Who guards the guards?

Choosing interlocks

INTERLOCKS SHOULD NOT ONLY BE DIFFICULT TO BY-PASS BUT SHOULD DISCOURAGE OPERATORS FROM USING THEM REGULARLY AS A MACHINE STOP. BY MARTIN KEAY.

It is a worrying thought, but probably true, that the usual criteria for choosing interlocking devices have little to do with safety.

First of all there is the price, because it's bad enough having to pay for an interlock at all, so we don't want an expensive one. Then there is the size and shape of the interlock, because if the interlock won't suit the guard we have already designed we don't want it. And then there is the question of what is in stock, because we have left specifying the interlock until the last possible moment and we cannot wait for the right interlock to turn up.

Regrettably very little thought is given to choosing the right interlock for the right application and an assumption is made that any safety interlock will do, because of course they are all safe aren't they?

Well yes and then again no. When you start looking at the ways in which different types of interlocking device fail you begin to realise that they all have their drawbacks and they all have their benefits, but for different applications.

So, for instance, metal tongue operated switches work well in situations where they cannot fill up with bits of product and where there is little or no play in the guard. However, if they are fitted to a large guard which can flex, the tongue will hit the sides of the switch rather than going in, which naturally encourages the operator to use a bit more force and, before you know it, your safety switch is in a variety of small pieces.

Then of course there is the question of spare tongues in engineers' pockets, ready at hand to by-pass the guards. No, of course it would never happen in your factory, so I won't go into that.

Cam operated switches mounted on the hinge of a guard overcome many of the shortcomings of the tongue switch. Because they are mounted on the hinge of the guard, they are usually well away from areas that could become covered with product and, because they are attached to the hinge, are not affected by a guard flexing.

However, hinge mounted cam switches also have their drawbacks. When fitted to a large guard the free travel on the switch in the interlock can often be sufficient to allow the guard to open enough for a hand to reach in without actuating the switch.

Another problem with hinge mounted switches is that it can often be a case of out of sight, out of mind. Left unobserved, the cams on hinge mounted switches can work loose, allowing the door to open without triggering the interlock, and fixing screws can come undone leaving interlocks dangling in the breeze.

So what about coded magnet switches?

> **"Power-locking devices are being fitted by machine manufacturers to an increasing number of machines specifically to prevent operators from opening guard doors while the machine is running."**

Coded magnet switches overcome many of the problems of both tongue switches and hinge mounted cam switches. Because from the outside they are essentially rectangular blocks of plastic, they can be mounted in an area that can become contaminated with product and are also tolerant of more misalignment than tongue switches.

However, they are more expensive than other devices and are relatively easily damaged. So is the answer to make use of captive-key mechanical locks?

Captive key systems are certainly very reliable and do ensure that the machine is well and truly stopped by the time the operator gets the guard open. The downside with captive key systems is that they make it difficult to operate the machine because nothing can be done quickly. Machine operators can find this very frustrating and the temptation is then to find a way around the safety system or guards.

It is not uncommon to find operators climbing over or under guards secured with captive keys or even shutting someone within a guarded area to sort out a recurring problem. And then of course there is the question of spare keys, but I promised not to go into that.

The selection of interlocking devices is the subject of European standard BS EN 1088 *Safety of machinery – Interlocking devices associated with guards – Principles for design and selection* and so the first thing when choosing a device is to make sure that it is designed and constructed to this standard.

EN 1088 stresses the importance of understanding how the machine will be operated when selecting an interlocking device.

Is it attached to a door that will be opened once in a blue moon, several times a day or several times a minute? What is the machine environment like? Will the device get covered in product, washed with hoses or be part of a detachable guard that is routinely dismantled for cleaning? All of these factors should be taken into account when choosing an interlock.

Another important factor when selecting a device is the consequences of failure. Will a failure be detected easily, go unnoticed or will the failure inevitably result in an accident?

The standard also considers the criteria for selecting a power-locked interlock. Power-locking devices are typically used where the run down time of a machine is longer than the time taken to reach a moving part when a guard door is opened. It used to be quite uncommon to see power-locking devices fitted to machines, but this would appear to be changing.

Power-locking devices are being fitted by machine manufacturers to an increasing number of machines specifically to prevent operators from opening guard doors while the machine is running. So why the change?

On machines where pressing the stop button has exactly the same effect as pressing an emergency stop button, it is only slightly more risky if the operator stops the machine by opening a guard door and triggering an emergency stop.

However, on a growing number of machines that have digitally controlled drives, an emergency stop and a cycle stop will be two very different things and repeated use of the emergency stop function could eventually lead to mechanical failures.

In these situations machine manufacturers want to prevent operators triggering an emergency stop by opening a guard and the only effective way of doing this is to fit power interlocks that hold the guard closed until the machine has stopped in a normal cycle stop.

Power interlocking is also being fitted to many servo driven machines.

If power is disconnected from the drives of a servo driven machine while it is in motion there is a risk of mechanisms colliding or stopping in positions that could cause a problem, such as heating mechanisms in contact with packaging materials.

So here again power locking mechanisms are being fitted to prevent guard doors being opened before the machine has come to a controlled stop with all its mechanisms correctly oriented. ■

Safety stop servo aims to cut costs

The new Safety Stop version of the Lenze 9300 Servo series has been developed, says the company, to reduce the cost of machinery, without affecting the operating safety of equipment where disconnection of the drive is a crucial requirement.

Featuring a special safety disconnect switch within the drive unit itself, the new 9300 Safety Stop variant eliminates the need for separate contactors and improves EMC protection of the motor cable, by avoiding the need to interrupt the cable screening.

Lenze points out that safety critical machinery often needs to be configured to ensure that the output from the drive to the motor can be disconnected instantly in the event of a fault.

This is typically achieved by inserting a contactor into the motor power line and, although this system normally works satisfactorily, it can be prone to problems, as the contactors can wear. In addition, the extra component adds to the cost of installation, wiring and hardware and, in equipment where space is at a premium, can be hard to fit.

By comparison, the new Lenze Safety Stop variant is said to be a compact and self-contained unit, incorporating a conventional transistor switch within the circuitry of a standard 9300 Series drive.

The Safety Stop variant is actuated by a 24V signal and, in the event of a fault, will automatically disconnect the power output to the motor. The fault signal would typically originate from a PLC that has received an error signal or from machine guarding that has been opened.

Safety Stop 9300 drives are available from stock up to 30kW at £50-100 extra cost which, says Lenze, more than offsets the normal additional cost of the contactor and installation.

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