FOOD PROCESSING
SPECIAL REPORT

What's Driving Automation Investments in the Food & Beverage Industry

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A Strong Vote of Support for Automation

A Food Processing survey finds throughput and labor savings the top goals of plant investment, and automation is the key to both.

For all the attention lavished on artisanal foods and handcrafted drinks, North American food and beverage production remains a price-driven business in which per-unit costs determine profitability. Higher throughput is the key to reducing unit costs, and automation is the path toward increased volume. To remain competitive, food manufacturers view automation investments as an essential component of sustained competitiveness.

A new study by Food Processing confirms this. Automation spending is on the rise at 44 percent of all respondents; the number is even higher among processors with more than minimal levels of automation (Figure 1). And more than a third in each case are at least holding steady. Less than 4 percent of the 259 food professionals responding to the survey on which this study is based reported reduced spending, with modest reductions the rule.

The areas of spending are as varied as individual manufacturers' current states of automation, of course. They also are influenced by the relative size of the companies, their current and anticipated

FIGURE 1: HOW HAVE AUTOMATION BUDGETS AT YOUR PLANT CHANGED IN THE PAST TWO YEARS?

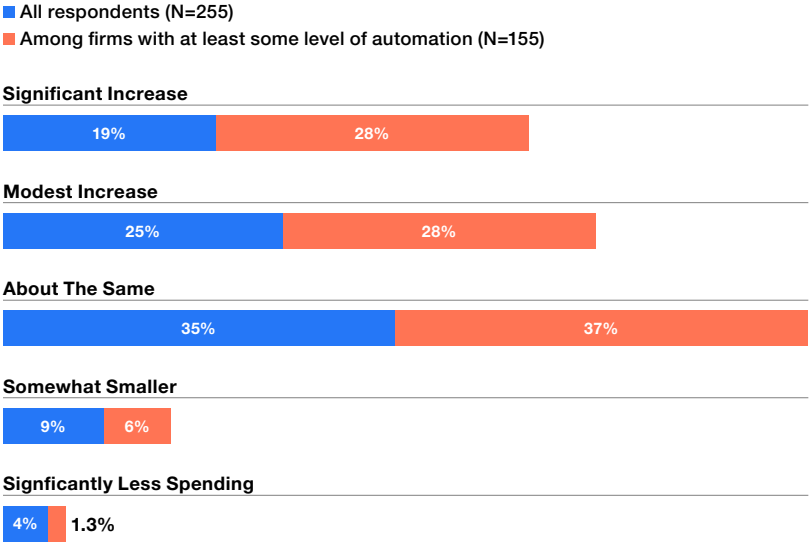
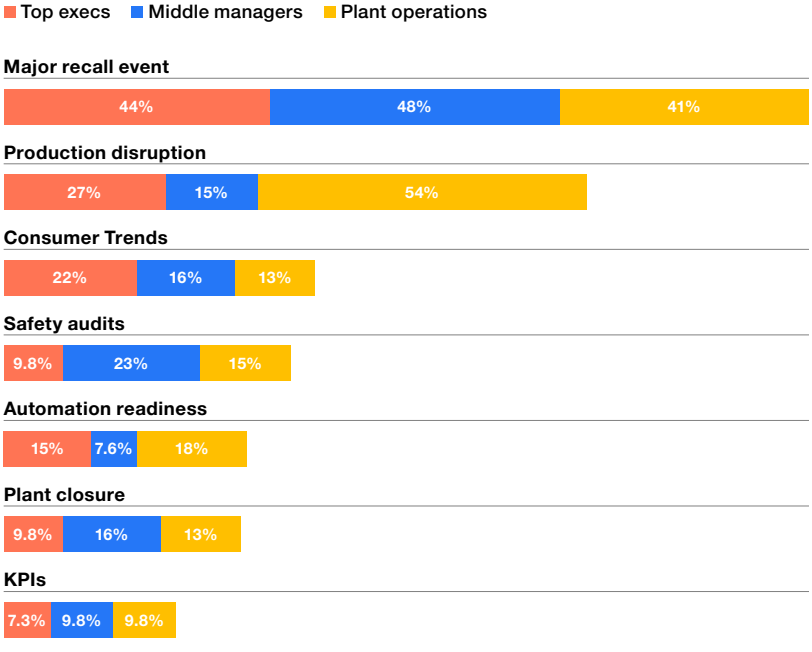


FIGURE 2: WHAT KEEPS YOU UP AT NIGHT?



needs and the respondents' level of involvement in the deployment and application of advanced systems and machinery. Even professionals who described their production processes as artisanal rely on technology in packaging operations and other areas: a third of those respondents indicated automation budgets are increasing. The survey's objective was to gauge attitudes toward, concerns about and justifications for these investments.

Automation encompasses much more than machinery. It includes process and quality controls, tracking software and food safety systems that help keep lines running. The greatest fear of half of the responding food professionals is a food safety event that triggers a recall or plant shutdown (Figure 2). Another third cite production disruptions as their primary concern.

Rational considerations ultimately are a bigger factor in prioritizing and justifying specific technology projects. When the decision involves machinery, replacement of labor traditionally was the primary factor in calculations of return on investment, with other savings regarded as soft benefits. That is changing. Greater throughput/efficiency was just a hairbreadth behind labor savings as the single factor when evaluating investment opportunities (Figures 3A-3B). Nearly equal numbers of top executives rated either labor reductions or throughput increases as the top consideration; among middle managers and plant operations professionals, increased production trumped labor replacement by a healthier margin.

Rigorous risk assessment and detailed record-keeping are requirements of the Food Safety Modernization Act (FSMA). Independent audit programs are aligning with FSMA expectations, prompting many processors to consider projects that would lower their exposure to recalls and other food safety events. Human beings can be vectors of biological contamination; so removing people from direct

FIGURE 3A: FACTORS THAT DRIVE AUTOMATION INVESTMENTS AND THEIR RELATIVE IMPORTANCE

Respondents were asked to rank answers on a scale of 1-6, with 1 being highest; so low score wins. (N=190)

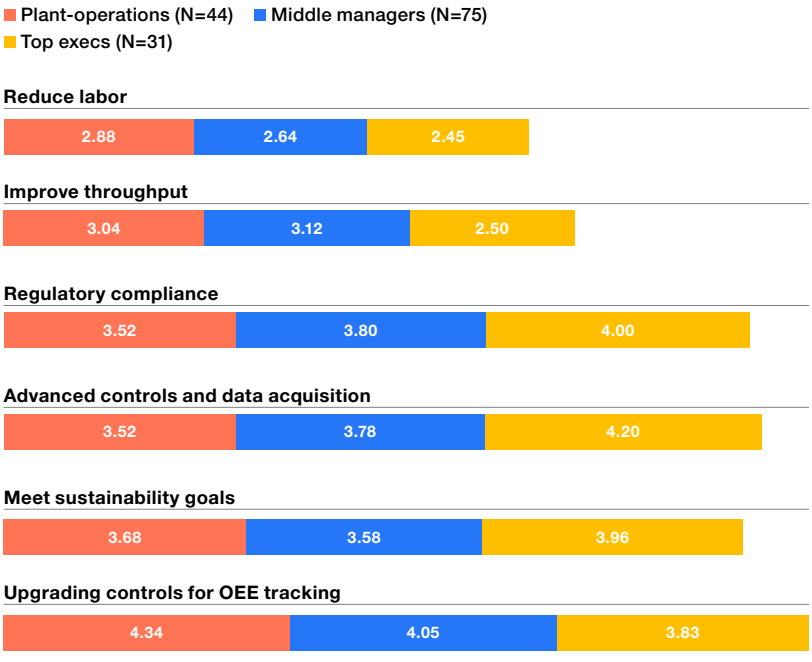
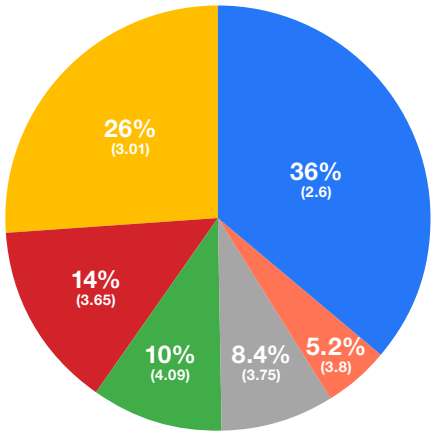


FIGURE 3B: FACTORS THAT DRIVE AUTOMATION INVESTMENT AND THEIR IMPORTANCE

This is the percentage of all respondents who ranked one of the given answers first (most important) and the average ranking on a scale of 1-6, with 1 being highest. (N=190)



contact with work-in-process is viewed by some as one of the benefits of automating a process. In fact, half of survey respondents cited reduced risk of cross contamination as a benefit of automation (Figure 4). "Automation means peace of mind," wrote one respondent.

But some food professionals question that assumption, citing problems that can manifest themselves when machines replace people.

"There are often food safety risks due to the intricacy of the robotic equipment and its poor wash-down capabilities," a quality manager wrote. In other cases, automated systems fail to deliver as promised. "By automating a packaging line," a plant engineer related, "we increased consumer complaints because bags with bad seals were not picked up by the machine like they were by the operator."

Reduced labor costs and lower inputs of energy and other utilities were cited by three in five respondents as elements in payback calculations. Half indicated reduced risk of worker injuries was an element in ROI. Even more—seven in 10—cited increased uptime and throughput as a payback factor. Improved product quality and lower risk of human error were benefits volunteered by some respondents.

Asked to prioritize seven investment opportunities for automation spending (Figure 5), two in five rated either motion control or advanced drives as the No. 1 area. And while they don't necessarily associate wireless networks and remote data access with the Industrial Internet of Things (IIoT), managers and production professionals recognize the value of information technology and cloud computing.

FIGURE 4: FACTORS CONSIDERED WHEN CALCULATING AUTOMATION PAYBACK (CHECK ALL THAT APPLY; N=251)

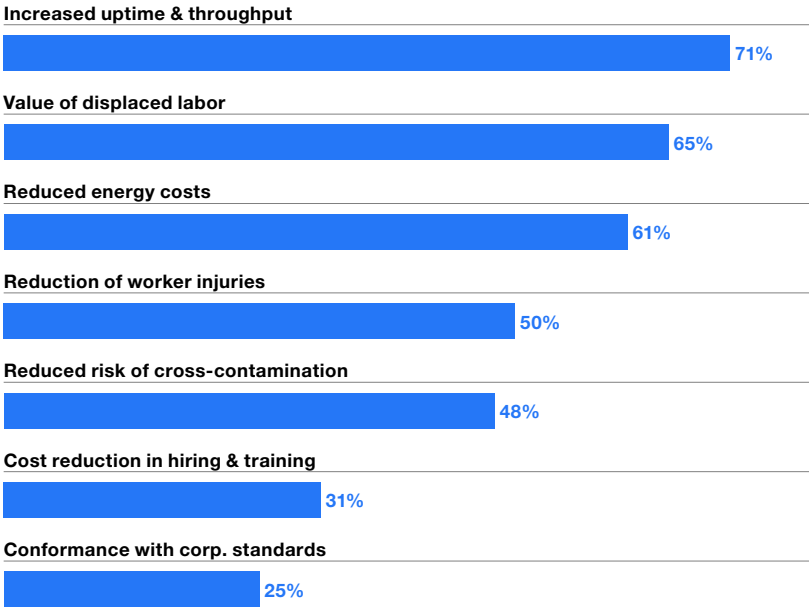
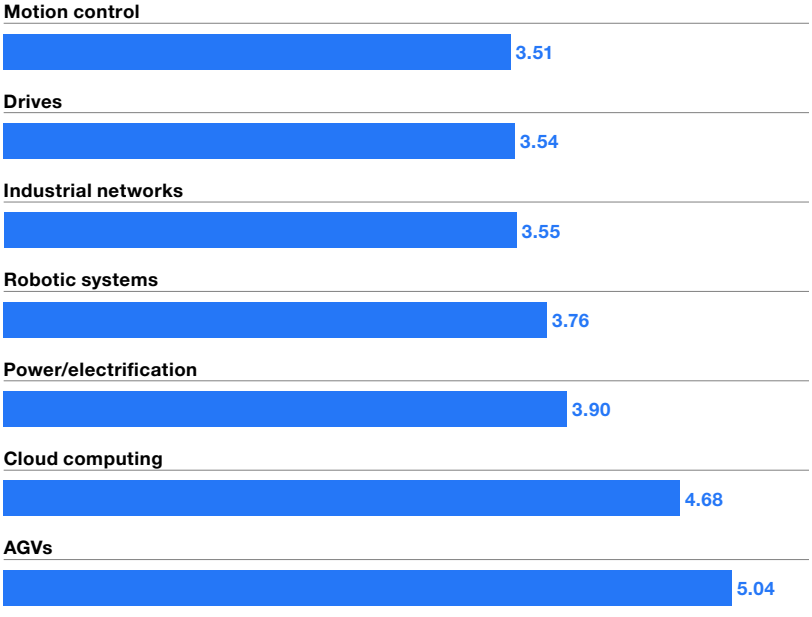


FIGURE 5: PRIORITIZE THE OPPORTUNITY FOR THE FOLLOWING AUTOMATION SOLUTIONS 1-7, WITH 1 THE HIGHEST RANKING (N=215)



"The untapped potential is in the area of safety and reduced number of incidents."

While 43 percent indicated there was no IIoT engagement at their companies (Figure 6), most respondents are leveraging the technology, usually in multiple ways.

Security always is a consideration when data flows outside the closed loop of the plant, yet half of those who did report at least some IIoT activity said their experimentation includes providing remote access to critical data to key personnel Almost as many allow them to alter machine operating parameters remotely. More than half of their firms have established wireless networks in their plants to poll field devices. More than a third are archiving data in a vendor-maintained server in the cloud.

Production of saleable product is how food manufacturers make money, so it's no surprise that projects involving process improvements or packaging automation are far and away the most likely operations areas to be targeted for investment (Figure 7). Plant infrastructure offers fewer opportunities and longer return periods, yet 22 percent rated either refrigeration or wastewater projects as a top priority.

FIGURE 6: HOW IS YOUR FACILITY MAKING USE OF THE INDUSTRIAL INTERNET OF THINGS? (CHECK ALL THAT APPLY; N=254)

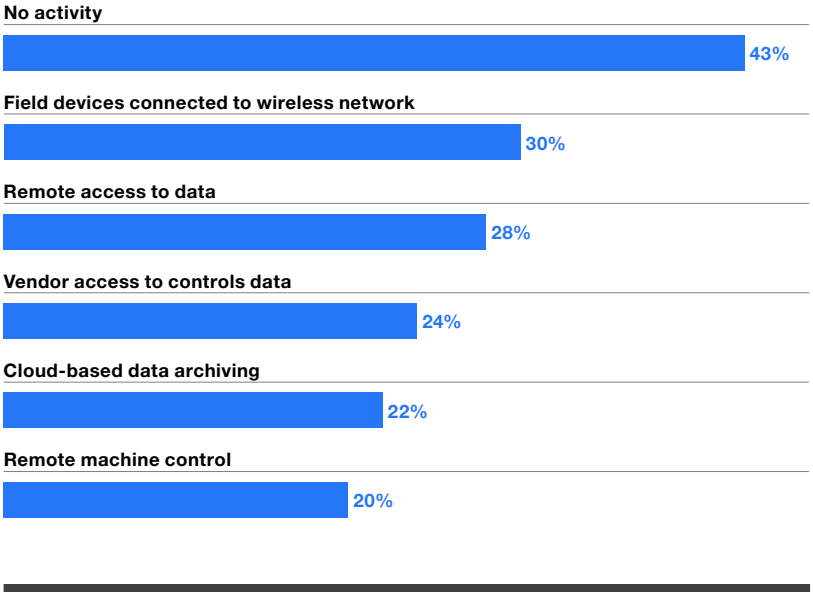
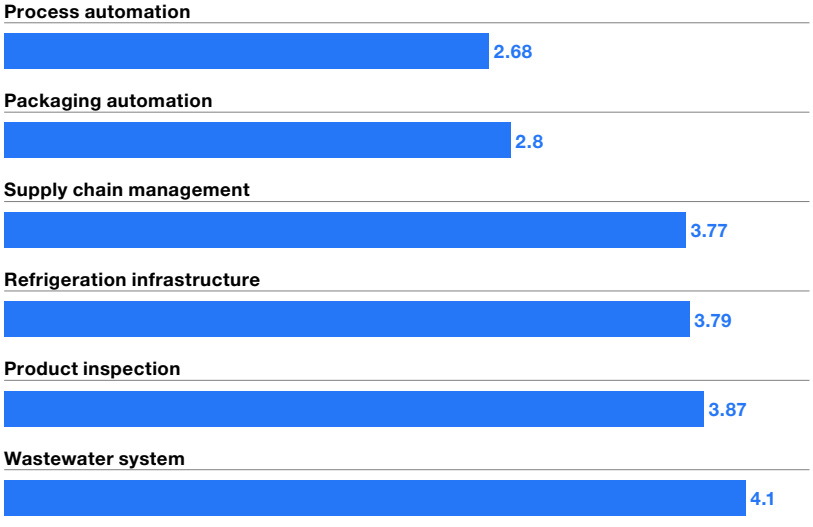


FIGURE 7: AUTOMATION SPENDING PRIORITIES, RANKED 1-6 (1=HIGHEST PRIORITY; N=190)



In some cases, capital commitment was the result of bitter experience: disruptions to and fluctuations in power supply caused damage to equipment or controls hardware at one in four facilities that experienced a power event (Figures 8 A-B-C).

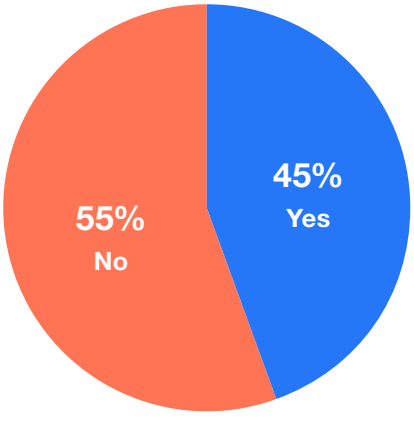
Two in five survey participants said their production facilities were adversely affected by disruptions in electrical power in the last two years. Two-thirds of the events originated with the electrical grid, and in 23 percent of the cases, the source was unknown. Internal voltage fluctuations, harmonic voltage distortions within the plant or a drop in the facility's power factor were implicated in one in 10 events.

In almost every case, lost production time was a consequence. Loss of work-in-process occurred two-thirds of the time. Redundant

FIGURE 8

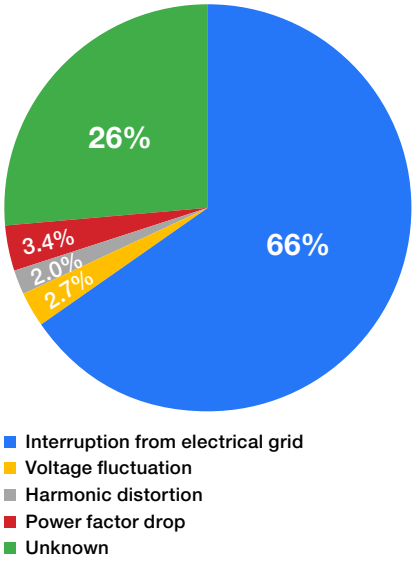
A:

IN THE LAST 24 MONTHS, HAS YOUR FACILITY BEEN ADVERSELY AFFECTED BY A DISRUPTION IN ELECTRICAL POWER SUPPLY? (N=247)



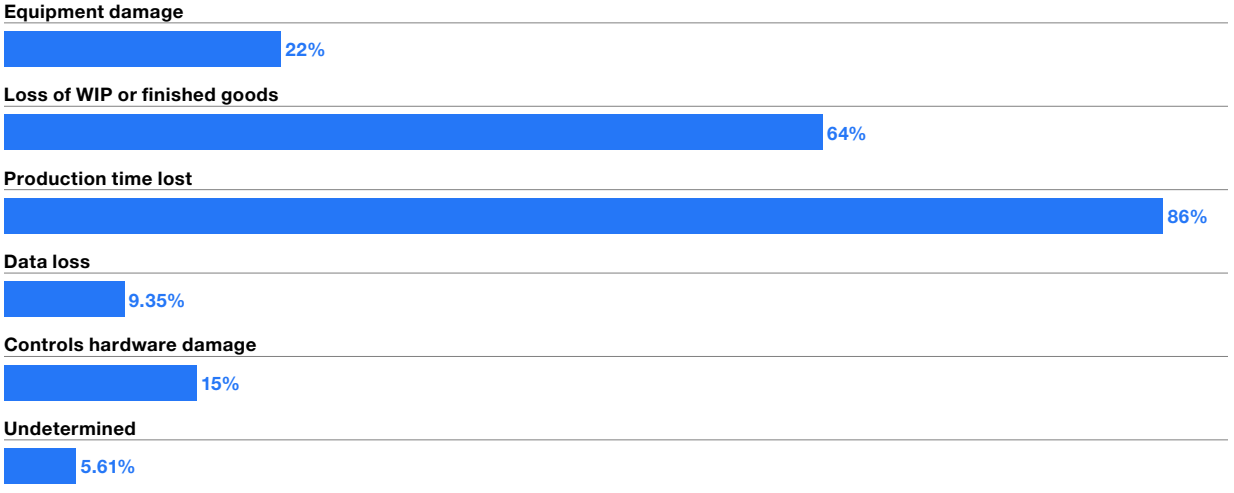
B:

IF YES, WHAT WAS THE SOURCE OF THE PROBLEM? (N=148)



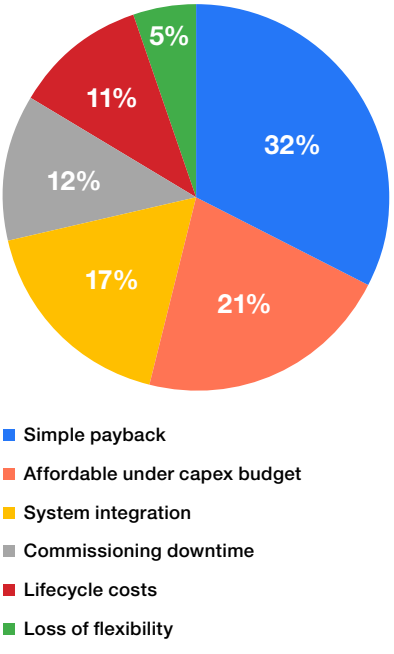
C:

IF YES, WHAT WERE THE CONSEQUENCES? (N=107)



"We need to educate college students on current industry equipment."

FIGURE 9: TOP CONCERN WHEN CONSIDERING AN AUTOMATION PROJECT (N=251)



back-up usually prevented loss of data, though data loss was cited by one in 10 respondents.

Automation usually involves change, and when a process is working, there is considerable reluctance to introduce change, regardless of the promised improvements. Financial reservations accounted for slightly more than half of the top concerns when considering a project (Figure 9), either because of capital expenditure restraints or because of uncertainty that promised paybacks would materialize. "We're currently implementing a significant upgrade of our automation system," a project manager wrote. "The biggest concern is whether or not it works as advertised."

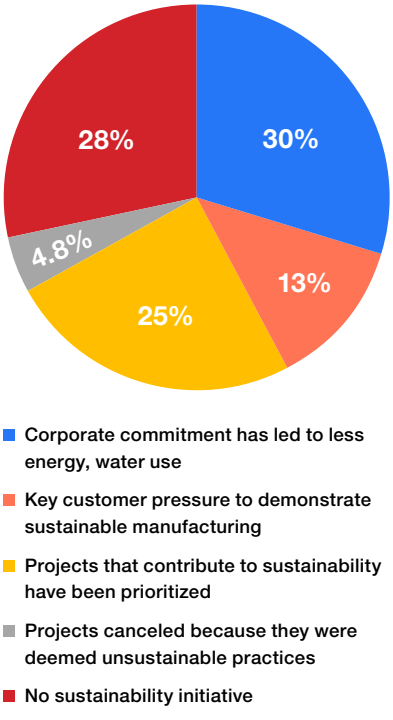
The bitter fruit of experience informs some of the skepticism. Several respondents provided answers to an open-ended question: "Are there possible concerns, drawbacks or untapped potential to automation projects?" One respondent groused, "Not properly planning before purchasing something."

A bigger hurdle may be the skills necessary to support advanced technology. "The technology can outpace the training of my maintenance team," observed an engineering manager. "Training and maintenance of the technology," seconded a safety manager. One C-suite executive noted, "Generally, just no knowledge of the pros and cons of automation projects, and with this uncertainty there is no motivation to pursue or to explore the possibility."

Flexibility is part of the appeal of robotic systems, which are easier to reprogram for different tasks than mechanical systems. That benefit, along with lower costs, helps explain the industry's embrace of robotics. They cannot match the infinite flexibility of humans, but robots are proving their adaptability in many of the North America's food plants. Presented with six possible drawbacks to an automation project, survey participants expressed the least concern over loss of flexibility, with fewer than one in 20 citing it (Figure 9).

Sustainability programs often are characterized as environmental initiatives unconnected to the day-to-day operations of a manufacturing facility (Figure 10).

FIGURE 10: WHAT IMPACT HAS YOUR PLANT'S SUSTAINABILITY PROGRAM HAD ON AUTOMATION INVESTMENTS? (N=252)



In fact, operating expenses are positively impacted when organizations commit to energy reductions, lower water consumption and zero-landfill initiatives. The financial benefits are well understood by the largest food and beverage companies, most of which highlight their goals and effectiveness in corporate social responsibility (CSR) reports.

Regardless of company size, most food manufacturers are attacking waste: only 28 percent of survey respondents indicated their organizations did not have a sustainability program.

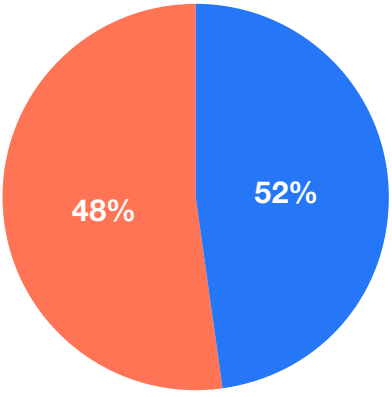
Of the remainder, two in five reported their firms were committed to specific reductions in sustainability metrics by their CSR program. More than a third said certain projects were expedited because of their positive impact on sustainable production. Conversely, a small sub-sample (one in 15) noted that some projects were cancelled because they undermined sustainable manufacturing goals. Asked to rank six drivers of automation spending, one-quarter rated projects that improve sustainable practices as the most or second-most important factor.

Worker recruitment is a challenge throughout the food industry. One in three survey participants cited reduced costs for recruitment, hiring and training as a soft benefit they consider when evaluating an automation project (Figure 4). On the other hand, some expressed concern about the diminished role of skilled workers, both inside and outside the organization. "Reliance on technology rather than people" was a potential drawback cited by a top executive.

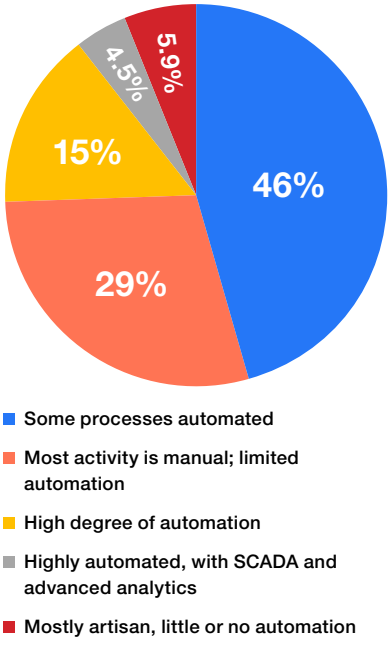
There are more needs and improvement opportunities in food manufacturing than there are capital-expenditure dollars to address them all. Some projects are mandated, but manufacturers exercise discretion when considering most, including automation investments. As food companies gain a greater appreciation of how those investments will justify themselves, financial allocations for automation will increase. □

RESPONDENTS PROFILE:

SIZE OF PLANT



CURRENT STATE OF AUTOMATION



METHODOLOGY

This report is the result of a web-based survey conducted by Food Processing magazine during the latter half of November 2016. Email invitations were sent to food & beverage processors in the job categories of plant operations, plant-level management and upper management. There were 259 total usable responses, all from the U.S. and Canada.