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Top 3 Applications Every Tire Manufacturer Should Safeguard

The fundamental process for making a tire hasn't changed much in 50 years. The compounds, components, and automation used in executing the process have evolved; but the basic process of wrapping piles of rubber together and putting them in a press to get the finished product remains the same. Machine safety equipment, however, has changed.

Many tire manufacturing plants use older equipment – even dating back to the 1960s or 1970s, nearly as old as the tire making process itself. When that equipment was installed:

- There was not the emphasis on safety that there is today. Safety has become much more top-of-mind as companies have come to understand the risks (e.g., financial, legal, ethical) of not having safe operations on the plant floor.

- The technology needed to effectively safeguard the machinery didn't exist. Because of the amount of operator involvement in the tire making process, safeguarding the work areas around machinery is a fairly complex process. Something as simple as a hard guard (e.g., protective fencing) was available when the equipment was built; but this fell short of providing adequate safeguarding that allowed productive use of the tools.

Manufacturing tires that are capable of withstanding extreme pressure, difficult terrain and harsh weather conditions require the use of potentially dangerous machines. Since personnel are in direct contact with many of the machines used to cut, assemble and mold tires, it is important to ensure a high level of safeguarding measures are implemented without compromising productivity.

The Complexities of Safeguarding

Today technology has progressed so that tire manufacturers have the means of effectively safeguarding all equipment involved in the tire making process, without diminishing the productivity levels necessary to effectively compete in the market.

However, the complexities of safeguarding equipment assets in a tire manufacturing facility are many. As noted, the overwhelming percentage of the installed equipment is very old.

These machines must be retrofitted with solutions that meet today's safety standards. Further, a wide range of machines exist and each one may have different safety needs. Finally, the extensive range of hazardous movements each machine makes requires several different safeguarding devices for effective protection.

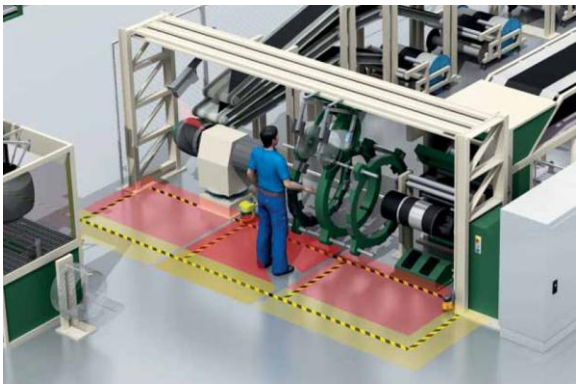
Top Three Tire Applications to Safeguard

1. Consider tire assembly machines. Because of the level of operator intervention and number of moving parts involved, tire assembly machines are particularly hazardous. The operator is in and out of the process many times, and sometimes needs to be engaged with the machine while it is still moving. For example, a drum spins and wraps a ply onto it; when the drum comes around, it should make a perfect splice. If it doesn't do this perfectly, the operator peels it off by hand, lays it back down by hand, and remains engaged with the machine in a hazardous area, while power is still running through it.

Because of the amount of equipment in motion—mandrels move side to side, drums rotate, servicers (i.e., conveyors) feed the plies—if the machine is shut down every time an operator steps in, the overall cycle time of the tire increases significantly. So this is simply not practical from an economic perspective. Consequently, the challenge is being able to safely allow operator access without shutting down the equipment.

Safety solutions for tire assembly machines include:

- **Hazardous area protection with protective field switching.** Because of the level of human/machine interaction and the number of dangerous movements made by the machine, hazardous areas must be protected. Safety laser scanners used with safety controllers to control all the safety functions of the tire assembly machine can do this. A particular advantage of safety laser scanners is the ability to use simultaneous protective fields.



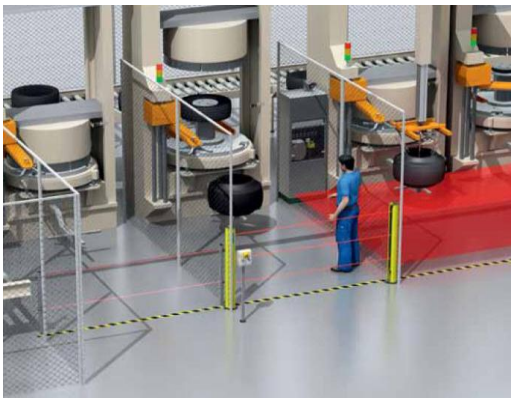
- **Flexible access protection.** Machine back panels may be monitored using

multiple light beam safety devices, which detect personnel bringing materials to or removing them from the machine.

- **Tire detection.** Tires must be detected at the hand-over point in order to be handled properly by the automation equipment. Small photoelectric sensors do this reliably.
- **Hazardous point protection.** Points for transferring finished tires from the tire assembly machine to automated conveyors are protected by safety light curtains, which can be used in tough environmental conditions. Different application requirements can be met by using various lengths and resolutions.

2. Curing presses present a different problem. An operator puts in a tire; the machine comes down, clamps it, and then applies steam and pressure over a set time period. When it opens up—voilà, a finished tire emerges. In the past, not many tire manufacturers safeguarded curing presses. There was a perception in the industry that there was no need to safeguard them. However, during the past several years, there have been injuries, including fatalities, on curing presses and the machines that load them. So awareness of the need for safeguarding these assets has risen significantly. But with curing presses, most manufacturers are starting from scratch; even newly built presses have little or no safeguarding on them.

Safety solutions for curing presses include:



- **Access protection.** Single beam photoelectric switches can be used in single or multiple beam systems to ensure that the necessary distance for safety is observed in front of the curing press according to the space available at the site. Multiple light beam devices are used for providing access protection to heating presses.

- **Hazardous area protection**. Safety laser scanners protect the hazardous area in front of a curing press. Use of a safety controller may enable up to four simultaneous protective fields; in this way, one safety sensor can monitor two hazardous areas (e.g., heating presses and automatic handling units) at the same time.

- **Safe position monitoring of the press mold.** Direct transponder safety switches ensure safe position monitoring of the press cover. When closed, access to the press is possible at any time. Coded actuators monitor the closed cover position.

3. Wind-up/let-off machines can create hazards near crushing and shearing points. Safety laser scanners monitor the hazardous areas in this case. After replacing a material bobbin, the new material must be drawn slowly into the machine. After manual confirmation, the machine operates at reduced speed. The safety laser scanner is deactivated.

Other safety solutions for these machines include:

- **Hazardous area protection before the winder.** Safety laser scanners monitor the area of the winder. After manual work in the hazardous area, an operator must manually restart the machine.

- **Safe controls.** Safety switch, emergency stop pushbuttons and optoelectronic safety devices can be connected to safety controllers. When used with motion control devices, this enables safe implementation of a speed monitoring system for system setup (using enable switches).

Regardless of what machine is being safeguarded, best practice is always to consult a safety expert before choosing any safety component or system.

The Emergence of Effective Technology

New technologies have enabled tire manufacturers to meet safety standards and achieve a high level of safety without slowing production. The combination of protective devices (i.e., safety laser scanners, safety light curtains, and multiple light beam safety devices) used with safety controllers has enabled dynamic safety zones that monitor motion and protect hazardous areas around dangerous movements, minimizing risk. Using software controls to apply high-level logic to protective devices, manufacturers can now change protected areas multiple times during each equipment process.

For example, a safety-protected tire assembly machine will allow operator access to the front of the machine at a particular time. But if he steps to the right or left or goes around the side, it may stop or slow down operation. Later in the process, the operator may be allowed around the sides of the machine, but cannot go to the front.

The development of safety logic controllers has enabled this safety enhancement. Twenty years ago, when the preponderance of this equipment was built, the devices that could execute the necessary logic simply didn't exist on a commercial level. Safety laser scanners are a perfect example. In the past, the typical application of an area scanner was to have one zone programmed for a stationary application. Effectively, it was an on/off device with a single protective zone that never changed**.**

Today, multiple zones can be programmed into the scanner that can change dynamically based on the logic in a controller. Intelligent communications between the controller and the area scanner allow tire manufacturers to look at things like speed and motion and specify responses to exceptions. When there is an infringement at a particular point, the solution may allow motion, but not motion exceeding a certain speed. That's one possible scenario.

The zones themselves can change dimensionally. If a machine has a mandrel that slides right or left that could crush an individual, an area scanner can be placed on the front side of the mandrel. This creates a zone that adjusts as the mandrel moves toward the individual, preventing him from stepping inside it. The zone has to be dynamic, has to change over the course of time, in order for this to be a realistic and effective solution.

Ensuring Productivity While Minimizing Risk

Production and safety are now seen as two sides of the same coin. In the past, the concern among tire manufacturers about safeguarding their processes was essentially an economic one: putting safety equipment on wind-up/let off machines, tire assembly machines, and curing presses would result in nuisance trips by operators, put those operators in non-productive space, and generally slow down production. This would make operations more costly, less profitable, and less competitive.

Several developments have changed this scenario. One, lack of safety is seen as a significant economic risk, in terms of legal and regulatory issues, brand protection, and employee satisfaction and performance. So it is good financial strategy to ensure safety throughout the plant. Second, the development of effective safety technology has made the implementation of safety practices both feasible and cost-effective. Software-based devices provide the flexibility necessary for a high degree of safety without hampering operations or equipment asset utilization.

Safety, so long addressed by tire buyers, is finally coming full circle, back to the plants where tires are manufactured.

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