Unilever Hungary Looks for Weak Links in Ice Cream's Cold Chain

Last summer, the company used temperature-sensing battery-assisted RFID tags to monitor storage and handling conditions at the factory, distribution centers and stores.

By Rhea Wessel

Jan. 21, 2008—Behind every ice cream cone we eat is a logistics cold chain of mammoth proportions. If the cold chain is broken, the breach can have a severe effect on the ice cream's quality.

Unilever Hungary, a manufacturer of ice cream and other products, such as Dove soap and Lipton tea, explains that if ice cream warms above -18 degrees Celsius (-4 degrees Fahrenheit), its quality may suffer. And if temperatures rise further, the ice cream can deteriorate even more significantly. Since the product can change hands up to 10 times between production and consumption, ice-cream makers need a method for tracking storage and handling conditions.

Unilever Hungary has made a first stab at solving this problem. The company has completed a proof-of-concept test employing RFID tags and temperature sensors on cases of ice cream produced in the city of Veszprem. During the trial, it gained experience using RFID and temperature-sensor technology, and found occasional breaks in the cold chain—particularly when goods were loaded on and off trucks.

Given the test experience and results, which are still under analysis, Unilever Hungary says it hopes to conduct additional, more extensive trials using RFID to trace products as they move from factories to freezer cabinets in stores. "We are looking at how to integrate RFID into the continuous quality-control cycle," says Andras Buzinkay, the warehouse and distribution manager for all of Unilever Hungary's business lines.

Each year, Unilever Europe conducts supply-chain checks as part of the company's quality-improvement initiative. Samples of ice cream are rated on 35 different criteria, such as taste and packaging condition. In 2007, Unilever Hungary decided to expand the process by examining various elements of the supply chain with RFID. "We wanted to check the total supply chain and find out where the cold chain could break down," Buzinkay says.

Buzinkay conceived the idea of using RFID and spoke with Rácz László, a project manager for Hungarian systems integrator and security printing house Allami Nyomda, explaining the quality test he needed to perform. The two men, in partnership with Italian RFID tag and temperature sensor maker Montalbano Technology, agreed to collaborate on the project. Each company carried its own costs during the test, which lasted seven weeks during the peak ice cream season in July and August.

The test targeted two areas of the supply chain: The partners applied battery-assisted passive (BAP) RFID tags with built-in temperature sensors to 60 cases loaded on a single, bar-coded pallet. Each case was tagged because the cases were bound for different customers via the national distribution center. The pallet was

tracked with the existing system as it moved through the supply chain. The partners also placed the same type of RFID tags with temperature sensors inside 40 freezer cabinets at select stores.

During the initial phase of the test, the tagged cases of ice cream moved from the factory to Unilever's national distribution center and on to the retailers' distribution centers, then to about 40 retail shops. The 60 tags were interrogated twice in the course of the test—when they were activated, or switched on, at the ice-cream factory, and when the tags were returned to Unilever by participating stores. The purpose of the reads was to collect sensor data recorded every 10 minutes, and to make sure the sensors were working properly in a deep-frozen environment.

The temperature-sensing, battery-assisted RFID tags, known as MTsens, are made by Montalbano Technology. Operating at 13.56 MHz and complying with the ISO 15693 standard, the tags acquire temperature at a programmable rate, storing it on internal non-volatile memory. (The tags use a battery only to acquire and store the temperature data, and data is transferred only when the tag is interrogated.)

Proximity RFID interrogators, provided by Montalbano Technology, were used during the proof-of-concept project to program, initialize, activate and deactivate tags. They were also used to read thermal history and search for temperature recordings made at different times.

"Throughout the test, there were no breaks in temperature data, despite the severe environment," says Daniele Grosso, general manager of Montalbano Technology. "We were able to work in -30 Celsius temperatures for the whole battery duration, and each tag acquired more than 400,000 time-temperature readings. In addition, MTsens is very accurate in measuring time with a 0.006 percent accuracy."

Although Unilever Hungary was positive about the hardware and software test and says tag prices are decreasing steadily, thus reducing the barriers for larger tests, the company will still take years before implementing a tracking system able to provide real-time information on storage conditions. That, Buzinkay explains, is because tagging several million cartons of ice cream every year would be too expensive at this point. Furthermore, he adds, the tags should be read at the end of the supply chain so the company can determine what happened to the product the consumer finally receives. Since Unilever Hungary has 18,000 points of sale, Buzinkay notes, the tag interrogation step would require significant investment.

In the second part of the test, the partners placed the same BAP RFID-sensor tags within 40 ice cream display cabinets at select stores, programming the tags to record temperatures every 15 minutes. Unilever hoped to learn more about temperature changes at the point of sale. Most of the 40 tags were placed in freezers at hypermarkets, with the remaining tags put in freezers at small shops, which were opened frequently by patrons and store personnel.

The tags were read when they were activated at the time they were placed in the freezers and their temperature data was downloaded after the tags were taken out and interrogated. Unilever discovered wide temperature variations—in some stores, the readings indicated the temperature rose too much during the freezers' defrosting cycles, but in most situations, it was difficult to determine the reason for such changes. To get usable data, Buzinkay says, the partners would need to expand the application with more interrogation points.

Looking forward, Buzinkay says, Unilever Hungary plans to conduct specific trials with end customers next year. In addition, Unilever Europe is considering employing RFID to identify up to 1 million freezer cabinets that it lends to retail shops throughout Europe. At present, all identification of freezer cabinets is based on removable printed labels. "If we could couple freezer tracking with temperature monitoring, we could achieve physical inventory monitoring and quality monitoring in one," Buzinkay states.

RELATED_ARTICLES According to Buzinkay, the partners do not want to reveal the exact costs of the

hardware. "We believe this is now affordable to companies that have trouble with the supply chain—even in Hungary," he says. "We believe it's viable and affordable for representative test purposes. The technology has matured in the past two years."

Separately and unrelated, Unilever North America ran a data-sharing trial in 2006, using the Electronic Product Code Information System, or EPCIS (see Unilever Expects Big Gains From Its RFID Data-Sharing Trial).