

The Challenge of Food-Industry Maintenance

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Manufacturers of edible products face a diverse world of significant challenges, including stringent government regulations, harsh working conditions and complex equipment that can be difficult to maintain.

In the world of manufacturing, every industry has its own set of problems and issues. But food and beverage manufacturers probably face more hurdles than those in general industry for two reasons. First, their products are intended for human consumption. This means food manufacturers must deal with a wide range of regulations regarding food safety. Also, the need for heightened cleanliness creates a wet environment for many food makers, wreaking havoc on processing machinery.

Second, every piece of equipment between the front door and the back door, including a host of complex packaging machines, is connected by a system of conveyors, belts and fasteners. Maintaining the highly automated packaging equipment so that it keeps pace with the rest of the cogs in the food-processing production line requires constant attention and a unique set of skills.

Multi-layered regulations

"We have to deal with the standard regulations from the Occupational Safety & Health Administration, the Environmental Protection Agency and other government agencies like everyone else," says Chuck Armbruster, corporate reliability engineering manager at the J.M. Smucker Co., an Orville, OH-based maker of jellies and jams. "But we also have to deal with regulations from the Food & Drug Administration, the U.S. Department of Agriculture and other agencies because we are producing something humans are going to eat. There's a higher level of scrutiny in this industry."

Food safety regulations affect each manufacturer in a different way, and the newest one - the Hazardous Analysis and Critical Control Point (HACCP) regulation - is no exception. It's an FDA-backed set of quality guidelines adopted in 1997 for seafood, and expanded in 1999 to include meat, poultry and fruit and vegetable juices.

"HACCP is something all food manufacturers will have to take on in the next few years," says Chip Winiarski, industry marketing manager for the food industry at Applied Industrial Technologies, a Cleveland, OH-based distributor of MRO equipment. "Not necessarily because their segment will fall under the HACCP guidelines, but because as more large manufacturers rely on ingredient manufacturers for raw materials, they will require these manufacturers and their suppliers to offer an HACCP program that fits with their own."

HACCP also requires food manufacturers to develop a prerequisite program or a list of good manufacturing practices aimed at keeping foods free of pathogens. Each manufacturer is responsible for creating its own inclusive set of guidelines, covering the simple - a hand-washing requirement, for example - to the more complex.

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"There's a myriad of steps that each food manufacturer will have to introduce to its employees to help eliminate problems," says Winiarski. Many of the steps will be behavioral, he says, and "must be integrated into the culture of the company." Food manufacturers will also need to consider equipment upgrades to eliminate surfaces prone to rust and corrosion - breeding points for bacteria and pathogens. Equipment made of stainless steel and polymer is preferred. So is cleanability. Equipment must be free of voids or recesses where food can become lodged.

The challenge of a moist environment

While machinery with these characteristics is helpful in meeting HACCP guidelines, it is also an asset when dealing with the extremely wet environment of a food manufacturing facility. "In a food plant we use a lot of water and sanitary chemicals to keep things clean," says Armbruster, "which makes it a very wet and severe environment. That can cause havoc with equipment maintenance."

The water and chemicals are typically used in conjunction with powerful, high-speed jet sprayers to blast the machines germ free. However, these devices can be dangerous. "We use high-pressure pop guns to sanitize equipment and it can be a hazard to employees and equipment if the operators aren't careful," says Lisa Denney, reliability-centered maintenance facilitator at Coors Brewing Co. in Memphis, TN. "It can create injuries if you get hit with it and it can tear up a gear box pretty quickly, so we make sure everyone receives proper training to avoid problems caused by the cleaning equipment."

Heavy-duty washdown equipment can also strip away machine coatings. "These 7,000 lbs.-per-sq.-in. jet sprayers can peel off typical coatings and enamel paints like they are latex," says David Gavin, vice-president of Steel It, a South Lancaster, MA-based maker of specialty coatings for the food-manufacturing industry. "When the paint is stripped away, the machines start to rust. If that happens the factory can be shut down because rust is not permitted in a food-manufacturing environment."

In addition, all the equipment containing control panels, switches and other electrical components must be protected from moisture. "Everything must be specially sealed and often double-sealed for protection," explains Armbruster. "These systems are usually more expensive to install and maintain, but these are just extra costs that we must pay to have reliable and safe equipment." Armbruster isn't kidding about the extra cost. According to Coors' Denney, purchasing this type of equipment can add up to 30% to the cost of any project in a food-manufacturing facility. Unfortunately, even this precaution does not ensure longevity.

"In the course of doing our Reliability Centered Maintenance program, we found that equipment that is subjected to moisture and chemicals is much more likely to fail," she says. "For instance when we looked at gearboxes, we saw that those in the wet areas of the plant fell two years earlier than those in the dry areas." To extend equipment life, food manufacturers typically seek out the rugged designs. In the case of power transmission, that means using triple-dipped windings, stainless steel shafts or totally stainless steel motors for longest life.

Food manufacturers must also take extra care to protect employees from the slips and falls that can occur due to the wet surfaces. "We use special acid-glazed brick on the floors and epoxy coatings on concrete floors," says Armbruster. "This

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provides more grit and slip resistance than wet flooring surfaces alone, and it provides an extra barrier against the acids used to clean the equipment."

Wrapping it up on-line

One of the better and more efficient production methods embraced by the food industry includes performing product packaging on-line. "In the food-manufacturing industry we try to be as vertically integrated as we can," says Armbruster. "This includes performing finished-good packaging at the end of the production line because it gives us more control over scheduling and quality of the product." Most food manufacturers do their own packaging in the same plant as the processing. While this clearly creates efficiencies, it also causes problems. "Every time you add another piece of equipment on a production line, that's another potential source for downtime," says Armbruster. "By adding packaging equipment downstream, food manufacturers often make their production schedules more complicated and increase the chances for error. As a result, all the packaging machines need to be integrated and made reliable in order to get the finished goods out at the far end of the line."

That's not an easy job because packaging equipment is notoriously complex, says Ralph Cox, a food-industry consultant with Tompkins Associates in Raleigh, NC.

"Most packaging equipment is sophisticated to the point where an individual receives specialized training on one particular machine so he knows all the logic ahead of time," he says. "You can't just come to these machines cold."

Maintenance crews also need special skills to handle these advanced machines. In addition to the basic mechanical components such as gears, chain drives, timing belts, pneumatics and hydraulics, they need to understand each machine's internal control system. This includes the logic that the machine uses to run itself.

"The machine should, for example, detect things like whether all 12 cans are in place before it moves that tier into the corrugated forming area," says Cox. "Also, any packaging machine has either hard-wired logic, which means it's dedicated logic that can't be changed, or programmable logic controllers that allow you to change things like timing and setting," says Cox. "So the understanding of internal machine controls and the electrical circuits go hand in hand because when a machine is down and the problem is in the control circuits, the cause will only be obvious to the people that know the internal logic very well."

Even then, it can be difficult to maintain this equipment. For instance, Denney says Coors realized it needed a team of technicians to work on the automated packing equipment. "We found that when you adjust the mechanical systems of these machines, you can affect the electrical program, too," she says. "So you really need to have team of specialists - someone with a mechanical maintenance background and an electronics technician - who can work together on this equipment. The complementary aspects of this type of team is essential both when fixing a machine or installing new projects."

Besides the added maintenance burden, extra quality-control check points are needed to ensure packaging equipment is working properly. "Just as we have quality-control measures for the food that goes inside, we also have them for the jars and packages," says Armbruster. "Since the packing equipment touches the outer surface of the package, you have to make sure the tolerances are set right to avoid scuffing so you don't have a blemished container. We also need to make sure

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the cap and jar match up, that the label matches the food that's inside the jar, and that the label isn't skewed when applied to the jar."

With its trio of significant challenges - government regulations, a severe production environment and complex packaging equipment - food manufacturers face circumstances not found in most other industries. But because of those challenges, the food industry often finds itself at the cutting edge of technology, establishing trends and precedents that may guide other areas of manufacturing in years to come.

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