Safety first in your factory:

Five easy steps to determine which safety switches are best

Are you a plant manager who knows you need safety switches on your equipment, but just don't know how to select the best ones for the job? The process may not be as daunting as you may have originally thought.

Honeywell offers some guidelines for methodically making sound safety switch choices.

One of the most stressful, regretful and disastrous events a plant manager can experience is the injury of a colleague due to an accident. In this day and age of "too many things to do and too little time to do them," sometimes the job of keeping a manufacturing plant safe takes a second chair to cranking out product. But if just a few minutes of conscious examination and planning could prevent just one injury, wouldn't it be time well spent? Not only could a little forethought help prevent a needless tragedy, but it could prevent the fallout that inevitably follows an industrial accident such as OSHA inspections and fines, bad press and loss of productivity.

Call any distributor who carries safety switches, and they will tell you that the purchase of these products is usually triggered by one of two situations. One, someone has been injured and the plant is scrambling to eliminate the hazard. Or two, the plant is being proactive to identify potential risks and is taking steps to reduce these risks *before* accidents happen. It's pretty obvious that it is better to be in the latter category. And, thankfully, good help is not far away. A good distributor will work with you to help you develop and implement a safety switch/safety lockout plan to help reduce these risks.

Step 1: Understand the laws, rules, regulations and policies.

The first step is to have a clear understanding of what laws are in force and what parties are responsible for what duties. In Europe, the laws are drastically different from those in the United States. For instance, a Plant Manager or equivalent in Europe is responsible for employee safety. These duties are typically delegated to a Safety Manager who can be held *personally* responsible for employee injuries. In the United States, typically the company is solely responsible, not any one person or group of individuals. It is prudent to check both national and local laws, as well as local codes. Have a clear understanding of your plant's position and responsibilities by talking to corporate counsel and checking company guidelines. Knowledge of federal, state and local laws, codes, rules and regulations is a valuable tool.

Step 2: Understand what equipment is potentially dangerous.

The second step is to understand what equipment is potentially dangerous and plan to reduce these risks. The best way to accomplish this is to walk your production facility. Have a mental picture of how you want to categorize your plan. Organize your plan by machine, by production line, by area, by function, or by whatever categorization makes the most sense for your plant. Identify areas of potential risk by defining what machines can cause injury. Most plant machinery hazards fall into two groups—injuries caused by moving machinery components such as conveyors, belts, chains, knives or blades; or from burns caused by equipment running at high temperatures or using superheated steam. Machines that eject parts, or stir, blend and dose bulk product, powders, slurries or liquids are also risk areas.

Step 3: Understand who needs access to machinery and why.

The third step is to understand and document why people need access to these areas or pieces of equipment. Factory workers must gain access typically to perform maintenance or to replenish supplies or raw materials (ink, oil, water, toner, or baking powder, for example). Knowing who (what skill and training level) needs access and how often they need access (frequently or infrequently) can help you decide the type of protection that is best.

Generally speaking, there are two styles of machine guards: fixed and removable. Fixed guards normally are installed between the walkway and the machine. If a person needs access, you must physically dismantle the guards

with screwdrivers, wrenches and tools. A machine operator does not routinely perform fixed guard disassembly. This job is normally done by a supervisor or by the maintenance department. Removable guards are used when an operator needs to clear a jam, oil the gearing, or replace a belt. They are used when an operator needs to routinely get into the machine to do un-jam it, clean it or refill it. Access is gained when the operator opens a door to expose the working mechanism of the machine.

Controlling access to the inner workings of a machine can be done using a key interlock switch. Trapped key interlock switches and non-trapped interlock key switches are the two main types.

When one puts a trapped key into the head of a switch, it holds the key in place when the machine is running so the access "door" or panel cannot be opened. The name comes from the fact that key holds the door shut, so the key is "trapped." Removal of the key is controlled, and can be done only when certain circumstances are met. Picture yourself opening the door of a front end loading washing machine. Here, the key is "trapped" and the door is locked when the washer drum is rotating and there is water in the machine. The door can be opened only after the drum stops spinning and the water is evacuated.

To stop a machine that is able to stop instantly, for example, you would specify a non-trapped key interlock switch – one that does not trap or hold the key. A common example of this is disabling a burglar alarm before opening a door. The system does not "trap" or hold the key, but it does cause the system to change state, in this case, by disabling the alarm.

Two good applications for a trapped key interlock switch include restricting access only after all the parts in a machine have come to complete stop, not just after the power is turned off; and eliminating the risk of batch interruption. Let's look at the benefits of these switches in each situation.

Think of a trapped key interlock switch as a sort of traffic light for gauging the appropriateness of allowing access to potential risk in a machine. A "red" light means the machine is on and running, therefore access is denied. A "yellow" light means the machine has been stopped, but certain components may still be moving due to momentum, so access is still denied. A "green" light means the machine has stopped and all the internal moving components are at rest, so they key is disengaged and access is permitted.

For a "real life" illustration, picture a generator set running at 30,000 RPM. You turn the power switch to "off," but the drive train still needs to cycle from 30,000 RPM to 0 RPM before one can gain safe access. To accommodate this extra time allowance, trapped key interlocks can have a timer that adds an extra 5-60 seconds before access is allowed. Or, they can have a sensor that physically measures the speed of the disengaged components. In some applications, it may be wise to have a switch with both a timer and a sensor.

Preventing the contamination of a batch process is another example of where a trapped key interlock switch can be beneficial. Picture a food processing plant that processes canned vegetables. If an operator inadvertently opens the steamer line, the vegetable par-steaming processes may not reach the proper temperature, so there could be a risk of bacteria. The entire batch would need to be discarded, resulting in a loss of revenue. Interrupting a cooking, pasteurizing, mixing or dosing operation can render an entire batch contaminated or otherwise worthless. Preventing interruption in these types of processes is critical. A trapped key switch could be the answer.

Let's move to a more open part of the factory floor, where denying access to an entire section is either impractical or impossible. Picture a 100-foot long conveyor that is transporting cartons of product from the packaging area to the shipping area. We need to have a way to allow a worker who gets a sleeve caught in a conveyor belt to stop the line. But to put switches every two to three feet around the perimeter is not practical. Here, a good solution would be to consider a rope or cable pull switch. The cable encircles the conveyor perimeter and a worker simply pulls on the cord to activate the switch and stop the machine. Cable switches are an affordable, sensible way to provide protection around conveyors and work cell perimeters. It's like have an infinite number of emergency stop switches.

For a contact-less way to provide protection, consider the light curtain. This type of technology is seen in virtually every spy film ever made. When the thief breaks the glass case to steal the diamond, a beam of light is interrupted and triggers the alarm. A light curtain works on a similar principle. A photoelectric device with light transmitters and receivers is used to form a "wall." If a hand breaches the light beam, our equipment is turned off. Light curtains work well in applications like loading or unloading large presses.

Step 4: Work with your local switch distributor to create a plan.

Step four is to work with your local distributor to develop a safety switch plan for your factory. Call your distributor and explain what you want to accomplish. They will have technical specialists available who can assist you with drafting your plan, walking your plant, and helping you create and implement a safety switch strategy that is effective for your situation.

Fundamentally, your plan should address these three points:

1. Where will fixed guards work?
2. Where will removable guards work? Who, what, where, when and how will have access and how will you control access? What type of removable guard is the best choice?
3. If you cannot control access, how will equipment operators be able to stop machinery?

Step 5: Work with your local switch distributor to select suppliers.

After you have a completed plan, step five is to engage your distributor in helping you choose the most suitable safety switch vendor or vendors. Here are some supplier attributes you should discuss:

- A good safety switch supplier will have a very broad portfolio of all varieties of switches, not just safety switches. The products should operate over a wide range of specifications and environmental conditions. Does the company have the ability to deliver models with specifications that deviate from standard or off-the-shelf models? Can this company deliver these switches quickly, without long lead times?
- A good supplier can respond quickly. Does the supplier have the infrastructure to address your engineering needs? Could the location of the company's design, and service centers or manufacturing facilities impact your project?
- A good safety switch supplier should have a strong reputation for quality, reliability, on-time delivery, application expertise and creative problem solving. Get recommendations. Check for depth and expertise in electronics, in-house design, instrumentation, research, compliance, engineering, testing, intellectual property and manufacturing.
- A good supplier should be financially strong and secure. They should provide good sales, service and application support *globally*, but with local access.
- A good supplier should deliver value that adds to your bottom line. Remember, while a low price might at first glance seem to be attractive, do an accurate comparison. Be sure you are tallying up the potential for adding in soft costs or potential failures that may be identified after the final product is in your customers' hands.
- A good supplier should devote the proper engineering, regulatory and research resources to your project up front. Get this company involved early to get the best recommendations.
- A good supplier should make safety switch samples available. While these samples may not be free of charge, the manufacturer should be willing and able to provide several styles and ranges of specifications, mountings and connecting options for you to test before your final purchase.
- A good supplier should have a sound history of defect-free shipments and they should willingly communicate this data to you. Verify they incorporate processes that are meaningful to your company. These might include Six Sigma, Lean Manufacturing and other statistical models. Verify they are certified in critical processes such as ISO 9000, ISO 9001, ISO 9004 or other quality management standards your company may desire.
- A good supplier should have "next generation" expertise, such as tactile, membrane, wireless and programmable switch technologies.
- A good supplier will have a competent distributor network that is ready to serve. They will have staff who are well educated and trained in safety switch technology, operation and installation.

A good distributor and a good manufacturer is a formidable combination. The best way to get the best safety switches in your plant is to take advantage of the consultative power of your local switch distributor. This advice together with the distributor's supplier recommendations will yield the best approach for incorporating safety switches into your MRO plan.

Honeywell has a complete line of safety interlock switches, safety limit switches and safety cable-pull limited switches. For more information, consult with your local distributor or visit www.honeywell.com/sensing