Intelligent Ingredients
How smart manufacturing can help improve yield, productivity and efficiency in food and beverage operations
Heat.
Living in a pressure cooker

Think about the challenges your company faces today. What comes to mind?

More quickly responding to changing markets and consumer tastes? Meeting the needs of consumers who are more connected, informed and outspoken? Contending with new competitors, like online food providers, specialty producers or supermarket brands? Complying with new regulations for greater food traceability?

Clearly, this is not the food and beverage industry of yesterday. It is more complex, consumer-driven and fast-changing.

Despite all these pressures, your production operations must keep up if you want to remain competitive. A key part of this means improving productivity and efficiencies – not in a once-and-done fashion but continually and across your operations.
Rise.
The rise of Smart Manufacturing

Luckily, the manufacturing world is also rapidly evolving. Connected, information-enabled manufacturing – or smart manufacturing – is creating new opportunities to help you better understand your operations and get more from them.

Smart manufacturing connects previously siloed processes. It creates a single view of operations and enables seamless communications across people, data and assets. This can help you improve real-time collaboration, continuously optimize processes and keep operations moving, even as you contend with today's biggest challenges.
Mix.
The power of your information

Smart manufacturing capitalizes on the latest technological advances to re-define what manufacturing can be.

*The Internet of Things*, the proliferation of smart devices connected via the Internet Protocol, allows you to access data that until now has been trapped in your machines, processes & supply chain.

*Wireless and mobility technologies* enable data to be accessed and captured from nearly anywhere, and create new ways for communications and collaboration to occur.

*Big data and data analytics* help you manage massive amounts of data from across your enterprise and contextualize it into actionable information.

*A secure network infrastructure* based on industrial Ethernet protocols, such as EtherNet/IP™, supports seamless, real-time data sharing and communications across your enterprise.

Working together, these technologies give you unprecedented ability to access, analyze and act on data from your operations. In order to get the most from them, however, you must first converge your IT and plant-floor systems into a single network architecture.

A converged network architecture helps simplify how systems operate and streamlines the coordination of data from a variety of sources across your operations. Rockwell Automation calls this *The Connected Enterprise*.

> “Sensor data that are used to predict when equipment is wearing down or needs repair can reduce maintenance costs by as much as 40 percent and cut unplanned downtime in half.”

1 An Executive’s Guide to the Internet of Things, McKinsey & Company, August 2015
Flavors.
What can Smart Manufacturing do for you?

Bringing together disparate networks, improving production visibility and attaining better control of your processes can help you make operational improvements and drive gains in efficiency, especially for complex activities like changeovers. Additionally, wider availability of information can help you be more responsive to supply-chain developments and improve on-demand production.

In particular, **smart manufacturing** can help you:

- Improve asset utilization
- Increase yield
- Drive workforce productivity
- Optimize resource management
- Mitigate security risks

“By linking machines, production lines, operators and support services, smart manufacturing can help companies to optimize their business processes to a level that could previously only be imagined.”

1 Is Smart Manufacturing the Food Industry’s Next Revolution? Food Online, July 21, 2015
Appetizing.
Improve asset utilization

Better Intelligence
Manufacturing information is the basis for deeper analysis to improve operations. Integrated systems and coordinated data from a variety of sources are transforming food and beverage production. For example, the ability to access real-time information on parameters, such as temperature, pressure, cook time and clean-in-place, can help you create a more proactive approach to food safety and quality. Automated data collection, logging and reporting also can help reduce your regulatory compliance burden.

**Enterprise manufacturing intelligence** (EMI) software organizes, correlates and presents production information to help operators spot issues and adjust in real time. Data-rich dashboards display how a machine or line is performing, and notifications alert workers if production parameters exceed preset limits.

Enhanced Control
A **modern distributed control system** (DCS) integrates all of your automation processes into one plantwide system. DCS features, such as model predictive control (MPC), alarm management and batch management, can help improve plant efficiencies and operational performance. Virtualized servers and workstations can help reduce IT investments, improve uptime and extend life cycles.

Smarter Machines
**Smart machines** and devices can provide unprecedented access to the most powerful element that too few food and beverage producers fully capitalize on: their own data. Real-time data can be logged and analyzed to help workers make better decisions and ultimately optimize not only their machines, but their entire manufacturing process.

Chocolate maker Barry Callebaut used manufacturing intelligence software to track OEE and notify operators of product losses as they occurred via an ingredient-tracking dashboard. The facility turned material losses into a net gain.

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1 Barry Callebaut Finds Sweet Savings With OEE Solution, IndustryWeek, Sept. 26, 2015
Filling.
Increase yield

Smart manufacturing provides opportunities to:

- Follow the flow of ingredients and track yield throughout production
- Monitor key production areas and use insights to improve operations
- Respond to supply-chain developments to improve on-demand production
- Help prevent and manage recalls

**Manufacturing execution system (MES)** software automates data collection for deeper, more immediate production visibility. This can help you make better decisions based around your operations, the commodity market and raw ingredients to help manage material variance and improve yield.

It also can provide the foundation for a strong food safety/quality system and help track ingredients. Traceability within the food supply chain is becoming essential to efficiently respond to consumer demand, or help prevent and manage recalls.

**EMI software** can consolidate data from many sources within your operations, and provide reporting and analysis to help drive yield. Quality managers can review production events and monitor work cells to track first-pass yield. Plant managers can monitor yield as part of their plantwide data and metrics tracking.

**Line-integration systems** enable you to configure, control and analyze line performance from a standard operator station so you can more quickly deploy and optimize production equipment.

**MPC software** uses predictive models to calculate optimum set points during production. Then, it continuously monitors multiple parameters to help you maximize equipment performance and better manage complex processes.

*A major powdered milk processor used MPC to reduce moisture variability levels in its dryers by an average of 52 percent. This resulted in an average yield increase of one ton per day.*
Hillshire Brands implemented a manufacturing intelligence system at its Haltom City, Texas, plant, which produces 58 varieties of meals on a stick. The system gives operators insights into where problems are, where they may arise, and where additional production capacity exists. The improved visibility helped the plant reduce inedible product and waste goals to 0.8 percent – or annual savings of about 5.5 million corn dogs. Additionally, the system provides improved traceability and reporting for compliance with new regulations under the Food Safety Modernization Act (FSMA). \(^1\)

Food and beverage producers of all sizes face many of the same challenges, including the need to improve productivity, help protect workers and preserve the knowledge of retiring employees. Smart manufacturing can help you manage these challenges.

**Workforce Safety**

Safety systems that are integrated with machinery control systems can help mitigate risks and are not as prone to nuisance shutdowns as older hardwired systems. Additionally, data on safety incidents can help you identify risks and make adjustments in areas where safety-related shutdowns are occurring.

**Workforce Utilization**

Access to real-time data that is contextualized and relevant to the work being performed can create ‘frictionless’ productivity. This can help food and beverage companies be more responsive to workflow needs and reduce time-to-market.

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\(^1\) Case Study: Hillshire Brands Mobilizes Information to Improve Compliance, Reduce Quality Deviations and Waste Background, Food Manufacturing, May 18, 2015
Workforce Availability

As older, more experienced workers retire, younger, less experienced workers are taking their place. Operations should be future-proofed with this in mind.

Worker-specific instructions and contextualized production information can help reduce complexity for these new workers, and mobile devices can deliver information to them in an interactive, familiar format. Digitizing processes also can capture critical “tribal knowledge” of experienced workers before they retire.

You can also leverage outside services to augment your existing workforce when qualified talent isn’t locally available.

Some examples include the following:

- **Third-party, remote-monitoring services** can provide continuous machine monitoring, data collection and live support if your maintenance team is understaffed and overwhelmed. These services can be especially valuable for critical processes, round-the-clock operations and operations that are based in remote locations.

- **Embedded engineering** services can help keep operations running smoothly should staffing challenges arise. Factory-trained field service professionals can provide dedicated engineering support and maintenance services, and complement the skills of your existing workforce.

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1 The Skills Gap in U.S. Manufacturing 2015 and Beyond, Deloitte, 2015
Create a Future-Ready Workforce

In smart manufacturing operations, productivity is increasingly dependent on the network technologies and data analytics. You need to be sure your workers have the knowledge and skills necessary to design, maintain and support the network infrastructure. They also must be able to capitalize on the data that can keep your lines running longer and improve productivity.

The convergence of IT and plant-floor systems combined with the changing technology landscape is blurring the roles and responsibilities of IT and operations personnel. This presents challenges for you to be sure workers have the skills and knowledge they need to maximize network uptime and get the most from your data.

Training and certification services can help re-skill your workers for converged environments and an influx of data. Introductory-level courses give workers the foundational skills they need to manage and administer networked industrial control systems. More advanced courses dive deeper into topics, such as industrial Ethernet protocols, wireless technology implementation and advanced troubleshooting.

Nearly two-thirds of food, drink and consumer-goods company executives said sourcing and retaining key talent will be a significant challenge in the next one to three years.¹

Measure.
Optimize Resource Management

Improved productivity can be a corollary benefit when you use smart manufacturing to address other areas of need. One of those areas is the management of resources, including water, air, gas, electricity and steam (WAGES).

*Energy management* is a key example. Food and beverage consistently ranks high among U.S. manufacturing sectors when it comes to energy usage. As a result, organizations want to maximize their return on this controllable cost.

Smart technologies can make energy data more easily accessible and increase visibility to help make smarter decisions when it comes to controlling energy usage. Armed with these capabilities, food and beverage manufacturers can proactively manage load requirements, improve system performance and reduce costs.

A U.S. canned-foods producer upgraded its automation infrastructure to meet production and sustainability needs.

The new controls run a state-of-the-art heat and energy-recovery system, which re-uses 100 percent of the can-cooling process heat to warm city water for the soaking, blanching and cooking procedures. The result: a 38.2 percent decrease in natural gas usage.

Meanwhile, the company is producing the same amount of product in five days that used to take seven, while achieving a better product quality, too.

The system also re-uses cooled water to reduce the temperature of the cans in the cooking process. This has cut down on the company’s overall water usage by more than 100 million gallons each year.

Food Producer Reduces Energy and Water Usage as Part of Production Overhaul
Layered.
Mitigate Security Risks

For all the benefits that smart manufacturing can offer your operations, it also requires a more comprehensive approach to security. Seamless connectivity and smart devices are the catalysts to smart manufacturing – but they can also be a conduit for security threats.

Network security is critical for any smart manufacturing enterprise. In the food and beverage industry, you need to protect not only your uptime and intellectual property but also the processes, equipment and people responsible for keeping your products safe and high quality.

Your security program should be holistic. It should extend from the enterprise, down to the plant level, and out to all end devices. And it should address risks across your people, processes and technologies.

Some considerations to keep in mind when developing an industrial security program include:

- **Begin with a security assessment** to identify your risk areas and potential threats.
- **Apply a multi-layered security approach** such as defense-in-depth security to establish multiple fronts of defense using physical, electronic and procedural safeguards.
- **Leverage the technologies across your operations** in a way that optimizes security.
- **Use resources** – such as the [Converged Plantwide Ethernet (CPwE)](http://www.rockwellautomation.com) reference architectures from Rockwell Automation and Cisco.
- **Deploy the appropriate security efforts for new technologies**, such as using mobile device management to restrict and monitor mobile access.

“**As more food and beverage industry operations become automated, security risks, such as data/recipe theft and hacker-caused plant shutdowns, are becoming headaches for engineers.”**

Kaspersky Labs found that 21 percent of manufacturers suffered an intellectual property loss within a one-year period.

Ready.

Smart manufacturing has the potential to wholly transform food and beverage manufacturing operations.

The ability to access relevant, real-time and role-based information can enable more informed decision-making at every level and create nearly endless opportunities for you to improve processes. Additionally, advances in equipment, control systems and information systems can help you establish more flexible and more responsive operations.

And the benefits of smart manufacturing extend far beyond operational improvements. A secure network infrastructure, greater connectivity and access to actionable information also create opportunities to enhance quality, food safety and worker safety – helping to reduce your regulatory compliance burden.

To learn how smart manufacturing can help improve your operations, contact your Rockwell Automation sales representative or learn more here.

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