

The Agile Food Producer

Increasing yield and optimizing assets in the highly dynamic food-manufacturing industry



Executive Summary

Being a food manufacturer comes with a number of challenges as companies try to meet the growing demands of customers and remain profitable in a largely low-margin industry. This is essentially true no matter where in the world you have production facilities.

Gone are the days when you could produce a small number of products on long-sustained production runs. Instead, you're producing more products in more varieties – for changing health, taste, image and cost preferences – in a greater range of packaging options. You're also fighting to balance the demands associated with branded products versus private label to maintain a foothold in existing markets, which are becoming increasingly segmented, while competing against global and local food manufacturers in emerging markets, such as China, India and Latin America.

Amid these competitive challenges, businesses also must contend with internal and external forces, such as limited capital funding, high commodity prices, legacy facilities and equipment, increasing regulations, and aging workforces.

It's more important than ever to be prepared to do more with less. That means understanding the entire manufacturing spectrum and identifying areas where improved efficiencies can be realized. Food companies need to place greater emphasis on achieving operational improvements, increasing asset utilization, maximizing yield, increasing throughput and improving safety.

Proactively seeking improved efficiencies and then taking real action to achieve them will better position you in this highly dynamic, continually evolving industry to retain your hold in different markets and stay in the black.

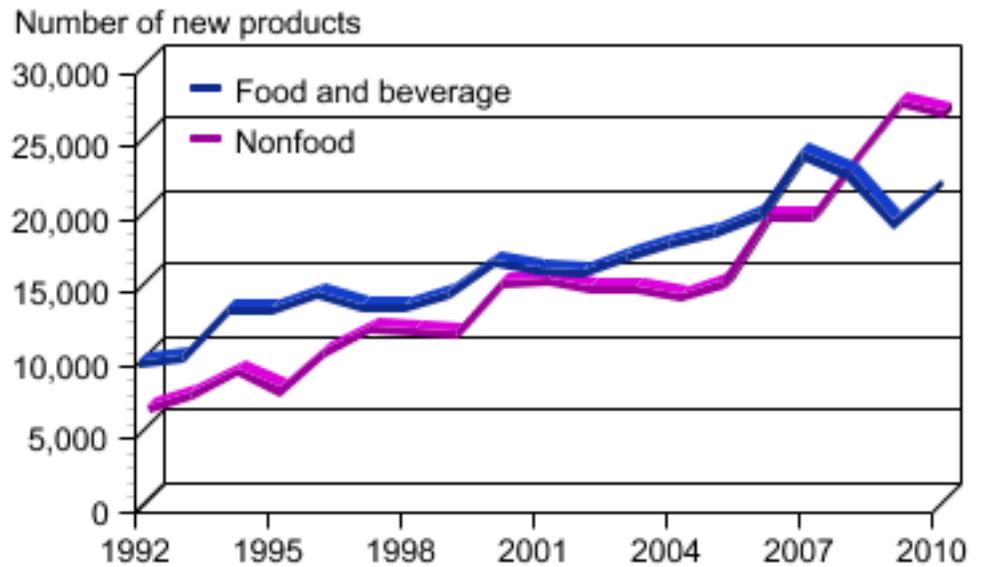
Introduction

More products – and more product varieties – are being made than ever before. According to the U.S. Department of Agriculture (USDA) Economic Research Service, the number of new food and beverage products introduced in the United States alone grew from less than 10,000 in 1992 to more than 21,500 in 2010. Additionally, a 2012 KPMG survey said that new products and services would be the top focus for food manufacturers' capital spending for the following year.

Concurrently, long-time sought-after brands from the West have seen their dominance dwindle in emerging global markets, where regional products and private labels have increasingly won the favor of the growing middle classes.

This presents many challenges – increasing commodity prices, aging equipment and infrastructure, more stringent yield expectations, higher shipping costs, global competition – for businesses that are largely unseen to customers, who merely want their preferred brands to be available, consistent in quality and at the price they're accustomed to. And with more food options available to them than ever – whether from local niche providers or big-box national retailers – these customers have more and more reasons to leave their brands for something new, better or cheaper.

LISTEN.
THINK.
SOLVE.



Challenges

If you're feeling strapped, with fewer resources and more demands, you're not alone. Today's food manufacturers face a host of obstacles, including:

- **Productivity:** Increasing visibility into the manufacturing process, identifying the root cause of line shutdowns immediately, improving operational performance and maximizing speed to market.
- **Agility:** Increasing asset utilization and line flexibility to produce more products with fewer machines or lines.
- **Safety:** Optimizing workplace safety and meeting regulations without impacting productivity.
- **Brand equity:** Ensuring consistent product quality and on-time product deliveries.
- **Tight margins:** Reducing scrap and increasing yield to improve the bottom line in a low-margin industry.

Achieving Agility

Operational Efficiencies

When reviewing opportunities for improved operational efficiencies, it's important to consider the entire production-cycle spectrum – from raw-material receipt to finished goods. At each point during production, there are four key areas to evaluate to increase efficiency and asset utilization.

- **Machinery:** Effectively utilizing machines to produce a product right the first time for improved first-pass quality.
- **Materials:** Using the correct and required amount of material in a recipe to minimize waste.
- **Methods:** Using the correct tools and most-efficient processes to manufacture a product.
- **Manpower:** Ensuring operators have the right skills and are focused on the task at hand while eliminating time spent on unnecessary activities.

These four categories are all intertwined, making the need to enhance efficiencies even more complex. Increasing efficiency in one area can impact the other three areas, just as waste in one category can cascade down the rest of the manufacturing process. For example, using the wrong recipe can create more scrap, requiring unnecessary manpower and machinery usage.

“In some instances that we had seen, the operators were relying on inefficiencies in the line to allow them to catch up. Not only did this present a bottleneck in the line, but it also had the potential to create an extremely disorganized and unattractive finale to what may have been a very-efficient packaging operation.”

*Electrical Engineering Manager,
Food-Industry Solutions Provider*

To meet the demands of your customer base, you must be agile and able to quickly react to market changes. New-product introductions, for example, can require several plants across a country to quickly produce them in a greater variety of packaging, such as different sizes or with region- or season-specific packaging variations.

To accomplish this, companies must build flexibility into the machines and manufacturing processes that produce them, which starts with an understanding of the impact of every point along the production process. This is critical to ensuring you’re making the right product, using the right materials and employing the right processes across the entire production line – while also allowing for a seamless transition from one product to the next.

A More Granular View

Unfortunately, too many manufacturers continue to rely on an antiquated paper-based flow of information in their operations. Manufacturing execution systems (MES) that are designed specifically for the food industry, on the other hand, enable you

to capture and compile manufacturing data at a more granular level, allowing you to view each production point and their associated costs, and then identify differences in performance and costs between different products.

With yield- and efficiency-improvement goals continuing to be set higher as part of continuous-improvement processes, the pencil-and-paper method will only make it harder to reach these goals. MES provides the detailed and holistic look into operations needed to discover where efficiencies can be gained for required improvements.

One of the most common inefficiencies for food manufacturers is material variance. It’s not uncommon for producers to find, for example, a significant materials variance at the end of the year because of over consumption. MES can provide insight into materials usage and even track final yields back to specific vendors.

This is especially important for the food products that have high raw-material costs:

- **Meat** – bacon, ground beef, chicken, steak, turkey, deli-style meats
- **Fish**
- **Dairy** – milk, cheese, butter, yogurt, whey
- **Prepared foods** – microwaveable dinners, soups, boxed meals, frozen pizzas

Even a small improvement in yield can translate to a significant financial impact for these products. For example, maximizing material usage and reducing scrap annually by as little as 1 percent can save hundreds of thousands of dollars in wasted material.

Dairy producers in particular don’t have the luxury of raising product prices every time milk prices fluctuate. Because of this, they need to understand how to best utilize milk and convert it into finished products that maximize profits. MES does just that, enabling producers to make better decisions based around operations, the commodity market and raw ingredients coming in the door from their suppliers in the field.

Consolidation Drives Efficiencies

Established food-manufacturing markets in Europe and North America are undergoing consolidation. Companies that once found it more affordable to produce packaged food products in China are moving facilities back to their home countries due to growing labor costs and higher shipping costs. While this is happening, production facilities in the United States are being shuttered and replaced with fewer, more productive facilities.

“With 14 tonnes of cheese passing through our plant, a 5 percent giveaway equates to as much as 700kg – or 2,600 extra 270-gram portions in a single shift, which could be worth between £1,400 and £3,000 per day.”

*Commercial Director,
Food Producer*

Facilities in which assets remained unused for as much as 50 percent of the production time are becoming a thing of the past, particularly as the food industry has evolved from long-run mass production of products on dedicated lines to a more compartmentalized start-stop-start approach. By optimizing existing assets, you can trim operation and maintenance budgets and produce the same amount of products in one facility that you previously made in two or more.

A renewed focus on asset optimization and improving line flexibility can quickly result in improved efficiencies during product changeovers. With hundreds, if not thousands, of stock-keeping units (SKU) being produced every month, reducing downtime between all of these product changeovers is critical.

Rolling changeovers can provide exceptional efficiency improvements. Traditionally, an operator would let a line run out and then carry out all the activities necessary to prepare every machine for the next product run. Rolling changeovers pre-emptively take action before a line ends to prepare for the next product. In essence, the machines have become multitaskers – thinking beyond their current task to prepare for the next one.

Rolling changeovers are made possible with new integrated line-control technologies. These flexible performance-management solutions can provide built-in machine and line performance and user-configurable line controls, enabling users to:

- Proactively set up operations.
- Call for raw materials.
- Validate the transition at each machine.
- Deliver procedures to operators and equipment for the next changeover.

This all adds up to improvements in production levels and flexibility. Additionally, line-control technologies allow the setup, control and analysis of an entire line to be managed from a single location.

Out With the Old

Integrated line-control solutions also can drive up efficiencies in other areas, particularly in food-production plants that heavily rely on legacy equipment.

If you still rely on relays and have no alarming diagnostic, for example, you can experience major headaches when a line shuts down. Without immediately knowing the problem's root cause, you're left to investigate where that problem resides. With lines containing several continuous activities happening at once, this lack of real-time information can result in significant machine downtime and lost productivity, as well as additional scrap in the form of a bad product.

Integrated line-control systems provide insights into how and why a line has stopped. In addition to alerting the operator, the system can communicate this information to the other areas and other machines to react as needed – whether that’s no change, slowing down or stopping – to properly optimize, or balance, the entire production line.

Improving responsiveness to line stoppages can result in significant increases in machine uptime. If, for instance, you’re running 1,200 SKUs per month and you improve your cycle time by an average of two minutes per SKU, you’re now gaining 2,400 minutes – or 40 hours – of recovered downtime per month.

Integrating Packaging Processes

On the back end, line integration also is being utilized in packaging operations. This is especially relevant because the packaging machines – fillers, case makers, wrappers, labelers, palletizers, etc. – used in most food-production facilities typically are acquired from a range of different OEMs. This piecemeal approach traditionally has the potential to make it difficult for machines to communicate with one another, requiring customized integration work and hard coding.

The advent of the Packaging Machine Language (PackML) has created a common language for these machines, and new line-integration technologies are leveraging PackML to create a link between machines across the entire packaging operation. This allows a supervisor to monitor each machine in a connected and standardized format, giving them visibility into the throughput of the individual machines and a centralized view of how the overall line is performing.

By standardizing the line integration, producers also can standardize the diagnostics and event-and-alarm information coming off of the line.

This easy integration and instant standardization means that line-integration solutions can provide instantaneous overall equipment effectiveness (OEE) reports on a packaging line. In fact, manufacturers using the line-integration technology in packaging operations have shaved weeks off their startup times and seen reductions in those times of as much as 50 percent.

Additionally, if changes are made to the packaging process, such as with limited-run packaging insertions like coupons, line-integration systems can seamlessly incorporate the changes. Legacy systems, on the other hand, require that you stop the line for each changeover.

Even packaging changes that impact the line’s mechanical or electrical makeup, such as changeover to a newly redesigned package, can be incorporated much faster using new line-integration technology because it already has the parameters for the other machines on the line and can easily integrate changes and make any necessary adjustments. This has the potential to help you achieve significant improvements in efficiencies, particularly as food packaging becomes more diverse and complex.

Managing Safety While Minimizing Downtime

The long-held belief is that safety and productivity are mutually exclusive. New developments in safety technologies, however, are changing that perception. Today, best-in-class safety performers look at safety as more than compliance and fine avoidance; they see it as a performance driver.

Three areas in which productivity can be optimized while still addressing safety standards include:

1. **Machine adjustments** – Manufacturers often want to know how to make adjustments to a machine without entirely stopping it for safety reasons. One solution is to incorporate a drive with a safe-speed monitor. This technology allows the machine to slow down and continue production operations – below safety limits – while the safety door is open and adjustments are made to the machine. After the adjustments are made and the door is shut, the operator can return the machine to its standard operating speed.

Without this technology, operators would typically need to stop a machine to make adjustments, such as correcting a dispensing nozzle flow. Performing the work while the machine is operating at a safe speed minimizes machine down time and allows operators to see the results of their adjustments while the machine is still moving, rather than starting and stopping it repeatedly.

2. **Machine cleaning** – The same technology also can be beneficial for maintaining productivity during machine cleaning. Rather than repeatedly stopping and starting machines to clean them and their conveyor belts, the machine can be put in a safe speed mode. This can cut cleaning time by as much as 50 percent to not only minimize machine down time, but also reduce the amount of time and resources needed for machine cleaning.

Imagine reducing daily cleaning time for 10 lines from six hours to three hours per line – that's 30 additional hours of new production capacity every day. If operations are at or near capacity, that kind of savings can mean the difference between adding new lines or even adding new production facilities versus using existing resources.

3. **Troubleshooting** – Integrated safety solutions, which incorporate motion, process, machine and safety controls all into one processor, can provide enhanced diagnostics during machine downtime to reduce troubleshooting and shorten mean time to repair (MTTR) for machines. Food manufacturers using this integrated safety solution have realized a reduction in maintenance calls by approximately one-third.

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Future Safety Challenges

Moving forward, the food-manufacturing industry can expect to see increased machine-safety regulations in emerging markets that are on par with the strictest regulations in the West. Because of the global nature of the industry, these markets are likely to mirror EN ISO 13849-1, which is the most stringent standard and thus sets the bar for the global industry. Concurrently, leading food-safety experts from retailer, manufacturer and food service companies are working with governments, academia and organizations from around the world as part of the Global Food Safety Initiative. The initiative aims to take on today's food-safety issues and ensure "safe food for consumers everywhere."

Again, having a centralized view of data from both the safety and automation systems will better position you to meet even the most demanding regulations while minimizing machine downtime.

Also from a safety standpoint, palletizers and depalletizers have recently been put under the spotlight because of worker-safety incidents. These machines are often moving fast with a lot of moving parts that create numerous pinch points. Improving safety with the machines, many of which are not in compliance, can create a safer work environment, reduce costs and improve operational performance.

Summary

The food-production process too often takes place in a black hole, with a lot of unknowns on the plant floor – from the real value that assets provide to the “how” and “why” behind line failures.

Limited capital funding may mean that the ideal “100 percent efficient” operation is unattainable. But working with automation- and safety-solutions providers can equip you with a better understanding of your production cycles and discover where efficiency improvements can be achieved that translate into real cost savings.

Rockwell Automation works closely with companies to deliver validation and value statements before investments are made, which allows you to see the potential for improvement – improving yield by X percent, reducing maintenance time by Y percent, increasing line throughput by Z percent – and the estimated dollar value of those investments.

As the food market gets bigger and your operations get leaner, the key to success will be finding efficiencies that drive success across your entire production process and ultimately improve the bottom line.

Resources

Call a Rockwell Automation sales office or an authorized distributor today to discuss efficiency solutions for your food-manufacturing operations or visit:

<http://www.rockwellautomation.com/industries/food>

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