Ensuring Food Safety

A look into the critical software capabilities that can help manufacturers optimize product quality and minimize food safety risks during production—protecting consumer brand loyalty and profitability.
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Introduction

Food safety concerns continue to be at the forefront of public attention, in part due to issues such as salmonella found in eggs and tomatoes, and melamine in milk, all of which have led to high-profile product recalls. In today’s age of globalization, ever-increasing consumer awareness, and continually evolving government regulations, there is a legitimate urgency among manufacturers to take more ownership for food safety to protect their brands.

Until recently, many food manufacturers focused much of their efforts on minimizing the impact of a recall if it occurred by ensuring swift response and communications. Identifying and isolating tainted products through traceability and managing “damage control” were the key goals to avoid any further potential harm to consumers and to minimize the impact of lost profitability and negative publicity.

While response and communications to recalls are still critical, the primary focus needs to shift toward the prevention of recalls—building safety upfront before products reach consumers. There’s a real opportunity for manufacturers to improve food safety during production by leveraging critical software capabilities that provide insight and analytics for enhanced control and consistency.

This paper discusses the integrated software capabilities that are fundamental as part of a manufacturer’s food safety approach to optimize quality and minimize risk for prevention. Forward-looking manufacturers that can develop and implement solid, integrated strategies with the right technologies can position themselves to consistently deliver high quality—protecting their brand and driving profitability for a competitive advantage.

Prevention as a core strategic goal

Regulatory agencies around the world are increasing their focus on preventative strategies, and food safety and quality programs are placing greater emphasis on better processing practices, escalating initiatives surrounding quality. It requires a holistic, integrated plan that allows for more control across production and closer collaboration between other key stakeholders in the food industry—including producers, regulators, and consumers.

A comprehensive approach that targets risks and ensures food safety through trending capabilities, powerful analytics, electronic standard work practices, and rich genealogy records can help manufacturers gain the deep operational insight and tighter control needed across production. Integrating all of these capabilities allows them to predict when issues are likely to occur and proactively take real-time corrective action when their process digresses from specifications—ensuring consistent high quality and food safety.

Critical software capabilities

- Trending helps eliminate the root cause of product risk

At the heart of preventing recalls is the ability to proactively recognize production trends as they happen and take immediate corrective action as needed, which requires manufacturers to shift away from looking solely at historical data to connecting it to real-time production information.

Software with sophisticated trending capabilities can help manufacturers effectively identify trends and gain detailed insight into the operation of their plants, including root-cause relationships, so they can make crucial quality improvements that mitigate risks as they occur.
For example, temperature trending led one food manufacturer to discover that its oven temperatures were not consistently being met for its product, increasing product safety risk and requiring corrective action. Trending data provided the critical intelligence needed during the process before it reached the failure limit, enabling operators to adjust the ovens “on the fly” to compensate for the temperature drifts and ensure product safety.

Understanding patterns and relationships between various sets of data such as temperatures, speeds, pH levels, and humidity—rather than compartmentalizing potentially at-risk products using post-production testing—can help eliminate the true root cause of product risk. Measured against food safety metrics, trending with real-time notifications of process upsets can help manufacturers identify and address small issues before they escalate into bigger problems.

- **Predictive analytics can prevent quality issues before they occur**

Real-time predictive analytics are vital to help manufacturers understand what could happen based on trends or if there are parameter changes, providing critical decision support to foresee issues before an event occurs. Advanced software with predictive analytics may leverage robust modeling engines and multivariate analysis to preempt alarm and failure events based on historical models—enabling “active avoidance.”

Analytics provide an opportunity to correct the problem that is about to occur, which can help manufacturers prevent quality issues. Take high pH readings in a key processing utility, for example, which can compromise product quality; if the pH level starts deviating toward a critical condition, predictive analytics software can extrapolate the scenario in real time and determine that a critical condition is likely by using a process model built on past scenarios and process knowledge.

The software can use the process model to identify and quantify what the major causes for the pH deviation are and alert the operator, who can then acknowledge the condition and causes, and adjust the process to prevent the critical condition from occurring. Such a solution can also support collaborative knowledge sharing by adopting operator knowledge into the software’s real-time engine, enhancing the ability to predict impactful events and alarms.

In a real-case scenario, a dairy company in the U.S. used predictive analytics software to reduce spoilage in its dry baby formula product. It discovered that its drying process could have better control; by looking at content moisture, dry time and several other parameters, it was able to predict the moisture content of its product and reach the desired state faster with a better success rate while providing more consistency for the parameters that reduce spoilage.

- **Standardized work processes help minimize inconsistencies**

The centerpiece of any good safety program is standard work processes (SOPs), which can help ensure that operators consistently adhere to recipes and comply with Hazard Analysis and Critical Control Points (HACCP). The latest workflow software enables manufacturers to digitize manual and automated work processes, instead of relying on static paper trails or a binder at an operator station. Addressing the need for better operator guidance, digitization helps them follow SOPs and work instructions with greater precision and fewer errors.

Workflow software is a powerful tool because it electronically guides operators through step-by-step instructions. Manufacturers can ensure that production complies with defined processes—through validated entry—capturing data for analysis and historical records. It can help automate and manage HACCP monitoring, integrating production work processes with real-time HACCP testing, and enabling faster response to compliance issues.

For example, workflow can help manage a HACCP plan and sampling by automatically triggering HACCP sampling based on production events or elapsed time, and provide operators with work instructions that connect production actions with real-time quality data. Such capabilities would enforce HACCP and other SOPs, and mitigate risks for inconsistent actions that could lead to quality problems and recalls.

Furthermore, workflow software with alarm response management enables operators to automatically and dynamically respond to production problems and events, while monitoring alarms and out-of-spec conditions from multiple systems. It can track HACCP data in real time and automatically adjust work processes to meet specification requirements—improving production processes for increased food safety.

- **Traceability & genealogy enable tighter controls across the supply chain**

Many variables can affect the availability and reliability of data on the plant floor and throughout the supply chain, which can be difficult to track and trace. While most solution vendors apply traceability solely for minimizing the impact of recalls after they occur and aiding customer complaint investigations, manufacturers that instead use traceability information to improve food safety can virtually prevent recalls.
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Software that offers rich product genealogy capabilities allows manufacturers to trace a product throughout every step of the manufacturing process and identify its exact materials and quality characteristics. It allows manufacturers to control the flow of product between equipment and manage in-process inventories in real time with greater transparency, and hence safety, between production orders.

 Manufacturers can leverage such software to integrate all data and trace the complex genealogies of batches, continuous processes, sub-assemblies, components or by-products, so they know the origin and destination of all incoming materials and outgoing finished goods—improving food safety by leveraging raw material intelligence. By better understanding the genealogy of raw materials to finished product, manufacturers can establish tighter controls to safeguard the supply chain.

For example, a food producer in Europe used genealogy capabilities to gain a better understanding of the effect a raw material had on its product. Although the shipping temperature fell within the specification, genealogy revealed that a variation in the shipping temperature of the raw material had an ill effect on its finished product. Therefore, by focusing on this parameter and working with the raw material supplier, the producer was able to tighten control and increase product safety.

The power of integrated capabilities

With prevention as the core goal, each of the four critical software capabilities discussed plays a distinct role in minimizing food safety risk. Leveraging all four capabilities—as opposed to one or a select few—provides the most advantage as the insight gained from each becomes exponentially more powerful as it builds on the intelligence provided by the other critical capabilities. Each component enables manufacturers to gain a more holistic view into the factors that impact food safety and to take a proactive approach that targets specific risks—ensuring the highest level of quality throughout production, even prior to when materials reach the production facility.

Conclusion

With increasing awareness of food safety issues and globalization of the food chain, consumers and regulatory agencies are demanding ways to ensure safer food. The focus for manufacturers is shifting from response to prevention, and the need to optimize product quality and minimize food-borne hazards across production and the supply chain is greater than ever before.

Only by establishing a holistic, integrated strategy with the right set of software capabilities can manufacturers leverage the critical insight, consistency, and transparency needed to identify and address potential food safety issues while products are still within the factory walls. Technology is a critical enabler for tighter real-time controls to help safeguard processes and prevent quality issues.

Forward-looking manufacturers that implement an integrated approach can position themselves to consistently deliver high quality products and to take greater ownership for food safety—increasing consumer confidence and protecting their product brand to set themselves apart from competitors and drive sustainable profitability.

| Minimize food safety risks | • Proactively recognize data trends and understand patterns and relationships
| | • Leverage real-time notifications of process upsets for immediate corrective action
| | • Identify process deviations and predict issues before they occur to enable “active avoidance”
| Enhance process control and consistency | • Digitize automated and manual work processes
| | • Enable faster, more accurate responses to compliance issues
| | • Control product flow with greater transparency and understand the genealogy of raw materials

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