Easier automation for food production

What will future food manufacturing look like? *Control Engineering Europe* spoke to some key industry vendors about the future of food production. As the need for skilled labor increases, and regulations require track and trace records, advanced automation is getting easier to apply and use.

Food manufacturers need to become more agile and flexible to satisfy the changing and increasingly demanding requirements of retailers and consumers in a market where consumer purchasing intelligence is becoming increasingly powerful, internet ordering is growing rapidly, and logistics are becoming highly dynamic.

The U.K. ranks as the second worst country for productivity among the industrialized nations; if productivity could increase to U.S. levels, each household would be $25,669 (£21,000) per year better off.

"For the machine designer it is simply not possible to adapt many existing solutions to achieve the step change in productivity that manufacturers are looking for," said Martin Leeming, CEO at Trakrap. "The whole system architecture needs to change from the bottom up, and you quite literally have to go back to the drawing board and start again."

Speed to market, asset utilization

Leeming, like others, said the answer is in the digitization of machines and processes and in the acquisition and proper use of big data. "A big step change in productivity improvement does not lie in simply undertaking the same process with less people. It requires companies to rethink other things like speed to market, asset utilization, energy reduction, reduced changeover times and making to order, not to stock," Leeming said.

He said many barriers remain: only 48% of manufacturers claim to be ready for Industrie 4.0, and it is thought that 40% to 50% of existing machinery will need to be replaced to make the step change that the U.K. needs.

Keith Thornhill, business manager, food and beverage at Siemens U.K. and Ireland, said the current rate of technological change within the industrial environment shows no sign of slowing, so food industry prediction is not an exact science. Even so, "With competitiveness and changing consumer demands increasingly being seen as industry drivers, it is clear that automated processes, whether ... physical or digital, will assist food manufacturers to deliver cost-effective, repeatable and safe products," he said.

However, to achieve this, there is a need to focus on critical areas of productivity, efficiency, and agility. By looking to maximize effectiveness

it is possible to take significant steps toward creating the technological-driven solutions necessary for the competitive years ahead.

Some identifiable areas require particular attention, Thornhill said. He advises food manufacturers to set a clear mid- to long-term vision of digital integration so factories can adopt maximum transparency across all areas of product development and production.

"This includes a need for closed-loop data integration from the enterprise resource planning (ERP) level right through to production, individual asset performance, and back," Thornhill said. "Detailed machinery and automation specifications also need to be agreed [upon], so data transparency can underpin strategic decision making and productivity targets can be addressed." Thornhill also advises that companies seek to reduce obsolescence to reduce costs and to future proof available assets.

Automation investment drivers

Andrew Macpherson, food and beverage manager at Festo, agrees that the pressure from retailers and consumers to safely produce more food, of greater variety, at sustainable prices and high quality, is driving investment in automation. He predicts that the level of automation in the food sector in 10 years will completely change the food production environment.

"In the future, food production machines from different manufacturers will need to share data and communicate with each other, using open communication protocols, and will be able to

Software, drives, and controllers from Siemens operated the Hacos MDECO 3D Chocolate Decorating Machine at Pack Expo 2015 in Chicago, producing the diverse customized confections shown. Courtesy: Mark T. Hoske, *Control Engineering*, CFE Media

MORE ADVICE

Key concepts

Automation increases productivity, quality, and food safety.

**Food processors** and equipment manufacturers have opportunity with Industrie 4.0.

Digital integration helps with transparency and flexibility.

GO ONLINE

See more international coverage at www.controleng.com/international and more from *Control Engineering Europe* at www.controlengeurope.com.

CONSIDER THIS

Are you updating your machines or applying retrofits rapidly enough to keep pace with competitive needs?
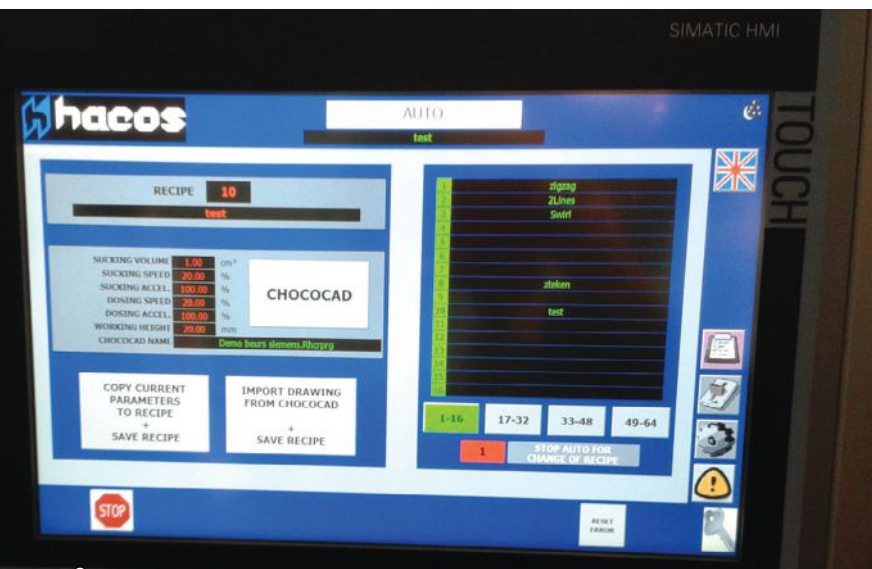
Hacos ChocoCAD software on a Siemens Simatic HMI showed measurements for volume, speed, acceleration, height, and product name, among other information, to help with custom chocolate manufacturing at Pack Expo 2015 in Chicago. Courtesy: Mark T. Hoske, *Control Engineering*, CFE Media

make necessary adjustments automatically. These machines also will be able to tell the operator if a problem is developing, whether performance is dropping or energy consumption is rising, and more importantly what needs to happen to fix it," said Macpherson.

Food manufacturers, suppliers and customers will be linked more closely. Data relating to consumer demands and trends will be shared to ensure that production adjusts with real-time demands. "Available data will bring new challenges, relating to security and how to interpret it. Engineers will have to work more closely with their IT colleagues to get the maximum benefit for their business," he said, adding: "As the link between the consumer and the food manufacturer gets closer, production machinery will need to become more flexible and able to change to smaller batch quantities, quickly."

Macpherson believes that the materials used in the production machines of the future also may be completely different from what is being used as standard today. An example is the development of nano-coating technologies such as plasma coating. "This could allow standard materials to be coated to provide increased bacterial resistance, potentially replacing stainless steel in the food sector," he said.

New technologies will emerge that help extend the shelf life of food products, involving new processes or the use of different gases, for example, ozone. "This will raise further challenges for food machinery producers, such as how to handle these new processes while ensuring it is a safe working environment for staff," concluded Macpherson.

Flexible track and trace

"The requirement for efficiency monitoring, product tracking and traceability, faster, safer, lower-cost processing and packaging solutions, and plant flexibility are growing across all sectors of the food industry," said Chris Evans, marketing and operations group manager at Mitsubishi Electric–Automation Systems Division UK. This has resulted in rapid advances in automation technology. One of the biggest is the increasing use of small articulated arm and SCARA-style robots to perform repetitive tasks. [SCARA stands for selective compliance articulated robot arm.]

"Mitsubishi hosts regular seminars on the use of robotics in the food industry and attendees are usually surprised by the low package cost, combined with ease of use and simple integration," said Evans.

"Platform integration is a major theme when it comes to delivering multiple benefits. Users expect an incremental improvement when replacing individual automation components such as drives, servo systems and PLCs [programmable logic controllers]," Evans said. "If you take a holistic view of your automation system, then you can make some really significant gains."

A powerful PLC used to manage a production line can coordinate guided-operator pick, light systems that improve quality and throughput for manual workers, conveyor systems, process plant ovens and chillers, high-speed packaging machines, robot cutting, and packing and stacking lines.

"The future for automation in the food industry is most certainly going to be centered around increased plant and automation platform integration, simply because the universal advances that producers require cannot be delivered without it," concluded Evans.

Automation helps personalization

Mass production is changing as consumers demand more highly personalized products. In the automotive industry, it is possible to choose a car's details, prior to manufacturing on a flexible production line. Similar choices are coming to the food market. It is already possible to design your own chocolates and have them made on a 3D chocolate printing machine (see related photos). In the U.K., Boomf, a personalized confectionery producer, has seen business increase by 600% in its second year.

Consumer choice is great for the customer, but "often represents a challenge to the traditional business model which is built on high volume, mass production. If you want to survive then you need to differentiate, and do something different," said Steve Arnold, business manager food and packaging at SMC.

New technologies are emerging to help businesses meet the need for more flexible, agile, smart manufacturing. Data appears to be the key, first collecting it and then being able to interpret it, to allow

> ' **Far more could be achieved with robotics and vision; ensure** that the best is made of what is already available while keeping a close eye on emerging technologies. '

businesses to make more informed decisions.

"New buzzwords like 'cyber-physical systems' are already allowing machine builders to transform a humble electric drive or process valve into a smart sensor, allowing manufacturers to purchase standard production lines but with the capability to run many different product formats in large and small batches and still turn a profit," continued Arnold. "The automotive sector has been doing this for many years and the challenge for the food sector is to embrace this new technology too, allowing for greater flexibility and agility to meet changing consumer demands."

Keeping pace with competitors

According to Mike Wilson, sales and marketing manager at ABB Robotics U.K., robotic automation will become a more attractive solution for production and packaging applications in the food and beverage industry. Robots allow producers to keep pace with the demand for greater variety, quality, and faster delivery. Producers need to find new ways to keep pace.

"The U.K. food and beverage sector has been investing more in automation in recent years to help it survive the supermarket price war. However, further investment in automation is needed to ensure continued competitiveness," said Wilson. "Other countries are automating at a much faster rate, with the most productive country in the food and beverage sector being Finland." International Federation of Robotics (IFR) data said Finland adopted 55 more robots per 10,000 employees than the U.K. in 2014.

As factories globally start to increase use of smart technology, U.K. food manufacturing needs to focus on that subject too. "As the tools which perform the various processes involved in smart manufacturing, robots are the primary technology that should be considered before implementing a full Industrie 4.0 strategy," Wilson said.

"As cyber-physical systems that use data to operate and communicate with other elements in the factory, robots are one of the most prevalently featured automated machines in any Industrie 4.0 model. They also are beneficial to anyone wishing to overcome the typical challenges facing food producers, such as inconsistent product quality, flexibility and reliability problems. Robots can also perform processes which have been identified as high risk by the health and safety executive (HSE)," Wilson said.

Labor costs, AIVs

"The U.K. food industry is a high labor economy; I don't really see that changing any time soon," said Robert Brooks, European industry marketing manager, food and beverage for Omron Europe. "We are seeing a continuing move towards 'redeployment' of the workforce for better resource efficiency, and this is being driven by cost and need."

Brooks said the industry is short of skills and at the same time there's a greater need for automation driven by productivity and flexibility demands. "This means that any automation solutions, such as robotics, will need to be easy to use," he said. Brooks said there is an increasing appetite within the food industry for robotic solutions. Around-the-process robotics, such as autonomous intelligent vehicles (AIVs) also will form a fundamental part of the future food manufacturing plant. Initially applications for such solutions, which are designed to dynamically move materials around a plant without the need for facility modifications, might include raw stock material replacement and replenishment, and bringing spares and repairs to the line.

"Moving people away from repetitive tasks, and with the potential to link these robots into the production and maintenance processes or ERP systems, the food industry could find a host of applications for this new breed of robots," Brooks said. "There are so many opportunities for their adoption within the food manufacturing environment and again, this will be driven by the need for greater efficiency."

Brooks also expects to see increasing adoption of simulation technologies to provide a low-cost solution to visualize the total cost of ownership and proof of concept of any potential new automation solutions before purchase.

"Artificial intelligence (AI) is another technology that is knocking on the door of the food factory," continued Brooks. "We should expect to see these cognitive thinking systems being employed to make sense of the increasing amounts of data being made available from smart systems.

"AI technology could be used, for example, to help manufacturers link consumer buying patterns to the weather and environment. There are many areas where cognitive thinking solutions could find applications in the food industry," Brooks said.

For now, though, Brooks advises that engineers need to look more closely at the tools they have available. "I believe that there is far more that could be achieved with today's robotic and vision solutions. It is important to ensure that the best is made of what is already available while also keeping a close eye on emerging technologies. It also is important to take time out to find out how these technologies might fit into your organization, now and in the future, because you can be sure that some of your competitors will be doing just that." **ce**

Suzanne Gill is editor, Control Engineering Europe; *Edited by Mark T. Hoske, content manager,* Control Engineering, *mhoske@cfemedia.com, from a Feb. 6 post on the* Control Engineering Europe *site, "Taking a glimpse into the future of the food production process."*