

Where is automation working for Food and Beverage?

A recent industry survey turns up the usual suspects... and some unexpected results

Consumers want more variety and more fresh foods. Manufacturers are more focused than ever on avoiding product recalls and production disruptions. Late in 2016 ABB undertook a study with *Food Processing* magazine to explore these and other industry trends, and learn how F&B firms are applying automation to address them.

Market trends: it's all about "me"

Food Processing identified several key trends in a May 2015 article that remain relevant today. They point toward a more specialized industry focused on fresh ingredients and individual portions.

- Millennials eat out less than their boomer parents, but when they do, they prefer fast-casual restaurants serving fresh food. In the supermarket, they tend to shop more on the perimeter where produce and other fresh foods are found.
- Boomers are aging, and less likely to try new things; they are more concerned with sustaining health and managing chronic conditions through their diet.
- Individual eating is on the rise. Half of all eating and beverage occasions happen when consumers are alone.
- Fresh ingredients are a priority. Consumption of fresh foods grew by 20 percent between 2003 and 2013, and it's the youngest generations, Generation Z and millennials driving the trend.

All of these trends imply smaller runs of more specialized products using a wider variety of packaging and labeling. Health-conscious consumers, for example, are buying more snack and meal drinks, but these beverages are more nutritious than "meal replacement" diet drinks and come in a wider variety of flavors. Plant-infused waters also continue to gain in popularity with a proliferation of specific products.

From an automation standpoint, flexibility—specifically the ability to switch from one product, package or label to another—becomes paramount in such a market environment. Changeovers are becoming more frequent, putting pressure on throughput.

Given this backdrop, it's not surprising to find survey respondents focused on keeping production running, but cost and food safety figure in as well.

Top concerns: it's all about uptime

When asked to identify "what keeps you up at night," there was broad agreement among respondents to the *Food Processing* survey. The top two responses were "a major recall event" (39.1% of respondents) and "production disruption" (31.5%), both of which directly impact plant processes. The next most-cited concern was "changing consumer trends" which was identified by 19.7% of respondents, indicating a second tier of priorities. But these overall figures mask a divergence of opinion between management levels.

When the above responses were broken down between executives, middle managers and plant operations, there was a consensus on major recall events with all respondents choosing it as a top concern. Regarding production disruption, however, there was a wide gap between management levels. More than half of plant operations personnel (54%) flagged this as a top concern compared to 27% of executives and just 15% of middle managers.

The fourth-highest ranking response was "food safety audits" with 15.6% overall, but here again there was significant divergence between management levels. Executives (9.8%) were least likely to flag it as a major concern followed by plant operations (13%) and middle management (16%).

This breakdown is perhaps understandable in light of who is held responsible for what. Executives are most concerned with big-picture issues, so it's not

surprising that they'd be more concerned about consumer trends than the other groups, but would have a fairly consistent view across various issues. Middle managers and especially plant operations staff would tend to be more focused on the here and now, hence their propensity for identifying production disruptions—and anything that might cause one—as a top concern.

The surprise, if there is one, is in the fact that middle managers appear to be out of step with both executives and operations. They identified recall events as often as the other two groups, but only 15% of the time when it came to generic “production disruption.” They were most concerned with food safety audits and potential plant closures, again perhaps owing to their specific responsibilities.

So, given these broad outlines about the challenges food and beverage operations face, what are industry professionals trying to accomplish with automation? The survey addressed this with questions about drivers for and concerns about automation investment followed by criteria for calculating payback on automation projects.

Project drivers: it's all about cost

When it comes to automation, there seems to be broad agreement on what the priority is. As Figure 01 illustrates, “reduced labor cost” and “improve throughput” together account for more than half of respondents' first choices. In fact, the rest of the potential investment drivers presented didn't garner nearly as many top picks, and “upgrading controls to improve overall equipment effectiveness” could easily be argued to be in the cost reduction camp as well.

Cost and productivity also dominate the factors F&B firms consider when calculating payback on potential

projects. The top three responses, as depicted in the chart in Figure 02 all speak directly to lowering cost and boosting productivity.

Approaching project evaluation from a wider perspective, the survey asked respondents to select from a list of “concerns when considering automation projects.” Here, too, depicted in Figure 03, financial issues dominated. Project affordability (i.e., up-front cost) was followed by system integration, which implies operational concerns but also speaks to project cost more broadly. Like “commissioning downtime,” it gets at the opportunity cost of an automation project that has the potential to disrupt normal processes.

It is interesting to note, however, that while 53% of respondents were concerned about payback, capex spending or both, only 11% identified lifecycle cost and 17% identified system integration as potential concerns despite their obvious impact on total cost of ownership.

Reading between the lines

Beyond the questions and responses represented above, it's possible to make some educated inferences about the issues raised. Returning to our third-ranked driver for automation investment (changing consumer trends) for example, it's clear that meeting the shifting demands of a dynamic market is a challenge that's likely to face F&B operations for the foreseeable future. As such, the ability to respond is more of a long-term competitiveness question rather than a near-term financial one.

Market fragmentation on the demand side coupled with increasing capability on the supply side are likely to make flexibility in production processes more and

Figure 01 Percentage of respondents who ranked given investment driver first (most important)



Figure 02 Percentage of respondents who consider given factor when calculating payback of automation investments (multiple responses possible)

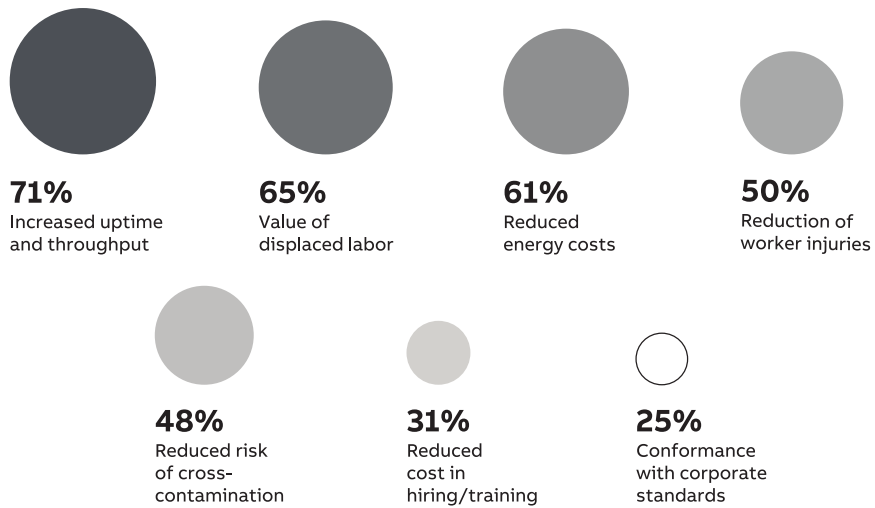
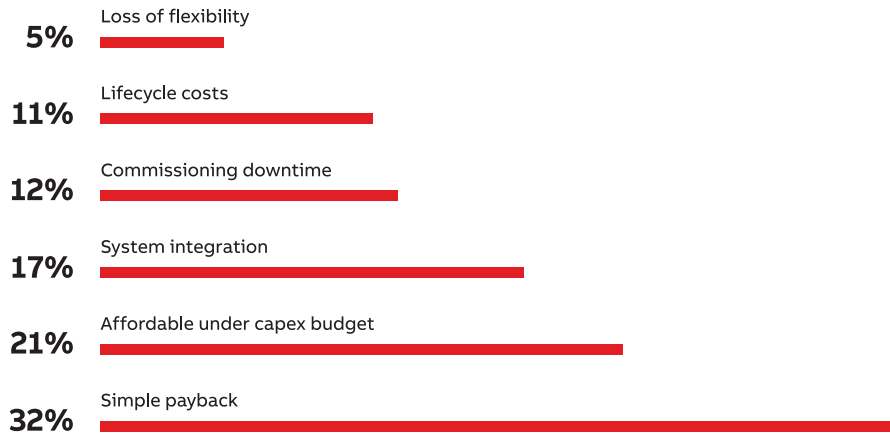


Figure 03 Percentage of respondents who ranked given issue as their top concern when considering an automation project



more important in the coming years. From this perspective, then, it's useful to ask what kind of automation technology is best suited to meet the challenge.

Packaging provides an instructive example. Even among self-described "artisanal" businesses, one in three see their automation budgets increasing over the next year, and much of that is likely to be spent on packaging solutions. The reason is simple: packaging represents low-hanging fruit, an application where automation can reduce cost and eliminate some of the most injury-prone activities from the list of things humans must do in a plant.

As explained in the text in Figure 04, robotic solutions offer a number of advantages over traditional automation. Robotic solutions are extremely reliable while also affording the plant great flexibility to adapt

to different products and package designs by re-programming as opposed to making physical adjustments to a hard-automated system.

Food safety is another issue that is important but may not occupy the same front-of-mind place as day-to-day operational concerns. Preventing water ingress, using food-safe materials and tracking ingredients all play an important role in ensuring food safety, not to mention quality. Wash down characteristics are well represented in equipment like motors, but are now being applied to other automation components. For example, pick-and-pack robots are now available in stainless steel, and ABB is currently developing a food-grade lubricant.

In terms of worker safety, food and beverage operations tend to use low-skill but labor-intensive processes that also rely on many injury-prone

Figure 04 The Case for Robotics

The main selling point for robotic solutions compared to their hard-automated alternatives is usually total cost of ownership. Robotics typically have a 30-40% cost premium but make up the difference on extremely low maintenance. A typical system will run 80,000 hours before the first maintenance interval arrives. Consequently, the difference in first cost is usually made up within the first two years.

Other benefits include flexibility (reprogramming vs. manual adjustment) and safety (taking humans out of the loop in injury-prone areas).

Here's a tip for evaluating robotics solutions: don't confuse "velocity" with "acceleration." Robot movements are short and brief, so it doesn't matter much how fast a packaging arm can move if it never gets the chance. Look for solutions that have quick acceleration to optimize a given process.

activities (e.g., palletizing). Mitigating risk, particularly by removing humans from dangerous activities, is an area where automation can help.

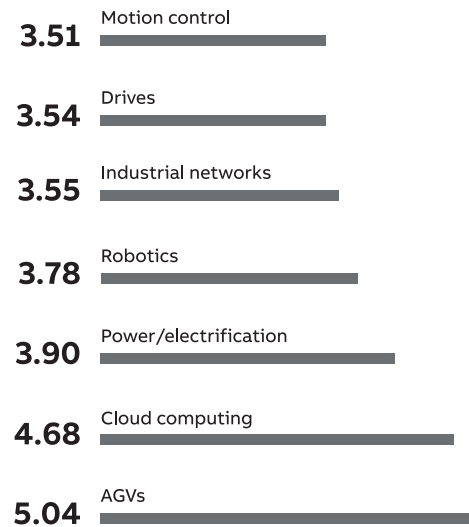
Where is F&B actually investing?

When asked about their spending priorities, survey respondents' answers fairly mirrored their concerns going in, with process and packaging automation perched well above a second tier of investment options that included supply chain management, refrigeration infrastructure and product inspection. This is in line with the attention placed on throughput and labor costs noted above.

When it comes to specific automation solutions, however, respondents' ranking of the seven technologies offered covered some of this same ground, but also hinted at perhaps a different hierarchy of priorities. Motion control, depicted in Figure 05, topped the list earning a score of 3.51 (1 being highest, 7 lowest), followed closely by drives (3.55) and industrial networks (3.55). There is clearly a temptation to interpret these figures as signaling a greater focus on, say, energy costs (i.e., the high rank of drives) than might be expected from the investment drivers listed above.

Similarly, the ranking of industrial networks might also lead us to believe that there is more here than meets the eye. These systems are necessary to feed the ever-growing number of analytic tools that

Figure 05 Automation solutions prioritized (1=highest priority)



provide insight to industrial processes and yield even greater cost savings and production increases than some of the more obvious alternatives.

Automation investment: it's all about the business case

According to *Food Processing* magazine's 2017 Capital Spending Report, food and beverage companies are currently working from budgets that are 10.4% higher than actual spending in 2016. The increase can be partly explained by the implementation of the Food Safety Modernization Act, which in some cases has driven the closure of old facilities deemed too expensive to upgrade. Similarly, new GMO labeling requirements and a new Nutrition Facts label are due next year, prompting many firms to rework recipes to reduce sugar, eliminate sodium and replace synthetic ingredients.

The confluence of safety and productivity challenges in F&B operations creates a unique opportunity for automation to have a substantial impact. As noted earlier, robotics can deliver benefits in cost, safety and throughput simultaneously. This strengthens the business case for investing in robotic solutions versus traditional hard-automated systems by looking beyond first-cost savings.

Robotics also indirectly addresses staffing issues. Setting up a new line or modifying an existing one with conventional automation solutions requires

specialized knowledge and time to make the necessary adjustments. Robotic systems, on the other hand, often can be set up in computer models to optimize the design before anything is done on the actual shop floor. So, workers trained on the robotics solution can easily accommodate a wide range of requirements.

Safety, productivity, flexibility. Clearly a business case that features improvement across all three of these areas is stronger than one that only addresses one or two.

Automation is a multi-generational trend that is driving the food and beverage industry as much or more than any other sector. As market conditions increasingly favor companies that can respond to consumer demands while adhering to more rigorous regulations, the successful integration of robotics and other modern automation tools will become more and more important. Companies that embrace these technologies to meet their top challenges will be well positioned for success.

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