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Grocery stores and supermarkets play vital roles in the food production and supply chain, providing ubiquitous storefront interfaces within metropolitan and rural communities alike. Ensuring food quality and safety have always been top priorities for food retailers, but these concerns are becoming increasingly important for consumers as well.

In a recent Emerson study of 1,000 consumers, 50% said they worry about the safety of fresh, perishable and frozen foods during transportation to stores. The same percentage indicated they would be less likely to shop from stores that aren't using the latest technologies throughout their supply chain to help ensure food safety.

To meet consumer expectations and protect their brand reputations, grocers need to adopt best practices at every step of the food supply chain. And when it comes to perishables, this starts with maintaining strict temperature adherence.

Temperature control for quality (TCQ)

Temperature best practices are typically focused on two areas of concern: quality and safety. Grocers should have temperature control for quality initiatives that ensure shipping temperatures are kept at precise setpoints throughout the cold chain.

If produce becomes too ripe — from poor temperature control or time-of-harvest conditions — it will naturally have a shorter shelf life. To reduce further shrink, ripe produce should be transported to store locations that are closer to the growing region and made available for consumption as quickly as possible. Pre-conditioned fruits such as avocados should be carefully monitored to ensure they are continuously kept at the correct temperatures.

Delivering past-ripe produce or poor-quality perishable products only erodes customers' loyalty and gives them a reason to switch to different brands — or shop at a competitor's

grocery store altogether. Aside from suffering a hit to their store's reputation, grocers also face financial loss from potential food shrink and diminished sales.

Temperature control for safety (TCS)

Keeping shipping temperatures at precise setpoints throughout the cold chain journey is critical to not only preserving perishable food quality, but also ensuring that it is safe to consume. TCS initiatives are mainly concerned with the safe shipping of fresh and frozen meats, seafood, produce and dairy products.

For example, the safety of fresh and frozen meat will degrade if temperatures deviate from setpoints or fluctuate excessively. As meat and seafood items thaw and refreeze, they lose water content, which dries out the product and reduces its flavor. If temperatures deviate from safe ranges or become too warm, product will purge (or release water) initially, then begin to grow and spread bacteria, which increases the risk of foodborne illness.

Cross-contamination can also occur when meat, seafood and produce are stacked together closely within a transport shipping container or arranged on a stack of pallets — which increases the potential for foodborne illness outbreaks and customer injuries. Improper sanitization procedures between loads can also lead to cross-contamination.

The goal of protecting consumer safety is an ethical prerequisite for food retailers. But it's also important to remember that it only takes one incident to permanently impact your store's reputation and incur the significant financial impacts of potential fines and litigation. Simply put, food retailers always have a target on their backs and must be ever vigilant to ensure food safety and protect their customers.

Cold chain management and logistics challenges

Effective management of the retail food cold chain requires an interdisciplinary focus on multiple factors — from coordinating with supplier partners to monitoring shipping logistics. This process often begins with ensuring proper harvesting times with preferred produce providers and establishing the proper setpoints per commodity type.

Respiration rates of harvested produce can be impacted by trailer setpoints; produce cooling processes can also place excess strain on product. For example, pulling heat from product picked in the 90 °F heat of the day down to a 33 °F transport temperature is not ideal; the goal would be to limit this variance between picked and storage temperatures. This is also why it's extremely important to be able to monitor temperatures in produce pre-

cooling sheds.

In addition, the age of harvest fields is another important consideration. Late-season fields are already experiencing excess crop strain; thus, extra efforts must be taken to reduce these impacts after harvest. Other environmental factors — such as bruising from rain or unexpected temperature variations — can also impact the quality of produce.

Perishable food transport best practices

Preserving food quality and safety in the perishable supply chain requires coordination among producers and shippers from inbound harvest and transport to outbound shipping and receipt from distribution centers (DCs). Best practices must follow a holistic approach that considers key factors at every step of this process.

- **Pre-cooling:** Establish a pre-cooling process after harvest to stabilize produce temperatures prior to loading in refrigerated shipping containers.
- **Transport refrigeration:** Ensure proper refrigeration and insulation of reefer trucks and trailers.
- **Inspection:** Perform a visual inspection between loads to ensure a clean and contaminant-free space.
- **Temperature stability:** Maintain continuous setpoint temperatures throughout a trip; do not permit the use of fuel saver mode or starting/stopping of refrigeration.
- **Calibration:** Schedule annual thermistor calibration of reefer trucks and/or trains.
- **Loading:** Ensure pallets are loaded correctly to enable proper airflow and consistent temperatures from the front to the back of trailers.
- **Load transfer and receipt:** Because refrigerated trailers are designed to hold (not cool) temperatures, do not allow them to sit in receiving docks for extended durations, especially in warm regions. Limit opening of trailer doors to maintain these holding temperatures.
- **Mixed loads:** Avoid mixed loads that contain a combination of fresh and/or frozen products with different ideal temperature setpoints. This is often done to save fuel costs from DCs to stores but can result in compromising load quality. Consider pallet-level temperature monitoring.
- **Data logging:** Deploy technologies that enable the automatic capture and recording of trip temperature data for reporting and verification purposes. This is essential for basic quality assurance and to help resolve disputes or questions over rejected loads.

Food safety regulatory compliance

Complying with food safety regulations is more important than ever, and grocers are shifting their focus from reactive responses to more proactive prevention. The Food Safety Modernization Act (FSMA) gives the Food and Drug Administration (FDA) the authority to mandate comprehensive, science-based and preventative controls governing the safe storage, handling and preparation of food throughout the supply chain.

To help ensure compliance, grocers should consider establishing a corporate food safety specialist and place quality control experts in DCs and/or logistics operations. They also need technologies that allow them to continually collect data related to food safety and provide the necessary documentation to validate these initiatives on request. Achieving temperature certainty of various fresh and frozen commodities is an essential component of these efforts.

Emerging e-commerce fulfillment challenges

COVID-19 represented an inflection point for the grocery industry by attracting an influx of first-time online shoppers. Not only did this unexpected spike in demand permanently reshape consumer buying habits, but it also introduced new food safety challenges.

Click-and-collect fulfillment presents new temperature control challenges, as chilled perishables and frozen goods must be kept within their optimal temperature ranges through in-store picking, order staging and customer pickup. Direct-to-consumer deliveries have the added responsibility of maintaining temperatures in delivery vehicles. For either of these new fulfillment models, grocers must make extra efforts to mitigate improper handling or cross-contamination risks.

Grocery foodservice challenges

Today, more grocery stores and supermarkets are providing ready-to-eat, home meals in addition to supporting traditional deli services. As more consumers look to grocers for home meal replacements, food preparation introduces hot-side food safety concerns. To ensure safe food preparation and meet local health inspection requirements, staff must be trained in the safe cooking best practices set forth by the National Restaurant Association’s (NRA) ServSafe® certification course.

Grocers also should establish and follow their own hazard analysis and critical control points (HACCP) procedures, with a focus on the prevention of bacterial growth and maximizing food quality/safety. Retailers that are new to fresh food preparation will need to familiarize themselves with recommended tools of the trade, such as: hot holding tables, temperature-probing devices and pocket-held thermometers.

Three best practices of grocery store food quality and safety

1. ***Don't bend food safety rules to save money.*** Cutting costs by bending food safety rules or best practices almost always backfires — creating shrink and introducing potential safety risks. Always follow best practices!
2. ***Establish a temperature-monitoring protocol.*** Maintaining tight temperature setpoint control for all types of perishable commodities is a key factor in preserving freshness and ensuring safety. Temperature monitoring programs are essential components of modern food safety programs.
3. ***Plan for any scenario.*** The potential for food quality and safety degradation exists along every step of perishable food's journey from farm to fork. Poor planning increases the likelihood of shrink and introduces risks of compromising food safety.

Partner with a food safety expert

To keep perishables safe and deliver the high-quality food offerings that consumers demand, grocers must first gain a clear understanding of everything that contributes to food quality and safety throughout the food supply chain. Then, they should partner with an expert to help them deploy the modern tools and technologies needed to support their food safety plans and best practices. As a full-service provider of temperature monitoring and control technologies, Emerson is committed to helping grocery stores address the many challenges associated with perishable cold chain management.

Gerd Uitdewilligen is the director of international sales, Cold Chain Digital Solutions at Emerson, a time and temperature monitoring solutions provider based in Boise, Idaho USA. As one of the first employees, Gerd has grown the international business from non-existent 14 years ago, to currently exporting to over 80 countries around the world. Gerd has been

actively involved in the produce industry including holding a seat at CPMA's Industry tech counsel. Prior to Emerson, Gerd was product manager at Extended Systems, a NASDAQ listed company in Boise focused on technology licensing including Bluetooth. Gerd has a Drs. Degree in International Economics from Tilburg University (Netherlands) and Master's Degree in Agricultural Economics from Montana State University. During his spare time he enjoys cycling and travelling with his sons.