EXCLUSIVE REPORT: MANAGING RECALLS WITH THE TOOLS YOU ALREADY HAVE

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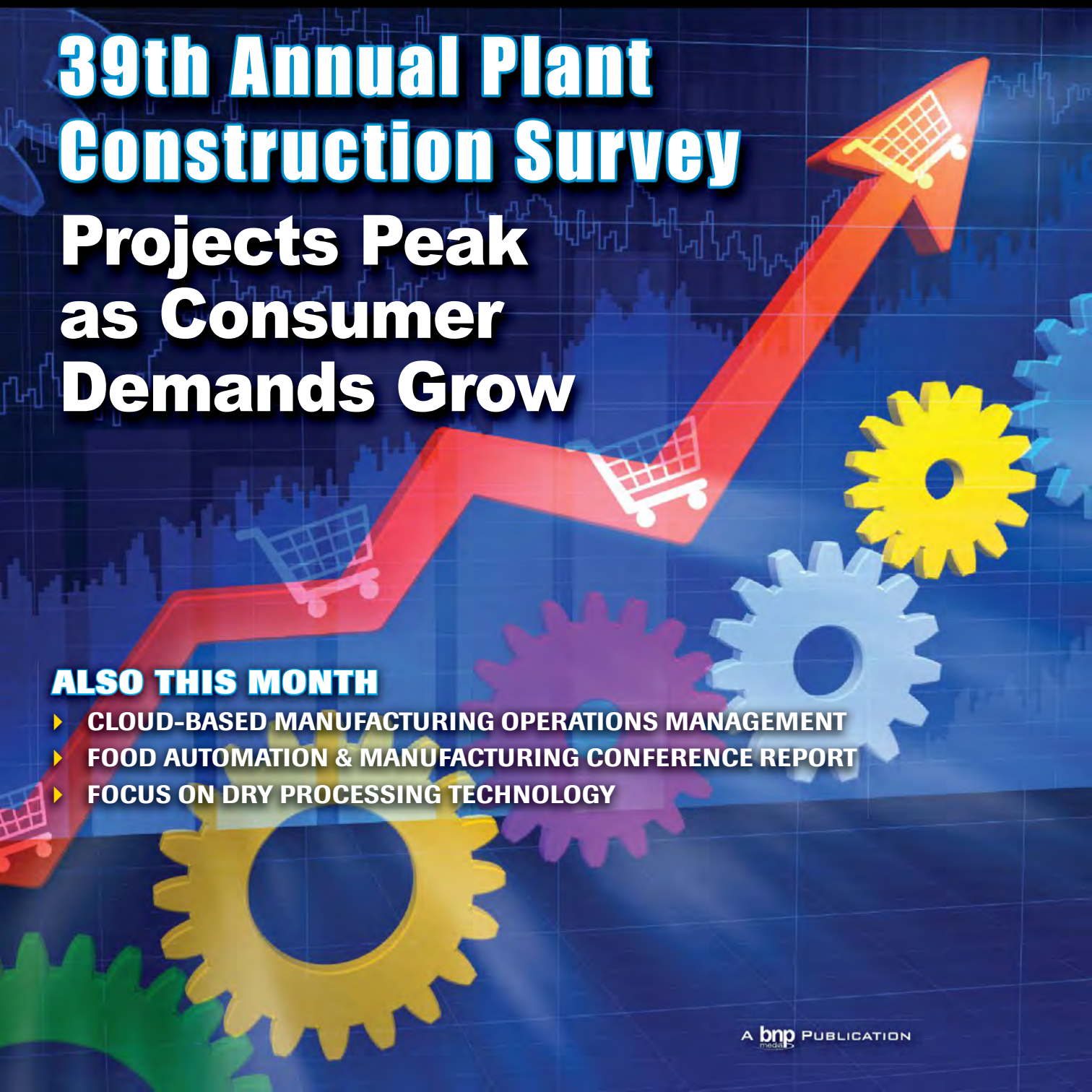

39th Annual Plant Construction Survey

Projects Peak as Consumer Demands Grow

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39th Annual Plant Construction Survey

Projects Peak as Consumer Demands Grow

The focus is on renovating existing facilities to meet new food safety standards while keeping workers safe and using automation to meet increasing customer demands.

Wayne Labs, *Senior Technical Editor*

We thought we hit a peak when 2014's total reportable food and beverage plant construction projects numbered 635. But, the number of construction projects recorded in 2015 is 9.29 percent greater and is the highest number in the last 10 years. The number of new greenfield projects in 2015 was just 0.45 percent higher than 2014's number.

However, the number of renovation and expansion projects for 2015 increased over the previous year by 13.98 percent. Architectural & engineering/construction firms (A&E/Cs) are largely in agreement about why. They believe many processors are locked into their locations. After all, it's not always easy to find a new greenfield site and move employees. But staying put requires some overhauling for these older facilities to pass new food safety regulations.

In addition, many of these older facilities have OSHA-related worker safety issues, such as safe zones or a lack of them and dangerous stairs, ladders and access paths.

At the same time, increasing customer demands—especially influenced by the millennial generation—have brought about the need for rapid product changeovers, the separation of allergens and non-GMO ingredients, and the ability to make more product faster, better and safer. Hence, automation is becoming more important, not only to keep food and employees safe, but to meet these new demands. This year's hottest food and bever-

age industry trends, as identified by our A&E/C interviewees, have changed a little since last year. Food safety and automation remain at the top of the list, but this year, "renovation and expansion to meet modern standards" and "personnel safety/welfare/training" hold the number three and four slots, which previously were held by "energy efficiency" and "efficiency of the operation." In addition, processors are especially concerned about organics/non-GMOs/gluten free and hygienic design, including the separation of workspaces and ingredients.

For the past four years, FE has been tracking alcoholic beverage-producing facilities, the number of which has been on the rise, thanks to the popularity of craft beers and bourbon. Source: FE.

What the numbers tell us

The total number of reportable food projects in 2015 (694) represents a 9.3 percent increase over 2014's number (635) and a 26 percent increase over the 10-year simple average of 551. The total new reportable food projects in 2015 (221) is a 0.45 percent increase over 2014's 220 and a 32 percent share of the 694 total projects in 2015. The 2015 renovations/expansions category total (473 projects) is 14 percent higher than 2014's total (415 projects). The renovations/expansions category accounts for 68 percent of total projects in 2015.

Reportable food projects are those valued at over $1 million. They have been made public by the processor, a government entity (including local or state economic development groups) or the A&E/C firms responsible for them. The survey includes projects begun, announced or completed in 2015.

Renovations and expansions can include retrofits, facility additions (attached or unattached) or new production lines and major equipment upgrades, or items such as new wastewater treatment facilities or refrigeration plants. Included within the new and renovation/expansion categories is a separate category for dedicated distribution centers, coolers and warehouses where no processing is performed. Facilities for alcoholic beverages, including new facilities, renovations/expansions and/or dedicated distribution centers, also are in the survey.

Interestingly enough, the number of alcoholic beverage projects has been steadily increasing. In 2015, there were 90 reported projects, compared to the previous year's 82, nearly a 10 percent increase. A large number of new brewery (especially craft beers) projects and bourbon-related facilities contributed to the growth of this category.

Meanwhile, the number of dedicated food and beverage distribution centers has fallen from 53 in 2014 to 47 projects in 2015, a 11.32 percent decrease but only down by 3.49 percent from the 10-year average of 48.7. Also, in 2015, alcoholic beverage projects were nearly double those of dedicated warehouse/distribution centers (DCs) at 90 vs. 47.

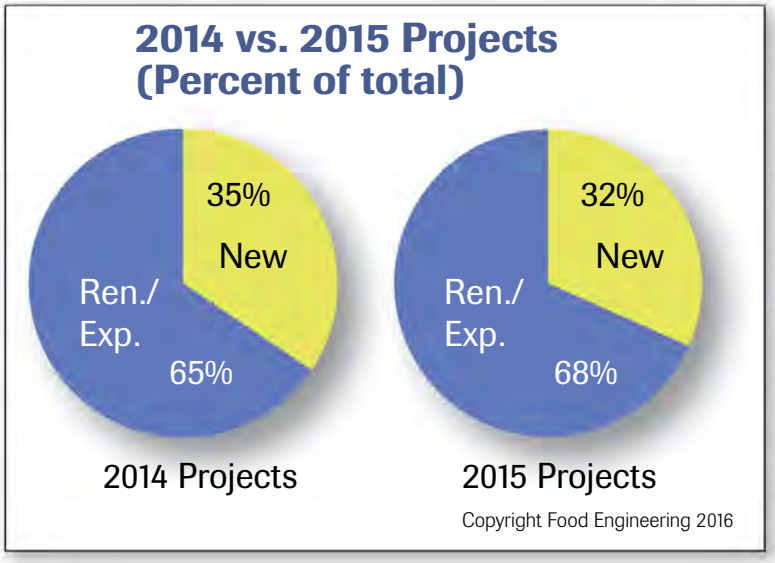
Food safety still a big deal

In 2014, A&E/C representatives cited food safety as the number one trend. In 2015, this was very slightly eclipsed by automation. Food safety is the big driver of all projects.

"We're seeing much more new construction and renovation due to food safety concerns," says Mark Redmond, Food Plant Engineering, LLC president. "Companies are not only talking the talk, but walking the walk when it comes to making real changes to safeguard their products. Why? Government regulations play a part, but a lot of this movement is due to consumers themselves. They expect and demand safe food. Problems make front page news and are splattered all over social media. Mistakes take companies down. It's not enough for manufacturers to have contingency plans. They have to fix the problems."

"Primary processing is moving away from co-packing and shifting toward self-manufacture," observes Jeff Johns, senior vice president at Shambaugh & Son. "One reason is cost savings, but another driving factor is the need for our [clients] to be in control of their product, partially due to the litigious nature of consumers. They want control of the quality and supply chain and not to pay for someone else's mistakes."

"A major trend now is new greenfield projects being constructed to replace aging assets that present food safety risks," says David Dixon, Faithful+Gould program director—food and beverage sector. "FSMA and increased risk of senior executives being susceptible to personal liability are helping justify new investments to minimize the risk to the brand, the stockholders and managers of major food and beverage companies."



Renovations and expansions increased from 65 percent of total projects in 2014 to 68 percent of total in 2015, while the total number of projects increased from 635 to 694. Source: FE.

With FSMA, food safety has become a very important, if not the most important, trend in the industry, according to Steve Tippman, executive vice president of the Tippmann Group. "Plants are renovating and enhancing existing spaces to comply with higher food safety standards. In addition, food processors are self-policing through independent, third-party audits to achieve SQF, BRC and other GFSI standards. This trend should help them with FDA inspections."

Meeting GFSI audits is more important than ever, since several major retailers now require this certification. Getting facilities ready is an important step. "In 2014, many clients were interested in certification because of a desire to export product and what might be necessary for them to do so. The conversations we've had with clients more recently seem to reveal a genuine appreciation for the validity of the SQF and BRC guidelines," says Mark Di Gino, E.A. Bonelli + Associates marketing manager. "Even fairly new facilities, and recent renovations, are being scrutinized for possible certification. A more forward-thinking food safety plan puts a legitimate emphasis on plant design, not just final product."

Food safety and sanitary design continue to be a focus, notes Darrin McCormies, Epstein senior vice president, director of industrial process engineering. " Some aspects of good sanitary design practices that were pioneered and are commonly used in high-risk manufacturing segments—like RTE products—are spilling over into more moderate-risk categories."

"We are advising our fresh fruit and veggie clients to do what USDA has forced protein folks to do for years with regard to sanitation, separation, process makeup air and cold chain management," says Mike Golden, Food Tech vice president. "With the explosive growth in these convenience foods, the government will undoubtedly take a hard line on any fresh food companies responsible for sickening consumers due to poor handling, washing and packaging procedures."

The microbial contamination of food can be very expensive for processors. Therefore, it's vital to design and build in hygiene in food processing equipment. "This is especially important in RTE facilities where positive air pressure zones must be established," offers Tim Nguyen, ESI Group USA regional vice president. "The air pressure zone with the highest positive pres-

FSMA best practices: Zones of control

Some of the best practices emerging from FSMA include:

Zones of control

- The design and construction of any food processing facility should include a complete separation of production areas that house uncooked (raw) from cooked, ready-to-eat (RTE) products.
- Construction should segregate welfare areas for employees who handle raw products from the areas for those who handle RTE products.

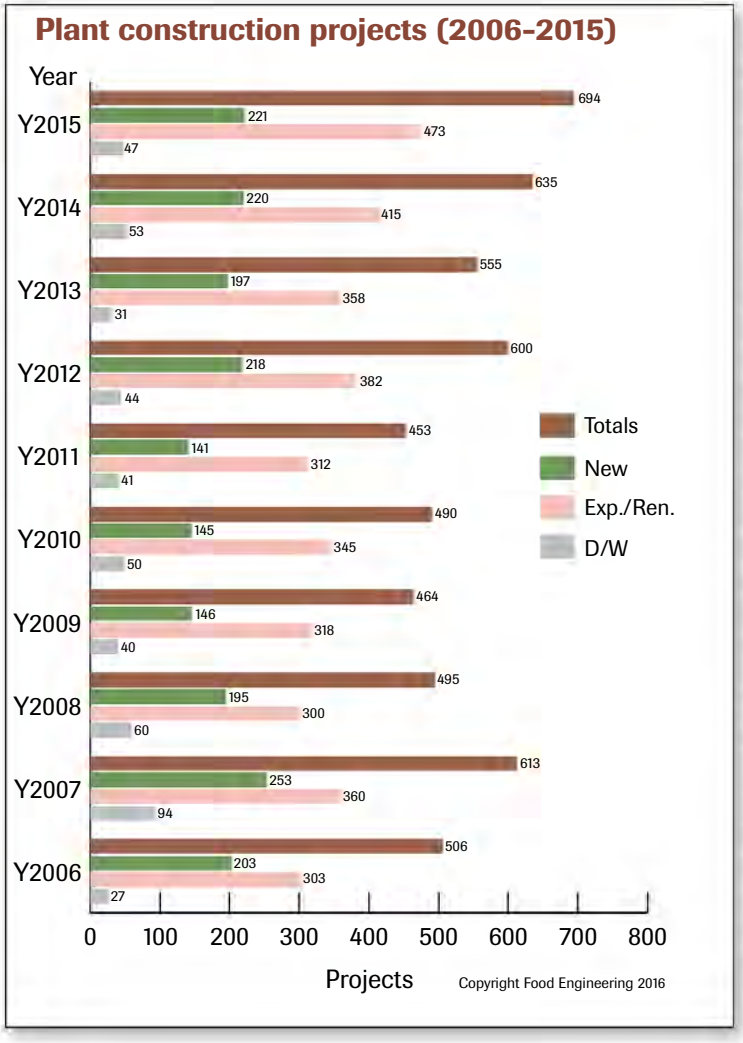
Temperature and moisture control

- Food processing plant design should begin with a clear understanding of each room's function to ensure sufficient room temperatures based on the intended use of the spaces.
- Installing reliable mechanical systems to control humidity within the plant is critical to eliminating potential food safety and bacteria harborage issues.

Cleanability and maintenance

- Materials used in the construction of a food processing plant should be selected for both durability and cleanability, including the ability to resist harsh cleaning chemicals and temperature variations.
- The design should include ample space above, around and under physical constraints, such as process equipment, with separate levels established for proper cleaning and maintenance of the building and the process equipment.

Source: Stellar.



New facilities, expansions/ renovations and distribution centers/ warehouses are shown for the years 2006 to 2015. Total projects = New + Exp./Ren. The DC/Whse. category includes new facilities and expansions, but only projects dedicated to distribution and warehousing (no processing).
Source: FE.

sure should be where the product is last exposed to open air. This is a critical zone and must be maintained with positive pressure and highly filtered air."

Interior air quality isn't the only concern when it comes to meeting GFSI guidelines and FSMA regulations. Other major considerations include site and building security utilizing electronic and/ or video surveillance, control of "redline" processing areas to prevent unauthorized access to production areas, building automation systems to control and monitor temperature, and hygienic air handling systems, according to ESI Group Regional Manager Jack Michler. "In addition, improvements to health, welfare and training areas; clean-in-place/clean-out-of-place provisions; and sanitary design to prevent potential contamination are commonplace concerns."

Security issues under FSMA cannot be underemphasized, warns Tippmann. "Our clients are implementing guardhouses, fencing, security cameras and other components to ensure their manufacturing sites are controlled and protected. Assessing documentation procedures and traffic flow has also become an important part of the design and construction of these facilities."

"Many of our customers are investing in fully enclosed offloading systems, or sealed trailer dock doors, and CIP capability for bulk offloading systems," says Tyler Cundiff, Gray Construction director, business development. "Engineers and designers must work alongside customer quality personnel to ensure all new processes and equipment stand up to internal HACCP specifications and external auditors. All parties involved must emphasize how to eliminate any sources of potential food safety issues, whether it is through hiring dedicated food safety professionals or increasing employee training and self-auditing."

Can an old facility be reworked to meet FSMA rules?

That is the question at hand. According to Jon Miller, A M King director of business development, processors are focused on plant renovation and expansion projects using proper food safety principles. "Separating raw handling areas from finished goods areas, including storage areas and employee welfare areas, and the utilization of air barriers through positive and negative air pressures are essential.

"Clients are examining their older facilities to bring them into compliance," adds Miller, "causing rework to produce a cleaner, more streamlined workflow, while improving food safety procedures."

However, renovating a plant can be a challenge, especially if the process flows must be reworked. While it may cost more to build a new facility, doing so can help a company meet all its specifications without disrupting current production, says Harlan VandeZandschulp, president of Gleeson Constructors and Engineers.

Plus, building now may be a good idea due to today's favorable interest rates, reminds Jeff Johns. "Due to the continued low interest rates, we've seen less interest in renovations and more interest in greenfield facilities."

But, new isn't always in the cards. "New construction over the last few years has declined in lieu of the renovations and expansions of existing facilities," says Sean Barr, senior director of project planning for The Austin Company. "Food manufacturing companies appear to be ensuring they fully utilize their existing resources, prior to executing greenfield projects."

Sometimes, processors renovate because they've consolidated operations, requiring changes to existing facilities. "Businesses are looking to take advantage of real estate they already occupy,"

Hot 12 trends for 2016

The A&E/C firms that participated in this survey identified the following trends. They are listed in descending order.

1. General automation (e.g., process, including building automation)
2. Food safety/FSMA
3. Renovation/expansion to meet modern standards
4. Personnel safety/welfare/training
5. Robotics in packaging/pallets
6. Energy efficiency
7. Non-GMOs, organics, gluten free, innovative foods
8. Hygienic design/sanitary design/CIP
9. Separation of spaces (e.g., raw and cooked)
10. Flexibility in lines/adding lines
11. Efficiency (operating)
12. Innovation in equipment design to keep up with food innovation.

This list was compiled based on the number of mentions per category. Duplicates by a single A&E/C firm were eliminated.

Source: Food Engineering's 2015 Plant Construction Survey.

states Bill Sokolowsky, Burns & McDonnell Engineering Company business development manager. "Transforming internal space for different use categories and expanding existing operations still make up a fair share of construction projects."

Plants in suburban or urban areas with no more real estate available to them have to get the most square-footage out of their property as they can. Some maximize their facilities to full build-out for production and cold storage, says Forrest McNabb, executive vice president of Big-D Construction Corp. "This [focus] also includes enhancements to the existing facilities to accommodate new production and packaging systems, along with the new products they may be bringing online."

Getting an older facility up to speed, either for food safety reasons or added production, can be tricky. If drawings even exist, they're probably far from accurate due to the many changes made over the years, probably without documentation. What to do? Three-dimensional (3-D) laser scanning, with the integration of 3-D design tools, reduces design errors by providing true backgrounds and reducing clashes in the field, according to Dean Weber, Amec Foster Wheeler senior project manager. "We are no longer limited to using as-builts from the last project or spending valuable time taking, inputting and verifying field measurements. The scans offer a color 3-D model of existing facilities that can be used as backgrounds for design and as a communication tool to show new and existing equipment to clients. The content allows contractors to quickly understand the project using freeware to move around in an assimilated 3-D model."

Redefining food and beverage products

Millennials now outnumber baby boomers, which means the younger generation has more buying power. And, when it comes to food and beverage products, millennials want changes and lots of them. "Millennials want an unlimited number of choices in everything from portion to nutrition, taste, price, packaging and more—all of which must be considered in the design of a facility," says Gray's Cundiff. "How manufacturers can go about meeting these demands can best be described in one word, which is flexibility."

Today, a facility must be designed to provide the utmost flexibility within the building itself, as well as its processes and systems. Changing over lines for different products is very much a necessity, and manufacturers must be able to do this quickly and seamlessly. This requires a certain level of automation.

"Our food manufacturing clients are continually responding to the market trends," says Joe Badalamenti, SSOE Group business development executive. "Some projects are tied to new processes and product innovation [like gluten-free products]. Others are tied to food safety and preventing the transfer of allergens from one food stream to another."

"[Food and beverage industry] market trends affect plant design in regard to process," adds Faithful+Gould's Dixon. "For example, General Mills is moving toward gluten-free products, which requires completely changing the base ingredients [flour] of a significant number of its products. Much of the demand for gluten-free products has been addressed by startup companies that build new facilities as their sales increase and outstrip their capacity." Other issues, such as fresh ingredients, also pop up when a company strives to meet millennial desires. As Dixon explains, "Often, farm-fresh, locally sourced ingredients arrive at the processing facility with a higher bio-load, requiring space and equipment for cleaning and prepping produce, washing and unit operations."

"The millennial generation is affecting construction," says The Austin Company's James Neveu, project executive. "For instance, significant capital is being diverted to segregate production lines due to allergens. Plus, many companies are reducing the number of ingredients [in their products] to simplify labeling and increasing their emphasis on tracking ingredients." Neveu also says processors are investing in equipment for alternative packaging and the conversion of lines to reduce cooking times and/or increase capacity for a more mobile generation that is looking for "healthy" vs. diet meals.

However, The Austin Company President Michael Pierce has some concerns about these developments. "I am not sure it is wise to base a 20-year plant design and construction survey on the stereotyping of millennials with respect to food trends," he says. "Fresh, allergen free and the like are niche markets that can be accommodated by flexible manufacturing techniques. And,

these techniques and technologies can be used for a variety of purposes. For instance, while flexibility and adaptability are increasingly important in a food plant design, area separations and HVAC designs often can address these requirements."

Automation keeps up with change

"Today's manufacturers want flexible packaging lines that are easy to change over and offer high throughput speeds, speeds that are now so incredibly fast humans cannot possibly handle them, but robots can," says Bill Sander, Hixson Architecture & Engineering senior vice president and project manager. "For these lines, automation delivers greater quality and accuracy, improves lot control, reduces the potential for human contamination and allows facilities to achieve net reduction in price per unit by being able to produce higher volumes with fewer staff members."

"For the past few decades, the use of automation has been increasing steadily, reducing manufacturing costs," notes Dave Bartels, Haskell director of project development—food and beverage division. "Fast-moving consumer goods [manufacturers] trend closer to total automation solutions, while niche and specialty manufacturers balance the benefits of automation with the installed capital costs."

Process automation is responsible for creating consistent, high-quality products while saving energy and decreasing waste. Gray's Cundiff lists a few areas that were automated in actual projects:

- Product distribution/CIP networks via mix-proof valve clusters
- CIP and COP systems
- Grain handling, milling and packaging systems
- Package inspection systems
- Inline blending system that replaces manual batching system
- Powder-into-liquid addition system that replaces manual bag dumping
- Product quality and process monitoring systems and equipment.

Another good reason to automate processes is the need to keep electronic records for regulatory purposes. For example, Sokolowsky suggests where data is required for reporting purposes (e.g., FSMA), DCS and SCADA projects should be implemented. Once SCADA's in place, processors can use historians and SPC programs to fine-tune processes for maximum quality, minimum waste and safe operating points.

"There is currently more emphasis on real-time monitoring for employees to track output and quality," says Chris Harmon, Hixson senior vice president and project manager. Companies are monitoring line efficiencies, implementing real-time production area scoreboards and undertaking similar initiatives to be able to react faster to problems as they occur and proactively solve issues.

"Facilities want to gather much more plant floor data," says Mark Redmond. "Regulations probably play a part in this, but

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more important is the ability to use this data to make better decisions regarding ways to optimize production schedules and efficiency and identify equipment needs."

Automating packaging and palletizing

"The use of automation is increasing in the packaging area," says Victoria Fleddermann, director of business development, Alberici Constructors. "As the number of SKUs increases in production plants, the need for more flexibility increases as well, and automation is key. LGVs [laser-guided vehicles] and ASRS warehousing are on the rise to cut down on labor costs."

"Using robotics in case and pallet handling is commonplace, and the use of robotics upstream in cartoning operations is expanding rapidly," says Amec Foster Wheeler's Weber. To keep efficiencies up, changeovers must be quick and easy. Robotics applications provide this capability while reducing manpower costs. Flexibility examples include the ability to make a standard six-pack, double-stacked eight-pack or a 24-pack configuration that can be bundled with various materials on the same machine.

Once used only in the auto industry, robotics and related material-moving equipment is almost ubiquitous in the food industry. "The cost of automation, like any technology, is decreasing, and many companies are taking advantage of the low-hanging fruit such as automated palletizing, AGVs and pallet shuttle moles in lieu of ASRS systems," states Food Tech's Golden.

Automation also addresses the challenge of staff retention. "Consider, for example, hard-to-fill positions in cold, damp environments," says Sander. "Adding robotic palletizers in refrigerated and frozen environments reduces the need to manage rotating employees and lessens food safety concerns caused by palletizing temperature-sensitive products in an ambient environment." Palletizers implemented in post-packaging applications increase payloads and rates, and one palletizer can often manage two or more lines simultaneously.

Mark Galbraith, co-owner/principal of Galbraith Pre-Design, has seen a real shift toward automation, with cutting-edge plants going robotic, primarily to increase production. Depending on where and how it's employed, robotics can produce measurable improvement. "One plant I know of has almost doubled its production, thanks to robotics," says Galbraith.

Have we arrived at the lights-out factory—one of total automation? "Total automation is still an expensive, risky proposition that does not necessarily lead to greater flexibility and lower costs," replies Sokolowsky. "Until there is an accurate crystal ball, knowing what flexibility to design for in the future remains speculation." ❖

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