Proactive Freshness Management

Modernizing the Fresh Food Supply Chain to Reduce Waste and Improve Profitability

The retail grocery business is facing a perfect storm. What had traditionally been a relatively peaceful and stable industry is now in turmoil as new competitors, increased freight costs and changing customer purchase preferences are forcing retailers to rethink how they do business and manage costs. The impact doesn't stop there, however. As retailers tighten their belts, growers and suppliers are also feeling the pinch as grocers try to manage every cost.

Despite these challenges, the industry continues to accept waste in the fresh food supply chain and consider it a cost of doing business. The NRDC estimates that up to 40 percent of the food we produce gets thrown out, costing an estimated $218 Billion each year. This cost of waste for produce alone can represent six percent or more of produce margins for retail grocers.

So, with all of today's technology, why haven't we solved this food waste problem? We have so many tools available, yet we can't consistently deliver fresh food with sufficient shelf-life that won't spoil before it's sold and consumed so we throw a staggering amount of food away. As the NRDC says, it's like buying five bags of groceries and dropping two of the bags in the parking lot and walking away.

Why do we waste this food and take the margin hit? What can we do to fix this problem?

How Food Waste Happens

The first step to fixing a problem is understanding its cause. In the case of food, most retailers believe the primary cause of fresh food waste is poor in-store handling. Why? Because the produce spoiled at the store and was culled and tossed out, and the blame is assigned to the last person who handled the produce. But most of us have experienced buying produce that looked good at the time only to see it spoil or grow mold the very next day. Retail grocers have the same problem. While in-store handling does have an impact on remaining freshness, there is much more to the issue than that. In fact, **most of the factors leading to food waste happen upstream in the supply chain before the product ever reaches the store**.

Studies indicate that improper or inadequate temperature management – starting at harvest – is the primary contributor to early spoilage and food waste.

All produce has a definable maximum shelf-life, or "freshness capacity." This freshness capacity varies based on harvest quality and conditions, and the product's temperature through distribution. Strawberries, for example, will last 12-13 days when distributed at the proper temperature from farm to table. But strawberries aren't always ideally processed. For instance, when harvesting a field at some distance from the processing site, the grower may want to collect 12 or more pallets on the truck before making the trip to the processing site. As it can take 10 minutes or more for each pallet to be harvested, that means the first pallet was harvested 120 minutes before the last pallet. This two-hour difference can impact shelf-life by roughly two days if the field temperature is 80°F or higher. Additionally, the pallets may be separated at the processing site, leading to further differences in handling. Those differences

can lead to product harvested from the same field on the same day to have shelf-life that varies by **as much as five days**. For example, pallet A could have 13 days of shelf-life and pallet B, from the same field, could have only eight. There is no way to ascertain this information visually. Additional variations can occur at the pallet level throughout the supply chain as the product makes its way from the supplier to the retailer due to a variety of factors, so it is critical to maintain pallet level monitoring and management through store delivery.

It's important to note here that the variations occur at the *pallet* level, not the truck, field or lot level. If the truck coming in from the field in the example above was treated as a single unit instead of individual pallets, then the ability to accurately manage the freshness variability that occurs at the pallet level is lost. Yet this lot-level approach is what has been used for decades when the fresh produce supply chain trusts and operates upon the "harvest date" or "best use by" date. Since the date labels are based on the harvest date – not accounting for actual handling and the impacts on shelf-life at the pallet level – they assume all produce harvested on that day has the same shelf-life. This is simply not true.

Zest Labs' research has shown significant variability between pallets being delivered from suppliers to the retailer. For example, one study with grapes showed a staggering 16 days of variation in shelf-life among pallets. Some pallets had three days of remaining shelf-life while others had as much as 19 days of remaining shelf-life. If you were expecting all the pallets to have a uniform shelf-life of 10 days, in this case, nearly 38% of the pallets (the totals of the 3, 5, 6, 7, 8 and 9 day bars below) would spoil before you expect – leading to increased costs, lost profits and, most likely, unhappy customers.
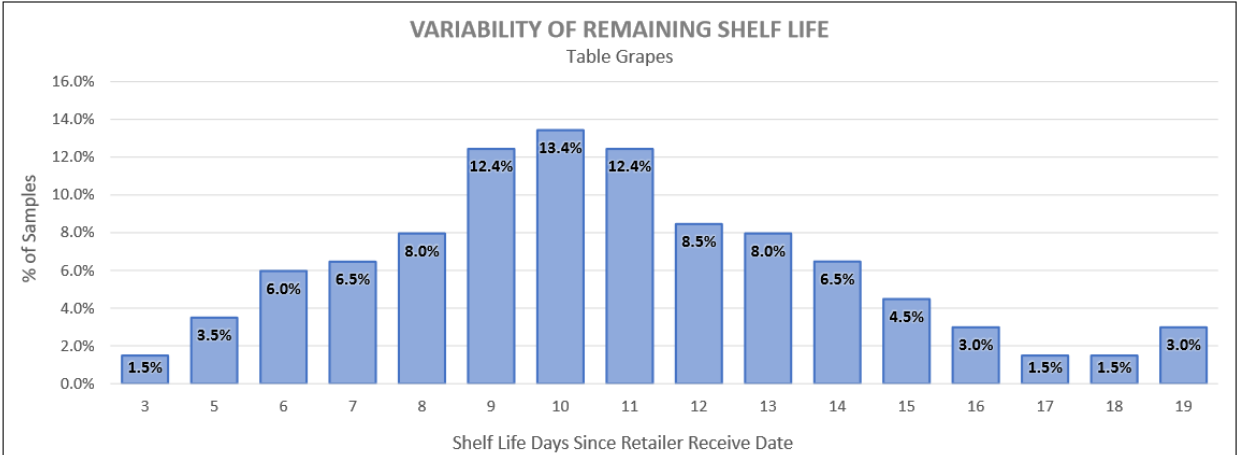
Time between harvest and pre-cooling is just one factor that can impact produce's remaining freshness. There's also pre-cooling effectiveness, time spent on a loading dock or in a warehouse, and in-transit temperature variation, to name just a few of the other variables that need to be managed.

In the end, how long fresh produce will stay fresh is a complex function of its environment and handling since harvest. And, since most growers, distributors and retailers don't presently have adequate visibility into the produce's history – let alone the condition of the product at the pallet level where the variation occurs – waste often occurs at the store, as we inadvertently offer

produce that has far less remaining freshness than the "best use by" date or "harvested on" labels indicates. Without consistent delivered freshness, growers, processors distributors and retailers all will bear expense due to waste and have a difficult time creating a more sustainable – and cost effective – supply chain.

Using the Wrong Tools and Approach

Growers and processors are aware of these issues that can impact produce's remaining freshness and they do their best to address them. However, most growers and processors don't have the tools and information to monitor and manage each pallet of product, so they rely on managing the process. For example, growers and suppliers understand they must cool fruit to a target temperature, and then test for that temperature on pre-cool exit. But the temperature test does not account for delayed cut-to-cool time variability from harvest or pallet-level variations during pre-cooling, which can significantly impact shelf-life. Sample checks of the process are insufficient to manage and deliver product with consistent shelf-life. Product monitoring at the pallet level starting at harvest is required to achieve a consistent, high quality result.

What's Up with the "Use By" Date

The remaining freshness "date" of the product is likely to be different for each product. As such, the dates are only guidelines, regardless if they're a "Sell By," "Best if Used By" or "Use By" date. Relying on data labels is inaccurate and leads to waste. Read more on this topic here.

The challenge is even greater in distribution, where *product* condition data is rarely monitored, and even less often shared. Data loggers are often employed at the trailer level, but these devices don't provide the level of granular data about the individual pallets or the ability to manage the dynamic shelf-life of the pallets. Because of this lack of product level monitoring, retailers typically rely on visual inspection, but visual inspection can't identify earlier process-related issues or reflect remaining shelf-life, so those charged with delivering fresh food are essentially flying blind.

Another challenge with legacy approaches is that they all provide forensic or after-the-fact data. Data loggers have limited functionality and can tell you there's been a temperature excursion after it happens. Visual inspection can tell you the product's going to spoil as it begins to spoil. Imaging solutions provide only a limited picture of the product's condition. They can perhaps tell you the current shelf-life, but they can't tell you the dynamic remaining shelf-life or when a product will spoil so they don't prevent waste – they only assign blame.

You Need to be Proactive

This is where pallet-level monitoring and management and real-time analytics change the game. None of the issues that lead to food waste are problematic if the supply chain stakeholders know about them as they're happening and are provided with the necessary information and insights to act to address the issue. If a distribution manager knows which strawberry pallets have reduced shelf-life because they waited in the yard for several hours before being pre-

cooled, they can send that shipment to a local store or restaurant. This informed decision at shipment means those strawberries can be consumed at full quality before they spoil, rather than shipping them across the country, which requires up to five or six additional days of shelf-life, only to have them spoil in transit or when they arrive. Likewise, with dynamic shelf-life information, the produce manager can prioritize that pallet in inventory, moving it to store shelves earlier while it still has sufficient freshness, avoiding waste and mark-downs and improving customer satisfaction.

So, instead of relying on "best use by" dates that are often inaccurate, we can now apply technology to create a dynamic freshness metric that enables proactive management of the fresh food supply chain.

The First Freshness Metric

The Zest Intelligent Pallet Routing Code (ZIPR™ Code) is the industry's first freshness metric and is a component of the Zest Fresh™ solution. The [ZIPR Code](#), introduced in January 2017, is a dynamic date code that empowers workers and systems to better manage product **based on actual freshness**, rather than relying on the false assumption that the harvest date label accurately represents remaining freshness.

Zest Fresh enables proactive decision making across the fresh food supply chain from harvest to the retail store. Wireless IoT temperature sensors, inserted into the pallets at harvest, autonomously collect data to monitor the product's condition and processing and, combined with cloud-based artificial intelligence, machine learning and predictive analytics, dynamically calculates the ZIPR Code of the actual remaining shelf-life for each pallet providing growers, shippers and retailers with a freshness metric that improves inventory and distribution management and ultimately improves product margins and customer satisfaction.

The ZIPR Code is:

- A dynamic, real-time calculation of the days of remaining freshness or shelf life.
- Continuously updated for each pallet, as quality and freshness can vary by pallet, even within a single day's harvest.
- A goal-oriented metric for freshness requirements.
- Normalized to easily implement across product categories.
- Specifically calculated for every product, from strawberries to lettuce to broccoli, etc., based the product's specific profile.

The ZIPR Code product profile defines the freshness capacity and the rate of aging which are used to evaluate pallet-level condition data, driving dynamic updates of the ZIPR Code for each pallet. Zest Fresh then uses the ZIPR Code to best match available pallets with customer requirements and transit times. That is, if you know one pallet has nine days of remaining shelf

life and another has twelve, they can be intelligently prioritized to locations that match the freshness with the transit time.

The supplier loads the trailer with pallets that have compliant ZIPR Codes. There's no action required from retailer – Zest Fresh, using the ZIPR Code, provides automatic compliance checking. If exceptions are needed, Zest Fresh can escalate the request to the retailer for review and approval. The target ZIPR Code may be modified for each purchase order, accommodating some variance in requirements due to seasonality.

Zest Fresh uses real-time analytics to empower suppliers to maintain adherence to processes and handling, improving the freshness consistency of its products. Real-time corrective action notifications empower the supplier's workers to correct for product not being handled or processed properly. This same data provides the supplier with guidance to maintain optimum operating efficiency, saving money and increasing throughput.

Conclusion

Armed with accurate real-time information, companies can proactively manage for freshness and reduce waste, saving businesses money and improving product margins. It isn't a one-party issue – growers, processors, retailers and AgTech solution providers all need to work together across the supply chain to combat food waste and restore sustainability. Real-time monitoring and management, combined with predictive analytics can improve visibility and decision-making within the fresh food supply chain, reducing waste and improving environmental sustainability.

Sending so much of the food we produce to the land-fill doesn't make sense from an environmental or a business standpoint. Fortunately, there is a better way for growers, processors and retailers who want to act to improve their business and their bottom line.

Pallet-level temperature management of product throughout the fresh food supply chain − and providing the information and insights to act on changes in conditions in real-time – reduces waste and increases delivered freshness and customer satisfaction.

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REFERENCES:

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