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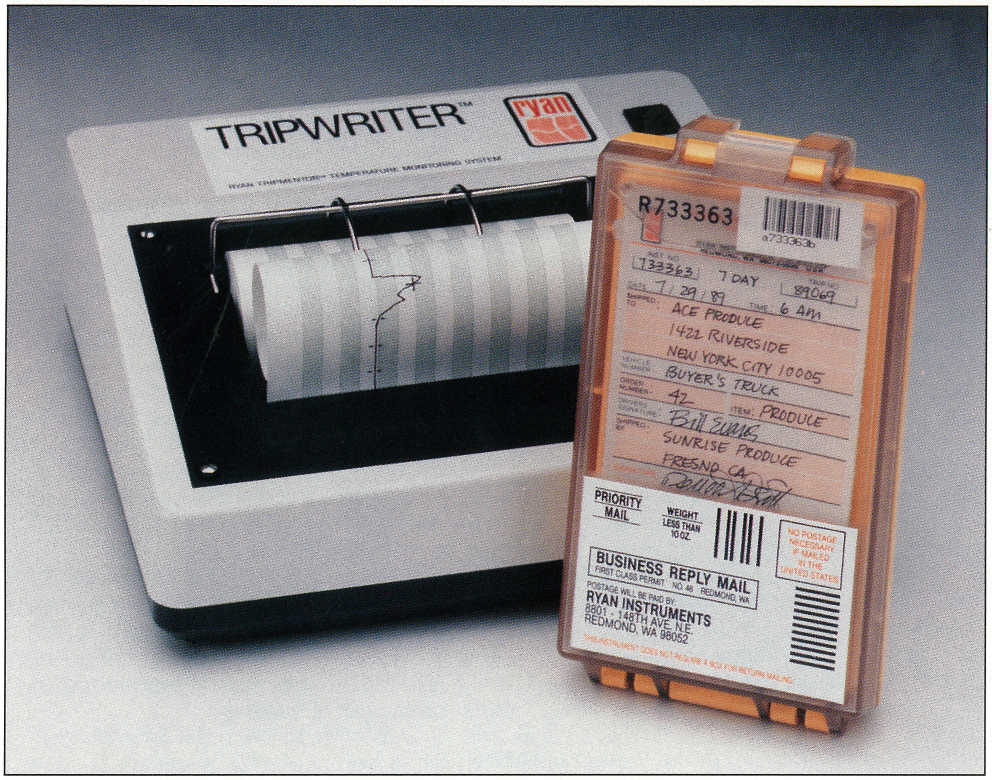

Monitors offer a constant, reliable, and legally-verifiable record of temperature fluctuations in food shipments.

Casebook

Temperature monitors offer practical advantages

Scientists, manufacturers and government regulators involved in the safety debate on chilled, prepared refrigerated foods agree on one point: Loss of product or product quality from temperature abuse can be devastating.

Recognizing this, Ryan Instruments (Redmond, Wash.) manufactures time/temperature monitoring devices to help ensure the safety of temperature-sensitive food products domestically and throughout the world. Today, Ryan Instruments monitors 75% of all time/temperature-monitored shipments worldwide, the company says.

Carl Randall, chairman of the board of the Chilled Foods Assoc., predicts that chilled, fresh-prepared foods could mushroom into a $5-billion industry within five years. This growth opportunity puts tremendous pressure on processors, retailers and regulators to design effective barriers against the microbiological hazards these foods could pose.

It is imperative that manufacturers maintain tight temperature controls over these products during manufacturing, storage, and distribution.

Observations that pathogens such as *Chlostridium botulinum* and *Listeria monocytogenes* can grow at temperatures as low as 40°F coupled with the heavy volume of foods that pass through centralized distribution systems tighten the degree of control that must be exercised over refrigerated food products.

"We feel that temperature control for most, if not all, of these products is going to be of paramount importance," says Dane Bernard, acting vice president of the Eastern Research Laboratory for the National Food Processors Assoc.

Time/temperature recorders will play a key role in maintaining the integrity of refrigerated distribution systems in the future. Time/temperature monitors (also called recorders) measure and record temperature fluctuations that occur throughout the storage and distribution of temperature sensitive products.

Ryan's temperature monitors will collect and store accumulated time/temperature data for each refrigerated food shipment. Data can be provided in several formats, including printed charts or digital files for computer analysis. The data provides a legally verifiable record of the time/temperature integrity of each refrigerated shipment.

Integral to distribution

As manufacturers work to develop "fail-safe" delivery systems, "You will certainly see these monitors becoming an integral part of these new product delivery systems," predicts Cornell food science professor Joseph Hotchkiss.

Kraft already employs such a system to ensure the integrity of its prepared refrigerated foods (Chillery and Di Giorno) lines currently in test market. Kraft mandates the use of time/temperature monitors on all of its shipments.

Until the line was discontinued last January, Culinova Group Inc., also used time/temperature recorders to distribute chilled prepared foods into test market.

Culinova "pioneered the use of time/temperature monitoring in distribution," reflects Nabil El-Hag, vice president of technical research and operations for Culinova.

"We used both strip integrators (see sidebar) and monitors to collect data on temperature fluctuations that occurred during distribution—as when truck doors were constantly opened and closed, for example."

Both Culinova and Kraft followed closely the recommendations made by the National Food Processors Assoc.'s (NFPA) Refrigerated Foods and Microbiological Criteria Committee. Last year, this committee recommended that time/temperature recorders be used to indicate the temperature history of all refrigerated foods during storage and distribution.

The American experience

As the president of the world's oldest time/temperature monitoring company, Ryan President Pat Vaché says that American chilled prepared foods manufacturers need to understand the role that time/temperature technology can play in the delivery of new products.

"As American manufacturers follow the European lead in developing this exciting market, they should note some

Monitors and integrators: The pros and cons

The pros and cons of each system merit careful consideration by all processors responsible for ensuring the safe distribution of chilled prepared foods. Some experts suggest that both types of technology should be used.

Strip integrators are used on individual product packages; they change color in response to time/temperature variations. Monitors (also called recorders) differ in two ways.

1. They monitor time/temperature fluctuations for entire shipments rather than individual packages.

2. They provide accumulated records of temperature fluctuations that can be broken down into specific time periods.

Although strip integrators have a role to play, some question using them as the only time/temperature device within a distribution system.

"The committee has some concerns as to whether the indicators can reliably integrate time/temperatures and ensure satisfactory safety margins in all cases," says Michael Wehr, a member of the National Advisory Committee on Microbiological Criteria for Foods.

The National Advisory Committee, which has reviewed both integrators and monitors, is expected to release its recommendations this year to the U.S. Dept. of Agriculture (USDA) and the Food and Drug Administration (FDA) for ensuring the safe distribution of chilled prepared foods.

Dane Bernard, vice president of the National Food Processors Eastern Laboratory, says that, although he is optimistic about future applications for integrators, he is "not sure if anybody's comfortable with the current time/temperature strip integrator technology." One concern is that strip integrators may not change color fast enough to indicate all potential hazards.

"Microbial growth is not linear," continues Bernard. "Growth rates for pathogens accelerate rapidly under extreme temperature abuse. Sometimes strip integrators can't change quickly enough to keep up with this rapid growth."

Under other conditions, integrators may indicate that the product has gone bad when, in fact, it is still good, according to Bernard.

This occurred when Culinova was test-marketing its chilled prepared entrees, according to Nabil El-Hag, vice-president of technical research and operations for Culinova Inc.

"One source of error we observed is that consumers would place a finger or thumb on the strip integrator when handling a package. Eventually, the integrator would change color because of the body heat, not because of temperature abuse. In time, the product would read 'abused' when, in fact, it was still good," says El-Hag.

Workers had no way of knowing if the strip integrators had changed color because of temperature abuse during distribution, shipment, or retailing—or whether it was the consequence of consumer tampering.

Only by monitoring the time/temperature history of each shipment at each point in time can manufacturers identify weak links in their distribution chains.

key differences in our respective distribution systems," warns Vaché.

For one, says Vaché, Europeans contend with much shorter shipping distances from manufacturer to market than their American counterparts, although this could change in 1992 when the last trade barriers within the European Economic Community (EEC) are scheduled to come down.

Also, European consumers tend to shop much more frequently than Americans do, so European products can have a shorter shelf life and still be economically viable.

"These differences present unique challenges for American food processors," says Vaché,

Ryan Instruments' time/temperature monitors can either be purchased or provided as part of a total service package. Manufacturers who use their own equipment for cold distribution may opt to buy their own monitors. However, independent suppliers, shippers and receivers usually buy into a Ryan service package. With this package, Ryan maintains a record of time/temperature charts and continually recalibrates its recorders to ensure their integrity during use.