



Winning the Freshness Wars: Creating Shopper Loyalty and Improving Profitability in Retail Grocery

How end-to-end temperature monitoring improves produce quality, reduces waste, and increases customer satisfaction and profitability

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About ChainLink Research

ChainLink Research, Inc. is a Supply Chain research organization dedicated to helping executives improve business performance and competitiveness through an understanding of real-world implications, obstacles and results for supply-chain policies, practices, processes, and technologies. The ChainLink 3Pe Model is the basis for our research: a unique, multidimensional framework for managing and improving the links between supply chain partners.

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Freshness—the Foundation of Competitiveness in Grocery

There is a war going on among grocery retailers—the ‘Freshness War.’ Grocers are acutely aware that the quality and selection of their produce, meat, and dairy sections is the prime determinant of where consumers decide to shop for their groceries. Studies from FMI and others¹ show that the quality of produce and meat is a prime reason that people go to a particular store to buy groceries. And these are the highest margin departments as well.

At the same time, evolving eating habits are putting an increasing emphasis on healthy fresh foods. The critical importance of fresh foods is reflected in the ways grocers market themselves and project their brand image.² Witness the explosion of dedicated produce stores and farmers markets, ready-to-eat and fresh departments within major grocers, organic and ‘whole food chains,’ and the popularity of cooking, health TV shows, and other proponents of fresh fruits and vegetables and healthy eating. In this article, we will discuss:

- *Freshness—the Foundation of Competitiveness in Grocery*—The changing competitive landscape in grocery, evolving consumer habits and lifestyles, and growing awareness of food safety.
- *Challenges in Becoming the Best in Freshness*—Challenges introduced by the increasing length and complexity of the fresh foods supply chain and the distributed nature of freshness responsibility; statistics on how big the problem is and how much it costs the grocer.
- *Solutions*—How an end-to-end approach, monitoring temperature from the field to the retailer’s door, can help reduce spoilage and provide consistent freshness.
- *Getting Started*—Steps for retailers towards achieving a self-funding freshness improvement initiative.

Although we focus on produce as the examples in this piece, the same overarching challenges, principles, and approaches (with category-specific variations) apply to other fresh food categories such as milk, poultry, fish, and meats.

¹ 92% of shoppers say that fresh produce is their No. 1 factor in choosing a grocery store, according to a survey of consumers by Supervalu. Meat came in second in that survey (Source: Wall Street Journal “A Food Fight in the Produce Aisle”). “Quality and Variety of Fresh Foods” ranked very high as criteria for store selection in FMI’s “U.S. Grocery Shopper Trends 2012.”

² Amazon’s foray into grocery is “Amazon Fresh.” Tesco named their U.S.-based grocery stores “Fresh & Easy”—emphasizing two of the attributes shoppers value the most. But Tesco discovered just how competitive the “Fresh Grocer” market is, announcing recently that they may be selling the chain, after investing over \$1.5B and failing to achieve profitability. The competition in the fresh foods sector is indeed intense.

A Shifting Competitive Landscape



The competition in grocery retail is fierce and comes from all sides. Supermarkets account for less than half of U.S. grocery sales, down from 66% in 2000. And it's not just the big box discount chains (Walmart,³ Costco, and Target) that have stolen market share from traditional grocery chains, but also drug stores, convenience stores, dollar stores, online grocers, and more.

These new competitors recognize the importance of fresh foods in the overall equation, not just in drawing customers into the store, but also in driving profit margins. Walgreens' growth strategy for 2013 focuses on "delivering a complete Well Experience" including "expanded grocery items and fresh food in stores." 7-Eleven plans to grow fresh foods to 20% of its revenue over the next few years.

Fresh foods are also extremely important to the bottom line. Grocery is a low-margin business, where after-tax net profit margins are, on average, barely above 1%. On average, produce occupies a little over 10% of the supermarket, but brings in close to 20% of the store's profits. Typical gross margins on produce are around 30%, about twice the average margins on non-perishables. The high profitability of produce, meats, and dairy is one of the reasons grocery stores are usually laid out to steer shoppers to those sections.

Changing Consumer Habits

One of the primary drivers of this increased focus on the produce section is changing consumer habits and lifestyles, with a focus on convenience and health. Increasingly, revenues and profits come from the categories in the perimeter of the store, which includes produce, meats, dairy, and deli/prepared foods, and decreasing revenue from the center store—the packaged food products. There is more emphasis on a healthy diet, which is increasingly equated with fresh fruits and vegetables. In recent surveys,⁴ 68% of Americans say they eat more fruits and vegetables than they did five years ago and 87% said they are trying to eat even more fruits and vegetables.

³ 55% of Walmart's U.S. revenue came from grocery sales in the year ending 1/31/ 2012, up from 53 percent a year earlier. Hard-goods and apparel share declined during the same period.

⁴ Source: [Kellogg Foundation Survey](#)

This is a long-term trend. USDA data shows the average per capita consumption of vegetables in the U.S. during the 1970s was 358 lbs, rising to 436 lbs per person during the 2000s— more than a 20% increase. When you factor in population growth, total nationwide consumption of vegetables rose from an annual average of 38 million tons in the 1970s to 64 million tons in the 2000s, a nearly 70% increase.



Another sign of increased consumer awareness of health and safety is increasing interest and sales of organic produce, which have been growing at around 10% per year in recent years, *much* faster than the rest of the grocery sector. Organic fruits and vegetables now account for well over 11% of all produce sales. In short, people increasingly care about where and how their produce was grown and how it has been handled, and this is having an increasingly dramatic impact on the retail grocery industry.

Food Safety Perceptions Impact Consumer Behavior

Along with the desire for freshness, consumers have increased awareness of food safety issues. Media headlines dramatize each outbreak of food-borne illnesses due to the likes of Salmonella, E.coli, and Listeria, and the subsequent recalls. And with social media, even local or individual food safety incidents can ‘go viral’ and drive consumers away from a particular location, retail chain, or food category. These incidents can cost the industry as a whole, even when the vast majority of the specific product being recalled or highlighted is still safe, especially when there is little confidence in the ability to diagnose and trace the problems back to the source and prevent further illness.

When the public is scared, they retreat to whoever they trust the most. Previous events demonstrated that those who can provide complete confidence about the origin, custody, and condition of their products, can often keep their product on the shelf and capture even greater market share throughout one of these scares.

Regulations Driving Traceability Requirements

Public concerns about safety also resulted in increased regulation. The Bioterrorism Act of 2002 requires that traceability records⁵ are kept by anyone⁶ who buys and sells food in the US, including retailers. More

⁵ The requirements are for one-up / one-back traceability records—i.e. quantity, packaging, and lot and code numbers for all food received or sold—and that those records can be retrieved within 24 hours. For more details, see [Federal Register Final Rule \(Recordkeeping\) - 69 FR 71561](#)

⁶ The rule defines who is covered as “Persons who manufacture, process, pack, transport, distribute, receive, hold, or import food in the United States,” with various exceptions listed.

recently, the Food Safety Modernization Act (FSMA) has given the FDA more authority and responsibility for food safety and the proposed rules direct the FDA to conduct traceability pilots and define recordkeeping requirements for high risk foods. The FDA rulemaking process will take time to play out, but clearly this law places the burden of food safety and traceability onto all players in the supply chain, including retailers.

Commenting on the impact of FSMA for retailers, the Chief Science Officer for PMA, Bob Whitaker, said, *“We see a lot more recalls now ... our ability to detect the presence of pathogens, whether that’s in produce or anything, is really mushrooming. Traceability is a key component for the retailer and supplier. Having a good traceability program in place allows them to respond quickly and move product.”*

In addition, the “Green Lane” provision of FSMA will provide expedited customs clearance to importers who provide, among other things, traceability throughout the supply chain and proof of consistent temperature controls. As these regulations take shape and become more vigorously enforced, it will become one more incentive for grocery retailers to provide traceability and monitoring throughout their supply chain.

Challenges in Becoming the Best in Freshness

Spoilage Challenges

Global Supply Chain – Long, Complex, Vulnerable

Consumers have come to expect high quality, fresh produce and other perishables (e.g. seafood) twelve months a year, regardless of the season. Fulfilling this expectation requires a very long and complicated supply chain that spans the globe. This creates longer transit times, and many more points of vulnerability for contamination, temperature diversions, and other potential compromises in quality. Using produce as a prime example, the vulnerability points for quality and freshness start with the trip from field to pack house, and can include the inland transportation, loading/unloading, and potentially sorting at the origin and destination ports, the overland travel, repacking at a distribution center, the ‘last mile’ to the retail outlet, and handling at the retailer. Speed, precision, and good monitoring are required for every leg throughout the entire chain to reduce losses and maximize delivered freshness and quality.



The Cost to the Grocer

Spoilage is a huge problem in the grocery supply chain. 16% of produce is lost in the North American supply chain from post harvest, to processing, distribution, and retail.⁷ Most grocers simply accept this as a cost of doing business, due to the nature of the product. They assume that their existing visual and trailer-level QA processes will reject most of the unacceptable produce and assess a chargeback to the supplier. But the belief that those losses are not being borne by the retailer is misguided. Costs in the supply chain ultimately flow back to the retailer. Conversely, decreases in supply chain losses result in savings that, over the long run, benefit the retailer. Reductions in spoilage result in reductions in costs to the grocer and therefore increased profits and more competitive pricing.

Furthermore, since QA processes currently rely on visual inspection and trailer-level monitoring, they often miss issues caused by improper temperature control. Once the retailer has accepted the produce and put it on display, they have little choice but to continue to sort and throw out anything that goes bad, which costs both in terms of waste and increased labor. In fact, grocer retail executives get concerned if perishable waste numbers for a particular store are *too low*, worrying that it is an indicator that the displays are not fully stocked or not being adequately culled, negatively impacting the customer's experience and willingness to buy. Fortunately, there are practices that can reduce both pre- and post-QA produce losses, maintaining higher quality and resulting in net benefits for the retailer.

Who Owns Responsibility for Freshness?



The responsibility for freshness is divided across many entities in the supply chain—growers, packers, shippers, transportation carriers, 3PLs and warehouse operators, marketers, distributors, and finally the grocery retailer (see Figure 1 - *Supply Chain / Temperature Challenges*, next page). The freshness of produce is a product of its end-to-end handling, all the way from the farm to the checkout counter. Shrink and reduction in freshness begins at harvest and is magnified throughout the cold chain journey. It doesn't begin at the store, even if a shipment looked good when it was accepted. All it takes is one weak link in the chain to destroy the fruits of all the other supply chain players' discipline. The most effective solutions, therefore, will be end-to-end, spanning across all the entities handling the product.

⁷ Source: Food and Agriculture Organization 2011

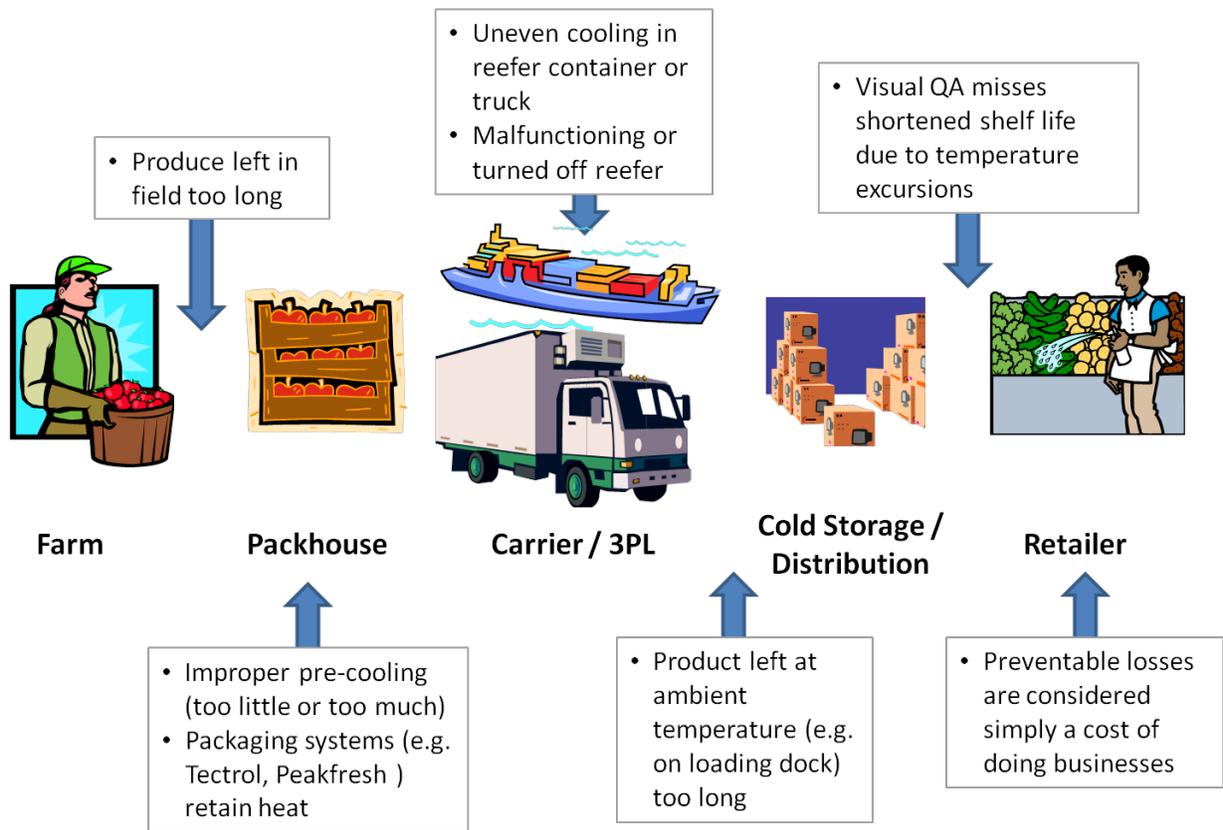


Figure 1 - Supply Chain / Temperature Challenges and Vulnerabilities

Quality inspection is by nature a sampling process, not complete inspection of every item. But the history and handling of produce is usually not uniform, even across a single delivery. There will always be portions of the load that were treated worse or better. Also, visual inspections miss a significant percentage of issues that are not apparent to the naked eye. Fruits or vegetables may look perfectly fine, but still have a significantly compromised shelf life due to temperature excursions.

Solutions

Some important parts of the freshness equation are within the retailer’s own operations and control—quality inspection and receiving acceptance procedures, as well as inventory management and proper rotation, washing, trimming, temperature control, and general management of the produce displays. More challenging for retailers is how to monitor and influence the proper handling of produce throughout the supply chain, from the field all the way to the retailer’s receiving dock. When retailers believe that what happens in their supply chain is not their responsibility, or beyond their control, they miss a critical opportunity to improve the performance of their supply chain, and increase freshness and ultimately profitability.

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End-to-End Temperature Control: The Key to Freshness

Having the right protective packaging is certainly part of the answer and is a key part of maintaining produce quality, especially for delicate fruits. But perhaps even more important, and the toughest nut to crack, tends to be temperature control. It's not enough to monitor and control temperature in just one leg of the journey, even if it is the longest leg. Problems can occur at every step—starting from produce kept too long in the hot sun in the field before it goes to the cooler, to each loading and unloading point. In fact, the handoffs can be the weak links, where the produce may sit for hours before being loaded onto a truck or put away into cold storage. For that reason, a solution can only be effective if it measures and monitors the entire temperature exposure history of each pallet or case of the produce throughout its whole lifecycle, from the field to the retailer's door. Monitoring each pallet or case is important, as each is unique due to its individual processing and handling conditions and history.

RFID-enabled Temperature Monitoring and Traceability

Barcodes are useful in telling where the product is or has been, but they don't tell anything about the duration or severity of temperature excursions. RFID-enabled temperature sensors on each pallet or in each case enable temperature monitoring at every step of the way throughout the end-to-end journey of the produce. RFID-based temperature tags today (such as ISO Class 3 battery assisted passive tags) are small and can be easily placed directly in the case with the produce right at the field or packhouse to start measurement right at the beginning of the journey. With RFID, the data can be automatically captured without modifying workflows or existing processes.

Placing the temperature measurement device within each case, right with the fruits or vegetables, provides the truest and most accurate picture of what the produce has been exposed to. Within a refrigerated truck, the temperature can vary by as much as 30% between different locations within the truck. Those temperature variations are captured by the case-level device, but are missed by the use of a vehicle-level device, even if there are several devices measuring temperature at a few different points within the refrigerated truck or 40' container. More importantly, simply measuring within the truck misses all of the potential temperature excursions that happen before and after that particular leg of the journey.



Example of Class 3 BAP Temperature-sensing Tag (from Intelleflex) packed in the case with produce.

Comparison of RFID vs. Traditional USB-based Data Loggers

RFID temperature sensors not only provide continual monitoring, but are very quickly and easily read using a handheld or forklift-mounted reader, or automatically read as part of the unloading process via dock door readers that the forklift drives through, or using a tunnel reader that a conveyor belt passes through. In fact, with most of these methods, the reading of data happens automatically as workers do their job (unloading the truck, putting cases on a conveyor, etc.) without any manual step required by the worker. This type of automated, in-the-chain reading is not practical with USB-based data loggers.

This is an important distinction: RFID can provide continuous data collection and near-real-time monitoring at each key point in the chain, whereas the USB-based logger only provides “after-the-fact” data at the end of the journey. There are a couple of reasons why this is important. First, RFID can provide alerts and notifications in near real-time,⁸ allowing corrective action to be taken. For example, the system could generate an alert when items have been sitting too long on a hot loading dock.⁹ Or if the compressor on a refrigerated container or truck failed or was not turned on, then an alarm could be generated. And RFID enables a First Expired First Out (FEFO) regimen at DCs in the cold chain, making more intelligent real-time decisions on where to send produce, based on its temperature history.¹⁰ These types of corrective actions can dramatically reduce spoilage and waste and they are not practically achieved using a USB-based approach.

Battery-Assisted Passive Tags

There is a big difference in performance between traditional passive UHF RFID tags and battery-assisted passive (BAP) tags, especially the newer ISO 18000-6C Class 3 tags. BAP tags can be read at 10X-30X the distance of a passive tag and are read more reliably in the presence of the high water-content inherent in fresh products (produce, meat, fish packed in ice, dairy products). They also can be read more reliably on fast-moving conveyor belts, within pallets stacked high with product, and in challenging environments such as a fast-moving forklift or a warehouse with lots of metal shelving. These can make the critical difference in real-world settings and use, where near-100% reliability is a must. It is a good idea to use tags conforming to the ISO 18000-6C Class 3 standard which improves significantly on the performance of previous generations of BAP tags, providing longer ranges, longer battery life, and better control over interference.

Secondly, by installing readers at critical points in the supply chain, waypoint data¹¹ can be written to the RFID device. This provides a traceability record—a record of each handoff in the chain-of-custody, as well

⁸ Getting real-time alerts requires RFID readers on the vehicles or at the locations being monitored. This investment may be justified, depending on the value of the product, current level of spoilage, and other factors that influence the value of this real-time monitoring.

⁹ This could be done by putting readers at each dock door and each refrigerated storage door in a DC or warehouse. The system could then notice that a case had been unloaded from the truck, but not yet put into storage (or vice versa) within a specified time period.

¹⁰ For more on FEFO, see the section below titled *Continuous Improvement and FEFO in the DC*.

¹¹ Waypoint data records that the tracked item was at a specific physical location at a specific time.

as an unambiguous assigning of responsibility for any temperature excursions. USB-based loggers do not provide this traceability or recording of handoffs.

Finally, beyond real-time alerts, having an RFID device that is continuously collecting temperature data all the way from the field to the grocery store provides the retailer with an unambiguous and precise measurement of the produce's temperature history, throughout its entire journey. This history can be very quickly and easily read, or automatically read, at the time the product is received by the retailer. The product can be received with confidence, or rejected knowing exactly when, where, and for how long it was kept at the wrong temperatures.

Cloud-based Solutions Provide End-to-End Multi-Party Integration

One of the challenges with trying to implement an end-to-end approach is that there are so many different companies and players involved. A cloud-based solution that is accessible at any point in the chain provides a straightforward way to address those challenges. It enables the simple integration of third parties including the growers, packers, carriers, and distributors. It can provide a platform to monitor the data anywhere in the chain and provide alerts and recommendations to take corrective action. When combined with RFID temperature sensing devices, a cloud architecture can help solve many of the typical temperature control problems throughout the entire lifecycle of the produce (see Figure 2).

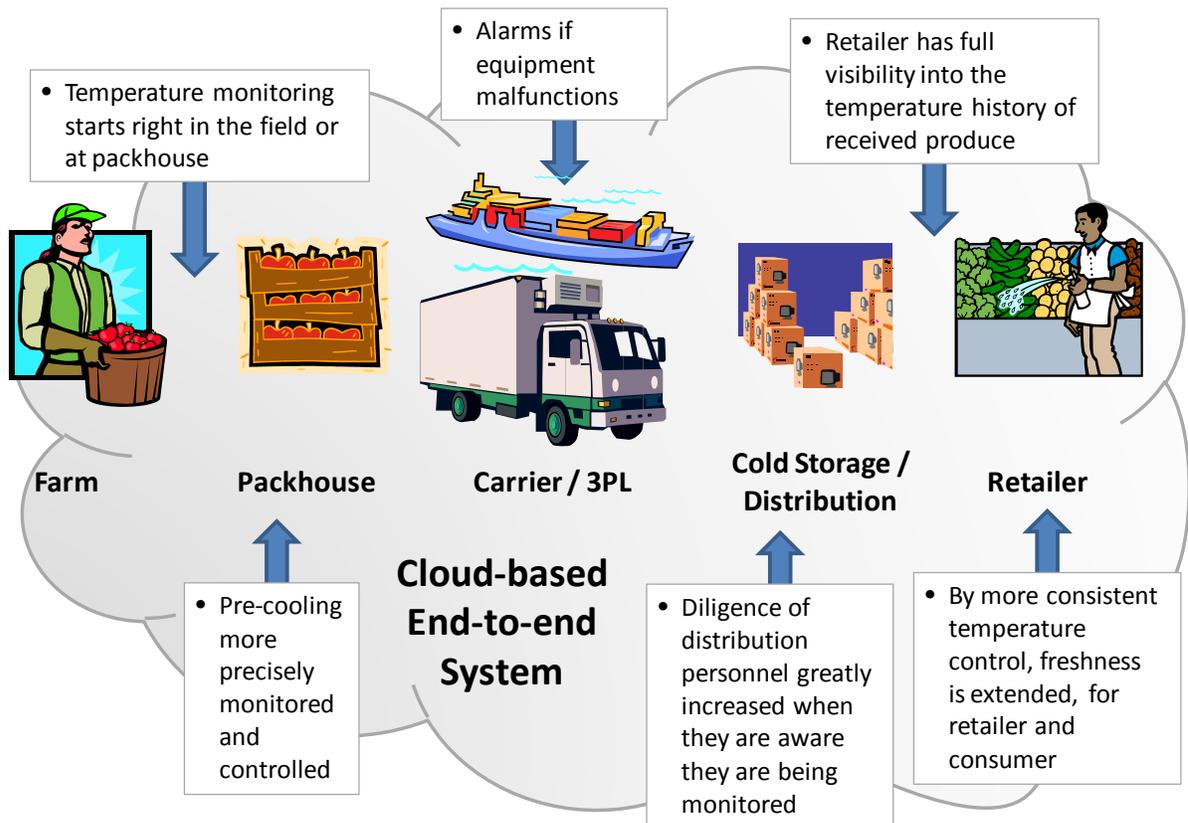


Figure 2 - Cloud-based System with RFID-based Temperature Sensors Provides End-to-End Monitoring

Extracting Real Value from Temperature Data

A Big Data Challenge

Pallet or case-level temperature monitoring generates a tremendous amount of data. It creates a Big Data challenge. Simply mandating suppliers to provide that bulk temperature data to the retailer will do nothing but bury the grocer in a mountain of data that already overworked staff cannot deal with. What is needed is a system that monitors and analyzes the incoming stream of temperature data. A cloud-based platform, combined with RFID and a wireless infrastructure, enables a *management-by-exception* approach. The system does all the heavy lifting of monitoring, analyzing, and making sense of the flood of incoming data. It can provide near-real-time alerts, throughout the product's journey, whenever there is a temperature excursion that needs attention.

Further, the cloud platform can make it is easy for the retailer to integrate this data into their receiving and quality inspection processes. The system can analyze the data and give a simple pass or fail (green light / red light) based on the temperature history. This would augment, not replace the existing visual inspection process. With this kind of system in place, product is evaluated based on objective temperature data, which can reduce the number of disputes between retailer and supplier. Furthermore, the system can read every single case, so the retailer may reduce the number of cases they visually inspect.

Continuous Improvement and FEFO in the DC

The temperature data can be used to continuously improve the performance of the supply chain. For example, it can help identify equipment malfunctions (even intermittent ones) and process breakdowns, such as locations or specific workers that chronically exceed desired out-of-cooler dwell times at the handoffs. This enables pinpointing of where problems are occurring and drives continuous improvement programs and better compliance to SLAs. It is amazing how quickly behaviors change once people know they are being measured and monitored.

The same data can also be used to implement FEFO (First Expired First Out) disciplines at each distribution center. The data can be used to understand which cases have the shortest shelf life, putting them at the front of the queue and/or shipping them to the closest destinations, where they will be consumed sooner. These types of proactive reconfiguring of priorities and destinations within DCs can lead to significant reduction in overall spoilage in the chain.



Getting Started

Grocers can choose to start with a pilot to prove out the concept, focusing initially on more spoilage-prone, high value products, working with cooperative suppliers. Measured improvements from those pilots can provide the proof points. Financial benefits from the reductions in spoilage may be used to fund broader rollouts of the program. Reductions in spoilage should enable growers and distributors to lower their costs and some of those savings should ultimately be passed on to the retailer—especially if the retailer is driving those improvement programs.

A cloud-based solution, using reusable RFID-based temperature measurement devices, helps lower implementation and ongoing costs, thereby hastening the ROI for these types of solutions. In addition to reducing waste and increasing freshness (thereby increasing revenues and profit), the combination of a cloud plus RFID technology automatically provides traceability. When there is an ROI in the waste reduction alone, it is almost like getting end-to-end traceability ‘for free.’

A fierce battle is on for the hearts and minds (and wallets) of grocery consumers. A grocer has to do everything right in order to continue to attract customers. Freshness has become one of the most important competitive attributes in consumers’ decisions about where they buy their groceries. End-to-end monitoring of temperature is critical to maintaining consistent produce freshness. Those retailers will win who use all the weapons at their disposal, including taking control of the end-to-end supply chain to provide the freshest possible produce, meats, and dairy products every time to their customers.



References:

- [Cold Chain](#)
- [RFID](#)
- [Life Science](#)
- [Logistics](#)



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