estimated. Sometimes those who install the systems internally overlook labor costs and common material costs such as wire and conduit. In addition, when using an outside contractor, travel expenses and per diem charges should be considered.

STEP 10. PROVIDE ALL REQUIRED SERVICES AND MATERIALS

Select the proper materials and proven methods of installation. Follow national, regional, and local regulations, as well as consensus standards, user specifications, and device or machine manufacturers' recommendations.

STEP 11. CONDUCT FOLLOW-UP RISK ASSESSMENT

After installing the safeguards, conduct a follow-up risk assessment to verify that the risk level has been reduced to a tolerable level. If it cannot be verified satisfactorily, repeat the process until the risk level is negligible.

STEP 12. PROCESS CLOSEOUT AND SIGN-OFF

The final step requires complete documentation. Residual risks should be identified and documented. Then the safeguarding system should be verified for effectiveness and compliance. Do this by following the machine and device manufacturer's set-up and try-out procedures. All safe work procedures and training material should be updated to reflect all system changes. After training, complete a machine or process sign-off to verify that the system is in proper working condition and the required tasks can be executed safely. If any group is reluctant to provide the necessary documentation as proof of compliance and tolerable risk, the machine or process should be re-evaluated before continuing.

FOLLOW UP

Maintain a safe system with follow-up training sessions to preserve and upgrade employee skills. Join forces with an outside safety integration specialist to review existing safeguards, create new specifications to ensure compliance, assist in device selection, and provide impartial review of compliance with applicable standards. When selecting an outside service for safeguarding, make certain it can cover all the above issues with expertise, which includes assisting the EH&S professional to ensure a safe environment by handling noncompliant items and providing comprehensive services.