

White Paper

# Advanced automation delivers workplace safety, increases productivity and reduces cost.

*Safety is an increasing concern for food and beverage manufacturers. An advanced solution allows manufacturers to satisfy safety requirements and reduce expenses.*

Look around and it is easy to spot a water-filled plastic bottle or a single serving packaged snack. Neither magically appeared out of thin air in a vending machine or on a store's shelves. Instead, they were produced by food and beverage manufacturers.

For these suppliers, safety is an increasing concern. After all, they have to protect workers, both because it can be a legal requirement and because it makes good business sense. According to surveys cited by OSHA, the Occupational Safety and Health Administration, 71 percent of companies in the United States list increased productivity and reduced costs as top benefits of workplace safety, with a **payback double** that of investment.

So, meeting the safety challenge is a good idea. What's more, it can be made easier – and in some cases possible at all – with advanced safety technology, as demonstrated in a solution example.

## **The regulatory landscape and statistics**

Before looking at the characteristics of advanced safety technology and a solution example, it helps to get the lay of the land. Take regulatory schemes. They differ from country to country and region to region. In general, there are two fundamental approaches.

In the method followed by the regulatory bodies in the U.S., for instance, the end user is responsible for safety. The machine builder is less responsible, in regulator's eyes, for installing safeguards and other technology to prevent or mitigate mishaps. In Europe, on the other hand, it is the machine builder who bears the responsibility for safety. In either market, the builder usually must deliver machines that meet a given safety

integrity level (SIL), as defined in the IEC 61508 standard or a given performance level (PL), as specified in the ISO 13849-1 standard.

Given this basic split, what should machine builders do? Well, if they want to ship the same machine worldwide, they have to satisfy both regulatory philosophies and always assume they are responsible for safety when designing and fabricating a machine. This reality is a major reason why safety is an increasing design concern and requirement of machine builders.

Another reason is revealed by workplace safety facts and figures. According to the U.S. Bureau of Labor Statistics, the median number of days missed in goods producing industries due to an injury ran nine days in 2013, the latest year for which data is available. The leading cause was from contact with objects. Roughly a quarter of the machine-related injuries involved more than 31 days away from work. As for work stoppages, 19 out of 20 were caused by injuries as opposed to illnesses.

Injuries, of course, harm workers and that is reason enough for safety technology and techniques. But, as the figures above show, there also are follow-on costs.



Advanced control technology, like the SIRIUS 3SK1 shown here, allow manufacturers to implement safety while saving money.

### Characteristics of an advanced safety solution

Given the need and desire for safety, what would an ideal solution look like? Importantly, such a solution cannot simply satisfy safety needs. It also has to have characteristics that provide economic benefits for both the machine builder and the food and beverage manufacturer.

It would take too long to run through every possible machine component and system. Instead, concentrate on two that are widely used: a safety relay and a motor starter. The first can be fundamental to any solution and the second can enable implementation of safety when it comes to motion.

Ideally, these two key components would be flexible, expandable and configurable. These attributes allow the use of the same relay and starter in a variety of machines, thereby reducing the part inventory that must be carried by a system builder. Having components that are adaptable also means that the same family of relays and starters can be used now and in the future. That helps standardize design and installation, again providing a way to cut costs.

At the same time, the safety relay and motor starter should meet the applicable safety standards. In the case of food and beverage machines, this means ISO 13849-1 and IEC 62061, the machinery-specific implementation of IEC 61508. These standards require certification, so clearly any safety relay and motor starter must have the required documentation.

On the economic front, components should be cost-effective. As mentioned above, one way to do this is by minimizing inventory. Another is by doing the same with wiring. Reducing the wiring needed pays dividends in terms of reduced costs for both the wiring and the associated installation. Compactness is also a virtue, as space within a machine or panel is limited and expensive. A small footprint is more economical than a large one.

Built-in diagnostics are another must have. When something goes wrong, the more information that a component can provide the better, as this data can cut troubleshooting time. That means that machine downtime is minimized, an important productivity and safety benefit to machine builders and end users alike.

Speaking of end users, an important point is that any safety device should have protection against attempts to defeat it. A machine as built may meet a given safety rating. However, that does little good if its relays and other components are bypassed, perhaps by well-meaning individuals who see the safety systems as impediments to doing a job or getting product out the door.

That brings up the final characteristic of an advanced safety solution. It should be from an industry leader with expertise in safety. The component supplier should also have extensive real-world experience, the type of knowledge that arises from having devices in machines in the field.



The new components also offer easy plug-in of input and output expansions, saving money by cutting installation time and preventing wiring errors.

### A manufacturer achieves savings and safety

Consider the case of a leading manufacturer of food processing machinery. This company was designing and constructing a new machine, which involved a vacuum-tight mixing vessel consisting of a mixing tool and an external homogenizer. Product was to be heated directly by hot steam or indirectly via a double jacket. The machine also was to include safety features, such as a pressure switch that would cut the feed whenever a clog occurred. The goal was a cost-effective, modular and compact machine.

When completed, the machine met these goals, thanks in part to an advanced safety relay, the SIRIUS 3SK1, and a motor starter, the SIRIUS 3RM1, from Siemens. Several key features helped the machine achieve its performance and cost targets. For one thing, the new relays were more compact and capable than previous generations. Functionality that had once taken two 45 mm wide relays could now be implemented with a single 22.5 mm one. This is possible because the new safety relays can connect to a sensor and actuator, along with connections to other components or a second fail-safe device through a cascade input. Labor and wiring material savings were realized by using the device connector system that allows a series of connections of the safety relay input and output modules and the associated motor starters. This eliminated the control wiring between the motor starter and the safety relay.

The relay also supports a wide range of sensor types. This flexibility in sensor choice allowed the machine builder to go with solid state sensors. What's more, the ability to handle standardized OSSD signal solid-state sensors enabled the use of devices from a diverse set of sensor manufacturers.

Another advantage was easy configurability of the relay and motor starter. That reduced cost while preserving the machine builder's ability to be flexible in satisfying requirements. The new components also offer easy plug-in of input and output expansions, saving money by cutting installation time and preventing wiring errors.

Combined with the right design and other components, this advanced safety technology allowed the machine to be certified to meet SIL CL 3/ PL e.

### Conclusion

As this example shows, with the right technology it is possible to meet safety requirements, thereby satisfying regulators and, just as importantly, ensuring the well-being of workers does not suffer due to workplace injuries. This goal was reached with a flexible, modular, and expandable solution.

Of course, the right solution for a given application will vary with the situation. That is why it is best to work with a supplier that has industry-wide expertise and offers worldwide, advanced technology.

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