Impact of COVID-19 on automation and digitalization of the Food and Beverage Industry

During the COVID-19 pandemic, some food and beverage manufacturing plants were forced to temporarily close due to outbreaks of the virus among employees at their facilities. The meat packing industry in the U.S. alone experienced over 17,000 infections between April and May 2020, which led to shutdowns and supply disruptions, food shortages and increased prices for the public. On this side of the border, closures at meat and poultry processing plants in British Columbia and Alberta brought the vulnerabilities of Canada's food supply chain into closer focus. This situation also highlighted the vital role that automation and digitalization could play in addressing current and future challenges in the food and beverage manufacturing industry. Specifically, automation and digitalization could allow plants to operate remotely without heavily relying on manual labour.

A recent regional survey[1] conducted in the food and beverage sector showed that at least 78 per cent of executives were actively preparing for the next global pandemic, because they expected to see another pandemic within the next decade. Two of the key priority areas in this strategic plan are reshaping digital strategies and accelerating investments into production automation tools[2].

Automation

COVID-19 has elevated prior concerns about how to increase productivity in the food and beverage sector with fewer resources. The outbreak has highlighted serious gaps in the food supply chain. Many of these gaps are because of increasingly spread out and complex supply chains, as well as high demand for faster processing and transparency. Before the pandemic, an aging workforce and shrinking talent pool drove these gaps. Now, these gaps are driven by restrictions on the number of people allowed in facilities and by shift requirements. The pandemic has shown the industry that in unforeseen situations, any repetitive manual labour role is vulnerable to staff and labour shortages. Therefore, these tasks have now become the focus of automation. The value of cross-training has another major lesson in these challenging times. Many food and beverage companies relied on a very limited pool of knowledgeable people for various machine operator positions and tasks. The loss of one key person put production in turmoil. In addition, food safety regulations and recalls are still a concern for manufacturers and compliance continues to be a top priority. This means companies can profit from using better tracking and warehouse technology to eliminate recalls or instances of foodborne illnesses.

Automation is being used in food and beverage manufacturing to increase productivity, maintain worker safety and ensure quality food production. Recent improvements to robotics and sensor data, combined with data processing and the interpretive power of artificial intelligence, have led to smarter, more efficient ways of moving food through the supply chain[3]. Nowadays, processing plants and warehouses use robotics and automation to transport raw materials, reducing manual handling. Manufacturers use computer vision to monitor and optimize the amount of product produced in their facilities. Automated tools for warehouses that measure things like temperature control, alerts and inventory levels are crucial to complying with food safety rules. Automation is also prevalent in most high-volume areas where products and packaging are consistent, such as cereal in boxes or soup in cans. However, in other sectors such as meat processing, because product size is not consistent, processes are still mostly manual.

Although automation shows many advantages, the food and beverage manufacturing industry was not able to capitalize on them in 2020, given the challenges the sector faced last year such as factory shutdowns and related financial problems. Companies stalled their capital investments in 2020, however the demand for automation is expected to accelerate in the near future. According to the Euromonitor International's Voice of the Industry COVID-19 Survey, conducted in October 2020, 25 per cent of manufacturing companies plan to increase investments in automation tools. Investments in manufacturing automation are expected to accelerate from now until 2025.

Manufacturers have actively used robots for years for packaging, palletizing, cutting, dispensing and sorting. However, the use of robots in other areas such as picking has been slower to develop. With improvements in robotics technology, such as grippers, collaborative robots (which can accurately and uniformly pick and pack even fragile produce) and mobile robots, the industry will likely see many more

[1] Survey commissioned by the American Institute of Baking

[2] Euromonitor – Digital transformation in Economies and Consumers – May 2021

[3] Daniel Bruce, founder and chief artificial intelligence officer at Vinsa, a West Palm Beach, Florida

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applications going forward[4]. According to the International Federation of Robotics, the global demand for industrial robots is expected to grow by 12 per cent per year by 2022, reaching close to 600,000 robot units installed per year by 2025. The global production value of automated industrial equipment is forecast to expand by 28 per cent over 2020 to 2025 to reach US$90.3 billion in 2025.

What processors expect from automation

During the COVID-19 pandemic, Food Engineering[5] conducted a survey asking automation suppliers what processors were expecting from them and their automation solutions. Although the expectations of food processors are also relevant in normal times, COVID-19 has magnified their needs and changed their priority order, which is shown below:

- replacing employees working in areas at high risk of contamination with automation
- implementing labour efficiency infrastructure to address skilled labour gaps and reduce reliance on unskilled personnel working in harsh environments
- alleviating bottlenecks at end-of-line packaging
- improving overall product yield and quality
- reducing risk of injury to employees in heavy-lifting jobs
- adding robotics to process applications besides the usual packaging and palletizing
- giving managers a digital bird's-eye view of the plant floor
- beginning to digitize or automate operations without scrapping legacy systems
- improving overall manufacturing and energy efficiency while becoming more sustainable
- using system integrators to help determine what works and does not in a process
- improving process operations before proceeding with automation
- accessing automated systems with management input
- accessing intelligent edge devices for remote troubleshooting and maintenance
- improving economies of scale at plants and automation suppliers to serve as partners in technology
- accessing more accurate and faster inspection systems with digital capabilities

Digitalization

Travel restrictions and distancing requirements have created barriers for technicians to complete onsite testing. An alternative to onsite testing is the dial-in contact communication software that can perform virtual equipment validations and confirm proper functioning of systems to ensure they are failsafe.

The digital transformation has made remote design, engineering, and testing capabilities possible. Equipment changes and upgrades certainly look different now. These added possibilities have been essential to keeping plants up and running. Food and beverage companies quickly adopted the necessary technologies to complete remote factory acceptance tests and remote troubleshooting and diagnostics. Additionally, augmented reality tools support live conversations with audio, video and the ability to make notes on the screen. This supports collaboration and provides a trusted platform for food and beverage companies to connect securely with their suppliers.

Impacts of automation on the labour market

Because of the pandemic, the food and beverage industry has introduced the following measures to keep its workforce healthy:

- daily health screenings
- social distancing
- use of personal protective equipment (PPE)
- on-line technologies to connect virtually or to provide service support to customers
- restrictions on non-essential travel and non-essential visitors in the plant

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[4] Jeff Burnstein, president of the Association for Advancing Automation in Ann Arbor, Michigan.
[5] Publication based in Michigan, USA that provides information to executives in Production, Engineering, Operations and Packaging in North America's largest food and beverage manufacturing companies

Collaborative robots are another automation tool manufacturing companies adopting social distancing measures can use to address workforce issues. This tool allows machinery and human workers can interact and streamline the production process. This type of automation solution will be crucial to sustaining high productivity levels, as workers will start to retire or simply be less physically able to perform the activities in food and beverage production plants.

On the other hand, increasing factory automation, combined with COVID-19's effects on the economy, may increase both uncertainty in the labour market and employee anxiety. Advancing automation in the production process may increase job losses and especially hurt lower-skilled workers, unless effective skills training programs are implemented. Survey results from the first quarter of 2021 show that 56 per cent of manufacturing and distribution executives in North America have plans to increase their workforce within the next six months. However, only five per cent of those executives felt confident they would successfully fill those positions.

Impacts of automation and digitalization on production location

The food supply chain has become more complex and demanding over the years. It requires the entire supply chain to automate to effectively meet demand. The pandemic has exacerbated this need.

Because of the pandemic, some food and beverage manufacturers around the globe have accelerated the implementation of an intentional, defensive and resilient supply chain to reduce any risks associated with unplanned disruption, geopolitical risks, and other supply chain vulnerabilities. For example, manufacturers are implementing an integrated supply chain strategy that leverages a multi-site manufacturing approach that gives them the opportunity to implement regionalization or re-shoring initiatives and expand their ability to respond. This type of approach, which is agile and resilient, ensures that product supply is available and customers are protected. Managing supply levels is a critical aspect for food and beverage manufacturers. With automated tools and forecasting applications, manufacturers can determine precisely what goods need to be produced and how much material should be purchased, based on supply and demand planning.

Automation, new production tools, autonomous robots and production simulation models help localize production, repatriate some of the manufacturing activities back to the developed economies as well as transform their supply chains and create networks of semi-independent micro factories located close to consumers instead of relying on large suppliers abroad. This concept of micro factories is driven by the think global-act local strategy and it is not new. However, the growing trend is expected to accelerate post-COVID-19. Over the next three years, companies are expected to accelerate investments in production diversification and micro factories, as this may increase supply chains flexibility, reduce transportation costs, and be closer to consumers. An expanding food and beverage manufacturing sector in turn could provide additional job and economic gains in other sectors. In Manitoba, for example, for every dollar of direct sales generated by the food and beverage manufacturing industry, an additional $0.74 of value-added is generated somewhere else within the provincial economy. Industries focused on business-to-consumer demand and with higher transportation costs are expected to stand at the forefront of micro factory transitions. This model would allow these companies to better meet consumer demand by customizing products, while shorter transportation networks would result in financial, time and carbon footprint savings, in addition to food security. As a reference, in 2019, the food and beverage industry spent US$175 billion globally in transportation.

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