FOOD & BEVERAGE, CPG MANUFACTURING

Quality as a competitive advantage in process manufacturing

Food, beverage, and other consumer packaged goods (CPGs) manufacturers are keenly aware that "problems with quality translate quickly to lower levels of customer satisfaction, higher costs, and shrinking revenues," according to the **Boston Consulting Group** (BCG).[1] What manufacturers need to be mindful of is that the definition of high quality is not limited to the taste and texture of the product. Quality touches virtually every corner of a manufacturing company, and when the quality of processes suffers, so ultimately does the finished product—whether it's the result of poor scheduling, labeling errors, or inadequate equipment management.

When an entire organization embraces a culture of quality and integrates that into its core competencies, a true transformation happens. The organization stops trying to prevent quality-related issues from happening, and instead focuses on building its reputation on quality. Following are several critical areas manufacturers can focus on to take a more holistic approach to quality.

1. Frank Lesmeister, "How to Create a Culture of Quality Improvement," Boston Consulting Group (BCG), March 14, 2018.

Recall readiness

According to the US Food & Drug Administration (**FDA**) database, 1,845 food and cosmetics products were recalled in the US in 2018.[3] Meanwhile, the European Commission's Rapid Alert System for Food and Feed (**RASFF**)'s annual report reveals that "a total of 3,832 original notifications were transmitted through the RASFF" in the EU in 2017.[4] Whether the causes were accidental contamination, faulty labeling, or inadequate storage conditions, manufacturers had to quickly respond—often recalling products from distribution and store shelves.

Product recalls are one of the greatest financial risks food and beverage companies face. According to **Food Safety Tech**: "The recall process in the food manufacturing industry is a highly expensive one, averaging more than $10 million in costs to cover activities such as communicating the recall across the supply chain, retrieving and handling the recalled product, investigating the event, and implementing corrective actions to prevent reoccurrence."[5]

Research shows that food recalls have increased 10% since 2013.[6] The rise, though, is not believed to be due primarily to increased negligence by food manufacturers, but from greater scrutiny and crackdown on unsafe food practices. As inspection, detection, and reporting policies improve, the number of recalls is likely to continue creeping upward, challenging manufacturers to examine their traceability practices and ramp up improvements.

While recalls are not an inevitable outcome for all manufacturers, companies that are prepared to respond to recalls are more likely to minimize disruption and costs. The United Fresh Produce Association's **Recall Resource Guide** advises that manufacturers should have recall plans in place, which "provides specific procedures, defines terms, and assigns roles and responsibilities when a food safety issue arises with a product."[7]

Adjusting worker behavior

Recognizing the need to take a holistic approach to quality is easy; putting it into practice is the hard part. Improvements to infrastructure, technology, and business processes are essential elements; but so is getting the buy-in of workers. As to how that can happen, **BCG** suggests: "To change the behavior of employees, you have to adjust the context in which they work. This might mean making change within processes, organizational structures, performance metrics, incentive systems, or the distribution of roles and tasks."[2]

The guide explains that, "having well thought out action steps in a written plan enables quick and effective reactions by key players to minimize both health risk exposure to consumers and liability risk to the company."

A key part of being ready for a recall is having technology that allows manufacturers to track and trace origins of ingredients quickly and accurately to contain adverse quality events across the supply network—in some cases preventing the need for recalls before they're even started. Some companies are looking to **Blockchain** to accomplish this, but the technology is still in its nascent stage.[8] Fortunately there is existing technology to help increase the efficiency of identifying a "containment" or recall if one is required—narrowing the focus and detecting specific batches, isolating the products, and limiting the impact of the recall as much as possible, without jeopardizing safety. Quickly identifying and locating the actual lots or affected batches of product helps to reduce cross-contamination and the likelihood of spreading pathogens through contact with machinery or equipment.

2. Ibid.
3. Compliance Dashboard/Recalls, U.S. Food & Drug Administration.
4. European Union, RASFF: Annual Report 2017, p. 13.
5. Michael Koeris, Ph.D., "The True Costs You Endure During a Food Recall," Food Safety Tech, September 4, 2018.
6. Evan Watson, "Food recalls on the rise; doctors in Hampton Roads seeing more food sickness cases each year," WVEC-TV, February 25, 2019.
7. United Fresh Produce Association, Recall Resource Guide, p. 2.
8. Chris Copenhaver and Ken Reiff, "How blockchain can change the food industry," Food Dive, April 9, 2019.

Recalls can be costly and damaging to a company's reputation. But how well a company responds to a recall can go a long way in repairing that reputation.

Customers, consumers, and regulators all expect food and beverage manufacturers to take a more proactive and responsive approach to quality and recall management. In an age of instantaneous communication, it's not unreasonable to envision a day when consumers will expect to be personally informed of recalls and outages immediately, and told how to get replacement products. Market-leading companies that figure out how to do this will have a competitive advantage.

Respond to inquiries

Recalls aren't the only reason why food, beverage, and CPG manufacturers need top-notch track-and-trace capabilities. Customers and consumers are increasingly seeking information about products to help drive their purchasing decisions—and manufacturers need to be able provide this information. For instance, **Nielsen** reports that "67% of consumers want to know everything that goes into the food they buy… 46% of Americans say that claims on food products have a direct influence on their purchase decisions."[9]

While **taste and cost are still the primary drivers** for food purchases, today's consumers want to know more than just labeling claims and ingredients.[10] According to the **International Food Information Council Foundation**, "Consumers want to know how their food is produced, where it came from and the quality of the ingredients. They also have broader questions about environmental sustainability and many seek brands that align with their broader social values."[11]

To meet these demands—as well as the demands of recall readiness—manufacturers need to utilize modern lot-tracking technology that's tied into network-based supply chain traceability. Manufacturers can choose to track at a very broad view, such as capturing and recording an individual truck load as a single lot.

Or, the manufacturer can opt to track at a more granular level and record the shipments of fresh ingredients arriving by pallet, time, and day. Some manufacturers see the value of tracking ingredients to the farm level, especially if the resulting products are marketed as organic, non-GMO, or free-range.

The flexibility gives manufacturers the ability to tailor the lot-tracking application to the needs of the organization, weighing the benefits versus the costs. Using a supply network solution helps provide evidence of chain of custody, lending proof to support the marketed attributes.

When this is also tapped as public-facing information, it can be made available in a variety of ways, such as via mobile-friendly websites or **smart labels**.[12] But in order to provide this information, manufacturers first have to be capable of collecting, curating, and disseminating vast amounts of data.

A market-savvy company will use modern tools, such as

Graphical traceability

Food, beverage, and CPG manufacturers need technology that allows them to trace the entire supply chain—through all steps, occurrences, and activities—from original raw materials or batches to semi-finished or finished products that are supplied to the customer. But even with that level of functionality, it can be difficult to visualize how all the data and processes fit together. A graphical-based track-and-trace solution can provide visualizations that make the information much easier to digest and query. A graphical interface also makes it easier to evaluate if processes and procedures are being followed for specific batches or products. When done right, manufacturers can leverage traceability and food safety as a way to build value into their companies and brands.

9. "It's Clear: Transparency is Driving FMCG Growth," Nielsen, June 5, 2018.
10. "2019 Food and Health Survey," International Food Information Council Foundation, May 22, 2019.
11. "Five Food Trends to Watch in 2019," International Food Information Council Foundation, January 8, 2019.
12. smartlabel.org

digital marketing and social media, to keep both customers and consumers engaged and build brand loyalty.

Global compliance

According to **Deloitte**, "Somewhere between US $5 trillion and US $10 trillion worth of consumables are sold globally each year" (as of 2016).[13] That's greater than the entire GDP of Germany, and still a sizeable chunk of the estimated, total **$80 trillion world economy** (as of 2017).[14] Of all that trade, the **Royal Institute of International Affairs** estimates that global trade of agricultural goods was valued at more than $1.1 trillion (as of 2015).[15]

Many of the raw materials, supplies, and products themselves must cross international borders to get to their destinations. Every time that happens, these items are typically subject to the regulations of both the country of origin and the country to which they are headed. These regulations can cover everything from ingredients and labeling, to safety and storage temperature, to traceability and documentation, and more. Making matters even more complicated, countries are continually updating their regulations with increasingly stringent food safety and labeling requirements.

Not meeting regulations can result in fines and confiscated raw materials and finished products. The European Commission reports that in 2017, 46% of the notifications issued via **Rapid Alert System for Food and Feed** (RASFF) were for items at outer borders, points entry, or border inspection posts.[16] While not all items get confiscated, some are held for additional analysis; any delays can quickly eat into the profit margins for items with short shelf-life constraints.

Food, beverage, and CPG manufacturers need to have systems and processes in place that can keep up with this constantly changing, global landscape. These systems need to be able to easily share data across borders, and support multiple languages, currencies, and localizations.

One of the key ingredients to ensuring regulatory compliance is by smartly managing the plethora of **documentation** that gets generated from placing supply orders to stocking shelves and everything that happens in-between.[17] It's this documentation that regulation enforcers are the most concerned with, as it tells the complete story of a product through every step of the value chain.

This often includes lot-specific lab analysis, which helps manufacturers modify formulas, as well as information that shows that ingredients were safe when they were acquired. Documentation can also include material related to hazard analysis and critical control points (HACCP) regulations, Safe Quality Food (SQF) certifications, or any number of other documents related to food safety. All of this documentation needs to be maintained in a readily accessible manner. In fact, food and beverage manufacturers who ship products into the US are actually mandated to meet **certain requirements for record retention and record availability by FSMA rules**.[18]

Few industries deal with regulations as complex as those of the food and beverage industry. Requirements are rigorous and the risks associated with failure are high. Which is why manufacturers need to take a collaborative approach to compliance that includes not just R&D, procurement, and production, but also suppliers and partners. A collaborative approach that ensures transparency throughout the entire value chain helps ensure that compliance is maintained from ideation to distribution.

13. Mike Armstrong, Francesco Fazio, Daniel Herrmann, David Duckworth, "Capturing value from the smart packaging revolution," Deloitte, October 15, 2018.
14. Jeff Desjardins, "The $80 Trillion World Economy in One Chart," Visual Capitalist, October 10, 2018.
15. Professor Tim Benton, "Food security, trade and its impacts," resourcetrade.earth (Chatham House: The Royal Institute of International Affairs).
16. European Union, op cit., p. 9.
17. Jason Dea, "Five Errors That Impact GFSI Compliance," Food Safety Tech, July 8, 2016.
18. "FSMA's Record-Keeping Challenge," FSMA and Your Business (CRC Industries), 2017.

Equipment maintenance

Plant floor equipment is another key variable that can affect quality. Poor equipment maintenance strategies can **reduce a plant's overall productive capacity by 5–20%**.[19] Inadequate equipment maintenance can also lead to accidental product contamination. Unlike tracing a contaminant to a specific supplier or ingredient, trying to find the source of this kind of contamination can be like trying to find a needle in a haystack. This can halt production—unplanned downtime can **cost food, beverage, and CPG manufacturers $8,000 to $15,000 for every hour that production sits idle**.[20]

Taking a reactive approach to equipment maintenance frequently leads to downtime, and is simply not a viable option for manufacturers that want to be successful. Equipment maintenance comes in many different forms; the most common being preventative maintenance. The goal of preventative maintenance is simple: Improve equipment availability through routine inspections, lubrications, adjustments, etc. While this approach helps reduce downtime, it's not the most effective equipment maintenance strategy.

More successful equipment maintenance strategies use sensors to monitor conditions and spot early warning signs of maintenance needs. At its most basic, this is considered predictive maintenance. When sensor data can trigger automatic responses to allow technicians to focus on data analysis and maintenance priorities, this is considered a consumptive maintenance strategy.

Currently, the most advanced equipment maintenance strategy is condition-based monitoring (CBM). This approach generates a detailed index rating for each asset, monitoring a wide range of factors from expected lifespan and critical ranking of the asset to expected cost and time to replace. This allows managers to see at a glance where the most pressing issues are lurking. With CBM, asset managers can see beyond the surface-level checklist of common issues, like tank cleaning or production equipment motors that need to be replaced.

CBM also enables the ability to better understand the complex interrelationships of multiple factors at once and answer more difficult questions, such as whether an ailing asset should be repaired, upgraded, or replaced. Technicians can focus on other priorities, such as new deployments, embracing sensor technology, reducing waste, improving sustainability, and scaling for expansion. This marriage of the Industrial Internet of Things (IIoT) and artificial intelligence (AI) can help manufacturers up their goals and reset expectations—focusing on prevention, rather than repair.

When a manufacturer deploys CBM, **independent surveys** indicate significant savings can be achieved, such as:[21]

- 25–30% reduction in maintenance costs
- 70–75% elimination of breakdowns
- 35–45% reduction in equipment or process downtime
- 20–25% increase in production

19. Deloitte, Predictive maintenance and the smart factory, 2017, p. 2.
20. GE, Doing the Right Maintenance at the Right Time? If Not, Here's How You Can, 2018.
21. Rajkumar Rswagmare, "Condition Based Maintainace [sic] Basics," presentation, M.S. Ramaiah Institute of Technology, Bangalore, August 29, 2016.

Planning and scheduling

Soaring logistics costs, manufacturing bottlenecks, product variability, constantly changing demand and supply, and other unpredictable factors can make planning and scheduling a challenge for food, beverage, and CPG manufacturers. Poor planning and scheduling can produce excess inventory, which can result in products sitting in warehouses or on store shelves longer than what's ideal. While the products may still be safe to eat, they won't deliver the same fresh flavor they were designed for.

Old-fashioned forecasting methods, such as single-valued and probabilistic forecasting, work to varying degrees—and might even still meet the needs of some small manufacturers with limited customer bases. Most food, beverage, and CPG manufacturers, however, need more robust, precise, and flexible forecasting methods. Conveniently, **modern AI** is up to the challenge.[22]

AI models can automatically consider optimization objectives, various supply chain network costing factors, numerous supply chain constraints, and the penalties of excess inventory and wastage. While it's doing all that, AI can also simultaneously consider the impact of each calculated output at every location (store, warehouse, distribution center, manufacturing location, etc.) for all future days and continuously adjust.

For this to work optimally, these forecasting engines need to be able to tie into the vast amounts of data that are produced by both manufacturers and their supply chains. When manufacturers and suppliers can rely on a single source of up-to-date data, it's easier to accurately track quality, inventory, and shipping.

This also allows manufacturers to make data-driven decisions around finding ways to speed inventory turns, reduce inventory carrying costs, and increase on-time delivery. It even makes it easier to pinpoint quality problems and address them early on to eliminate excess wastage and delays.

Shelf-life constraints

The shelf-life constraints of fresh food products adds an additional layer of complexity to scheduling processes. In addition to the time it takes to get the products to the shelves, shelf life can be further compromised by events such as temperature fluctuations, shipping delays, and border confiscations. Poor shelf-life management can result in price markdowns in stores, spoilage, product wastage, and stock-outs. Inadequate shelf-life management can also impact brand loyalty of both customers and consumers.

Manufacturers of fresh food and other products with shelf-life constraints need to evaluate all possible variables that can impact how long a product takes to get to the shelves and then optimize processes to best deal with those variables. The solution could be switching distributors, building new plants closer to where products will be sold, or even switching ingredients that can extend a product's shelf-life.

These same advanced technologies can be also be tapped to help optimize production schedules. Modern scheduling solutions can use real-time information to help drive a constraint-based scheduling approach. And when the scheduling solution is designed specifically for the food, beverage, or CPG industries, unique scheduling challenges can be addressed, such as tank capacity, product sequencing, co-products, by-products, shelf-life constraints, and more.

22. Pearly Neo, "Why F&B needs AI ASAP: Industry risks 'getting left behind' as tech advances march on," FoodNavigator-Asia, June 3, 2019.

Quality management

Improving the quality of organizational processes across the enterprise are key steps manufacturers can take to improve the perceived quality of their companies and products. But all of this is meaningless if customers and consumers don't see the physical product as being high quality.

At its very core, quality management is about ensuring compliance with customer requirements and safety regulations. But quality is also about product taste, experience, presentation, and even packaging. It's about worker safety, inspections, and knowing what data to collect and analyze.

Quality management for virtually any manufacturer should address control, consistency, and predictability of product lifecycle, supply management, production, and distribution activities. Ideally, these processes are constantly monitored and refined, with the intended goal of bringing products to market faster, with superior quality.

For this to work, it's essential that manufacturers have complete visibility across the entire supply chain—not just with businesses that are immediately upstream or downstream; quality management doesn't stop at the plant entrance. By establishing transparency across the supply chain network and implementing traceability between organizations, manufacturers are better able to identify and correct product quality issues more quickly.

In addition, advanced capabilities like social collaboration tools can boost manufacturers' ability to seamlessly communicate and collaborate with suppliers and partners. Business intelligence and analytics can help manufacturers measure supplier performance as well as examine industry trends and purchase and usage patterns.

End-to-end visibility

With a modern and robust quality management system, manufacturers can better assess and control overall business performance, manage audits, and determine the true cost of quality in areas including:

- Nonconformance and quality traceability to detect, assign, and track continuous improvement activities using complete problem-solving details
- Corrective actions and problem solving to manage assignments and performance
- Document, schedule, and track devices; test equipment for calibration
- Document management and data management for centralized location, change history, and document audits for electronic and physical documents

To help ensure quality standards remain high, manufacturers should proactively expand their supplier bases to protect against disruptions to production caused when only a single supplier provides a critical raw material. It's also important for manufacturers to understand each of their existing and prospective partners' internal processes for managing quality, compliance, and risk to identify how their processes fit or don't fit with the organization.

A culture of quality

Quality has palpable and measurable components; but it also has intangible aspects as well—like personal preferences, biases, and incalculable subconscious triggers. Food, beverage, and CPG manufacturers need to understand that ultimately, quality is **how customers and consumers perceive their products**[23]—and often the brands behind those products.

Instilling a culture of quality that permeates across every point in the value chain—internally as well as externally with suppliers and partners—can help drive the ability to consistently meet customer expectations. When a manufacturer can successfully make quality the primary focus across the end-to-end value chain, quality can be leveraged as a competitive advantage.

23. Harsono, Soni; Perdana, Soly; Riyadi, Dimas Bagus; Normasita; The Influence of Brand Image, Brand Trust, Perceived Quality and Perceived Value on Consumer Purchase Intention at Different Categories of Product (American Scientific Publishers, May 1, 2018).

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