## 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 conveyer, 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 data[11] 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.

## *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