IN-DEPTH ON RISK ASSESSMENT

By Erin Earley

Take a deep dive into the practical implications of risk assessment and your products.

In the last "On Your Mark" column, we looked at risk assessments, a fundamental element of labeling and product safety. That included exploring when risk assessment is needed during a product's lifecycle, key standards to follow, and the risk assessment process, with insight from Doug Nix, managing director of Compliance inSight Consulting. This month, we're back with Nix, who specializes in machinery risk assessment techniques, with an in-depth interview on practical implications of risk assessment for your products.

Can you describe the different types of machine-related assessments – and how they may be used to support product safety?

All risk assessments start with identification of hazards, after all, hazards are what do the harm.

- **A hazard-based analysis** starts with the hazards and ignores what people are doing with the machine. Safeguards are prescribed based on the presence of the hazard. This approach generally ignores the probability factors relevant to the tasks people do with the machinery and only considers the probability related to the severity of injury likely to be caused by the hazard. This is a deprecated method and is not normally used by knowledgeable risk assessment practitioners unless it is a preliminary step to completing a full analysis.
- **Task-based risk assessments** are focused on what people do with the machinery, and how that brings people into proximity with the hazards. When conducting a task-based risk assessment, the risk assessment team will brainstorm a list of tasks and a list of hazards, and will then look at what tasks occur in each stage of the life cycle of the machine. The same hazard may produce significantly different levels of risk during normal operation, maintenance or troubleshooting. Different types of control measures may be necessary due to the different ways workers will need to interact with the machinery.

As an example, consider a robotic work cell. In normal operation, the workers have no access to the danger zone around the robot. There is a fence to keep people from inadvertently walking into the danger zone, an interlocked gate that will shut the robot down if someone opens the gate to get access inside the cell, and light curtains or other presence-sensing safeguards where the workers interact with the machine during production. In maintenance mode, the robot has to be able to move despite the interlocked gate being open, so the maximum speed is reduced. The technician (called a teacher) who is working with the robot has a pendant in hand that has an enabling device on it, as well as hold-to-run controls that cause the robot to move slowly through its program steps or through a guided motion so that the robot can learn the necessary motions for its work. There is also an emergency stop on the pendant as a further backup. See Figure 1.

Figure 1: Examples of warnings that may result from a task-based assessment of a robotic work cell. (Label and sign designs ©Clarion Safety Systems)

- **A job hazard analysis** is a variation on the task-hazard risk assessment. It's not used for deciding what types of machine guarding may be needed in a design, but instead is used to consider the types of risks that a worker will be exposed to while carrying out a specific job, and then deciding how best to reduce those risks.

  As an example, a worker is assigned the job of breaking up a concrete floor with a hand-held jackhammer. What hazards will the worker be exposed to? Noise, silica dust, ejected chips, hand-arm vibration are guaranteed, and there may be others like embedded electrical wiring, or piping carrying hot liquids or toxic materials. The basic hazards (noise, dust, chips) can be mitigated with PPE, but hand-arm vibration means that limited duration of use of the jackhammer is important. Now you need three to four workers all trained in how to use the jackhammer safely, so that you can rotate them out, ensuring that no one is exposed to the vibration for more than 15 minutes at a time. The electrical and piping hazards have to be addressed by locating the wiring and piping using drawings or instruments to find the conduits, and then marking them out on the floor, plus ensuring that they are de-energized or depressurized and drained before the jackhammering starts.
- **Task-hazard analysis** is a term used to describe either a task-based risk assessment or a job hazard analysis. I've heard the term used to describe a "mini" job hazard analysis, where there is a relatively simple or small-scale activity that needs to be done.

What do you commonly see being done incorrectly or that can be improved?

The top mistake that I commonly see is poor task and hazard identification, but there are a number of other common pain points I've come across when working with clients. So much so that I've compiled a "Field Guide to Bad Risk Assessments" presentation that I share with them to help identify steps that may be needed to make improvements to their processes. It includes:

- Conducting short or overly simplified assessments, like using less than 10 line items in the risk register for a fairly complex machine.
- Risk assessments done in isolation or by a single person. Teams with varied expertise (users, designers, engineers, lawyers) are always needed to do a quality risk assessment.
- Risk assessments done "for form" and then placed in a file without any action taken.
- Conducting the risk assessment at the end of the project when it's too late to change anything.
- Using sub-par risk assessment experts who don't advise correctly or use outdated methods, like hazard-based risk assessments.
- Using poorly suited scoring tools, like using FMEA for conducting an occupational health and safety risk assessment.
- Risk assessments that fail to accurately identify hazards or that rely on overly generic risks.

How often do you recommend that machine manufacturers conduct risk assessments?

The most important times to conduct risk assessments are:

- **During the design process:** Risk assessment should start at the machinery's design and then be iterated at each major step in the design, build and installation of the machinery.
- **After installation:** Once the machine is commissioned, the workplace should take the machine risk assessment and use it as the basis for the workplace job hazard analysis to determine the specifics of staffing and training. The machinery risk assessment may also include recommendations for PPE which will need to be supplied by the employer, and which may also require proper fitting and user training, e.g., respirators or fall arrest / fall prevention equipment.
- **After changes or modifications:** Risks need to be reassessed if/when something in the process changes, the tasks are changed, or the machine or the safeguarding is modified.
- **New ownership of the machine**: When a used machine is acquired by someone new, it's important for that new user or owner to conduct their own risk assessment to determine changes that may be needed.

Erin Earley, head of communications at Clarion Safety Systems, shares her company's passion for safer products and workplaces. She's written extensively about best practices for product safety labels and facility safety signs. Clarion is a member of the ANSI Z535 Committee for Safety Signs and Colors, the U.S. TAG to ISO/TC 145, and the U.S. TAG to ISO 45001. Erin can be reached at eearley@clarionsafety.com.