



Shaping traceability in food and beverage packaging

Trends, challenges and strategies

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Introduction

In the food and beverage packaging industry, authenticity is essential. Consumers need to know that the foods they're purchasing consist of the things listed on their labels, as food allergies and expired foods can cause serious illness and possibly death. Since both public health and consumer satisfaction depend so heavily on product integrity, the food and beverage packaging industry is highly regulated.

One of the main things mandated by food and beverage regulation is traceability, the practice of maintaining thorough records on the origins and whereabouts of products and raw materials by scanning printed barcodes, direct part marks (DPMs) or radio frequency identification (RFID) tags throughout the production process and the supply chain. From raw materials supplier to production line to supermarket to customer, the creation and distribution of a particular food item should be as transparent as possible.

Food and beverage manufacturers also benefit directly from traceability protocols that minimize the occurrence and effect of costly issues such as product recalls by providing real-time data on supplier materials, processes and machinery involved in production. These protocols can significantly reduce cost of a recall by isolating tainted items and making it unnecessary to pull large amounts of non-tainted product off the shelves.

The FDA proposed Section 204 of the Food Safety Modernization Act (FSMA) rule for additional traceability requirements will further escalate the need for using automation technologies that help enable compliance to these new regulations.

This white paper discusses several key trends, challenges and strategies pertaining to traceability that food and beverage manufacturers are experiencing today.





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Complying with industry regulations

Upcoming regulations are one of the primary forces spurring food and beverage manufacturers to adopt robust traceability systems. In the United States, the foremost source of regulation is the FDA's Food Safety Modernization Act (FSMA). FSMA granted the FDA the power to implement mandatory recalls as well as other authority measures to take a preventive rather than a reactive approach to food safety issues. It impacts all aspects of the food system in the U.S., including farmers and importers as well as manufacturers.

FSMA requires food and beverage manufacturers to maintain records for at least three years and establish reliable traceability systems that meet recall standards outlined by the FDA. Rather than setting specific rules for compliance, the FSMA requirements are performance-based, meaning that they focus on outcomes in preventive control, traceability and record keeping, and sanitary equipment design. Although this gives food and beverage manufacturers plenty of leeway in their approach to meeting these requirements, it also means that many companies will need to seek guidance from other organizations to ensure they're on the right track.

One key aspect of FSMA is that it requires manufacturers to take a one-step-forward, one-step-backward approach to external traceability (the information shared across the supply chain). In other words, they must be able to identify which businesses have purchased their products as well as which immediate suppliers sold them their raw material inputs.

It's also essential for companies to understand the difference between external vs. internal traceability. Although these can be portrayed as two sides of the same coin, they refer to very different traceability strategies. Whereas external traceability involves

any data relevant to various parties in the supply chain, internal traceability deals with the processes that take place within a company. This includes any data related to combining raw materials, processing subcomponents, and reconfiguring or repacking items. There must be a clear link between the original raw materials and the finished product.

Did you know?

Source: CFIA

Did you know that a frozen pizza typically includes 35 ingredients from 60 different countries drawn from 5 different continents while chicken fried rice typically contains 28 raw ingredients, from 35 different suppliers, also originating from 5 different countries? Or that a typical chicken farm sells to 28 different manufacturers who supply 18 different retailers who have 834 products on the shelf which are consumed by millions of people?

In the food and beverage packaging industry, both traceability arrangements are equally important. Regulatory bodies are usually more concerned with external traceability, but solid internal traceability is what makes it possible to demonstrate the link between the immediate raw materials supplier (“one step backward”) and the purchasing party (“one step forward”).

Further, the proposed FDA rule, “Requirements for Additional Traceability Records for Certain Foods” which, if enacted, will require those who manufacture, process, pack or hold foods on the Food Traceability List to establish and maintain records containing Key Data Elements (KDEs) associated with different Critical Tracking Events (CTEs).

Since FSMA affects all stakeholders in the U.S. food and beverage industry, including importers, it’s driving foreign markets to comply with its standards as well.

In Canada, the Canadian Food Inspection Agency (CFIA) provides standards and guidelines around packaging, food label requirements, preventative controls and traceability.

And with the addition of the Safe Food for Canadians Regulations (SFCR) which went into force in 2019, came additional regulations for food businesses that import, or that prepare food for export or to be sent across provincial or territorial borders, as well as preventative controls that outline steps to address potential risks to food safety.

Some requirements had to be met immediately whereas other requirements may have gone into effect in 2020 and 2021 based on food commodity, type of activity and business size. The new regulations include a mix of prescriptive and outcome-based regulations that require food

businesses to maintain a written preventative control plan and/or keep clear and complete traceability records that show where food came from (the supplier and to whom it was sold). Food companies in sectors already registered with the CFIA under the previous regulations, such as meat, fish dairy, etc.) more than likely have plans in place to detect and mitigate risks to food safety but all businesses need to familiarize themselves with the new requirements and prepare for inspection under the new rules.

Many other regions of the world have their own regulatory standards in place for food and beverage traceability, and there are global standards organizations for the industry such as the Global Food Safety Initiative (GFSI). In many developing countries, regulation is increasing dramatically since more and more people are purchasing their food in supermarkets rather than living a subsistence lifestyle.



Combating counterfeiting, promoting ethical sourcing and minimizing recalls

Counterfeiting has become a major problem in the food and beverage industry as the market becomes more globalized. With the increase in imports coming from developing countries, it's crucial to have a traceability system in place to confirm that products are authentic. In addition, consumers are demanding information on the sources of raw materials going into foods in order to ensure that the products are ethically sourced. This is most applicable to confection goods containing nuts or cocoa, as these raw materials are often sourced using child labor or another form of labor in violation of international law.

Problems with product authenticity don't always come from outside, however. Mistakes in manufacturing can result in packages that say they contain one thing but actually contain another. As anyone with a peanut allergy knows, this is a potentially life-threatening issue. Food and beverage packaging must be extremely specific about what's inside, and if there's an information mismatch, the affected product needs to be recalled immediately. In fact, errors on labels and packaging are the most common cause of food and beverage recalls.

One of the best ways to combat labeling mistakes is to implement an industry-standard label verification system. Print quality inspection systems like Omron's V-275 are capable of performing a wide variety of verification-related tasks, including optical character recognition (OCR), optical character verification (OCV), master-to-label comparison and data and code matching. These features help companies ensure accuracy and data integrity, identify defects and avoid liability. The V-275 is Omron factory integrated into popular Zebra ZT600 series thermal printers to provide manufacturers with 100% label inspection at print speeds of up to 254 mm (10 inches) per second.

Since recalls can have a catastrophic impact on a company's reputation as well as its profits, minimizing errors on labels and packaging is essential. Companies that include any sort of repackaging process as part of their operations should be doubly careful to ensure that product identifiers are thoroughly tracked and that labels are comprehensively verified. According to IBM Consulting, 57% of customers will avoid purchasing brands that have been associated with a recall. This cost comes on top of the expenses that are directly associated with taking all the impacted product off the market.

Did you know?

Errors on labels and packaging are the most common cause of food and beverage recalls.

What can you do about this?

Implement a comprehensive label verification system to ensure that machine-readable and human-readable information matches and that print quality is optimal.

Using traceability to analyze and optimize productivity

In addition to helping companies avoid recalls and other disruptions to their profitability, traceability systems are also a great way to optimize processes and evaluate overall equipment effectiveness (OEE). By collecting and analyzing operational data, manufacturers can figure out which machines are under-performing and pinpoint precisely where bottlenecks are occurring in production.

In order to gather this data, manufacturers need to set up numerous barcode reading stations at various points across the production line. Barcoding helps track vital productivity information such as throughput and quality based on package type, machine, shift and product. In many cases, this means that barcode readers need to be embedded within machinery. This poses a challenge, since most manufacturing equipment is designed to take up as little space as possible and therefore doesn't have much extra room for barcode readers. This creates the need for ultra-compact readers like Omron's MicroHAWK readers.

The MicroHAWK industrial barcode readers and smart cameras are designed to be highly flexible and configurable within an exceptionally compact casing. This means that they can be easily embedded within machinery while still providing fast and accurate reading. Thanks to their liquid lens auto-focus technology, the MicroHAWK readers eliminate constraints on camera positioning. The same MicroHAWK camera can be used for machine vision inspection, enabling the expansion of automation as a facility's needs evolve without investment in new hardware.

Once traceability data is gathered via the barcode readers, it needs to be communicated to the rest of the system. This poses a new challenge – that of using this data without hampering control performance. When traditional controllers are tasked

Did you know?

Processing all the data coming from a traceability system can significantly lengthen the production cycle time.

What can you do about this?

Use a controller like Omron's NX1 that's specifically designed to collect large amounts of traceability data without slowing down the production cycle.

with processing large amounts of traceability data, they are liable to slow down the production cycle time.

Omron addressed this issue by developing controllers that can maintain high-speed control while handling all the information a traceability system provides. For example, the NX1 controller can be used for a packaging machine with the capability of handling 1,000 products per minute and can collect all traceability data in synchronization with the production cycle while performing motion control. This means that traceability doesn't need to slow down other aspects of production while fulfilling the purpose of collecting important data.

MicroHAWK barcode readers provide direct connectivity via Ethernet/IP to Omron's NX1 controllers, making it simple to integrate traceability data into the automated system. When it comes to utilizing traceability information, the data collection is one challenge. It's another matter altogether to transfer that data to the business and enterprise systems that store and use the data. Our controllers make this easy thanks to the seamless incorporation of SQL and OPC-UA.

Embracing vision systems for complete product integrity

Machine vision technology has been taking on an increasingly important role in traceability because it's an extremely effective way to maintain complete product integrity. Vision inspection includes a wide variety of functionality such as detecting defective products in real time and performing both OCR and OCV to verify that the data on labels and packages adds up. By functioning as a complete solution for ensuring that non-conforming products don't go out into the market, vision systems are vital for brand protection.

The hurdle that manufacturers face in implementing a machine vision system is twofold. Such systems are often expensive to implement, and the complexity of the technology can overwhelm operators. Many applications require special programming. However, these challenges are offset by the fact that a single product recall or fine for tainted product – preventable by a vision system – could cost more than the vision system itself.

Omron puts ease of use at the core of its machine vision technology so that manufacturers don't need to rely on experts to get things up and running. The HAWK MV-4000 smart camera is a perfect example of machine vision made easy. It has two separate user interfaces in order to satisfy both novices and experienced vision professionals alike. Operators who are new to machine vision can benefit from the intuitive AutoVISION interface, whereas the experts can gain access to the smart camera's full potential with the Visionscape FrontRunner interface.

The HAWK MV-4000 is also extremely powerful. As a standalone smart camera, it can reach processing speeds almost as high as a PC-based system of multiple cameras. With a complete vision, code reading and code verification toolset in combination with full industrial connectivity, it's an excellent choice for manufacturers seeking to take their

traceability systems to a whole new level.

In addition to high-performance smart cameras, Omron also has high-end, full vision systems with the same focus on ease of use. The FH Series enables high-speed, high-accuracy inspection and measurement functionality designed to meet or exceed the need for rapidly growing automation and higher performance requirements in industries like food and beverage packaging. FH Series machine vision systems employ sophisticated lighting that clearly shows defects by flexibly changing illumination colors and angles. Multiple cameras can be hooked up to enable panoramic shooting and expand the field of view by combining images at high speeds.

Did you know?

A single product recall or fine can cost more than it does to implement a new machine vision inspection system. However, many manufacturers still avoid machine vision technology due to its apparent complexity.

What can you do about this?

Find a machine vision system that's designed to be intuitive. Omron's machine vision solutions come with a user interface that's incredibly easy to use.

Transitioning from manual record keeping to fully automated traceability

The avoidance of unwanted complexity isn't just a deterrent to using machine vision – it's often a reason why manufacturers forego upgrading their traceability systems in any way. Because implementing a new system seems inordinately complex, many manufacturers prefer to stick with cumbersome and error-prone record keeping methods that rely on manual processes. It's understandable that companies want traceability to be easy. However, failing to upgrade the system with automation actually leads to more work in the long run.

Manual record keeping is far more widespread in the food and beverage packaging industry than it should be, especially when one considers the huge costs associated with certain types of mistakes. Unfortunately, not all companies have the budget to invest in good traceability software. Budgetary constraints and the fact that traceability solutions need to be scalable are major barriers to automating the system.

Omron strives to make traceability as easy as possible, just as it strives to make its machine vision technology intuitive enough for the average

operator to use. Its MicroHAWK barcode readers keep things simple by working right out of the box – in fact, the browser-based WebLink interface allows manufacturers to start using the readers without needing to install any software whatsoever. Omron also has extensive knowledge of how traceability works in a variety of industries, and its focus on providing comprehensive solutions with complete line integration lets companies rest assured that the upgraded system will “just work.”

Although often perceived to be challenging and somewhat expensive at the outset, a robust traceability system is the single most important means of complying with industry regulations and reducing the incidence and cost of recalls. Omron's traceability solutions address various pain points that manufacturers face in the food and beverage packaging industry so that real-time, automated traceability is within the reach of any company that needs to comply with requirements from the FDA and other organizations.





Omron MicroHAWK with weblink software for precision traceability and inspection solutions.



Omron NX1 high-speed machine automation controller collects traceability data in synchronization with the production cycle.

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