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Research Finds RFID Tags Can Take a Beating and Keep on Reading in Reusable Container Applications

New Report Says 109 out of 110 Containers Still Readable After a Year Going from Farm to Store and Back Again; 100% Reads 100% of the Time?

SCDigest Editorial Staff

Use of RFID tags to track reusable logistics containers and platforms has already emerged as one of the top commercial supply chain applications for RFID deployment. Now, a study based on research from Michigan State University and others shows that RFID tags can take a beating and keep on reading even after multiple uses and under fairly harsh handling and environmental conditions.

Reusable containers, such as plastic totes and a variety of pallets, bulk containers, bins, etc.

These types of containers already have wide adoption in the US, and probably even more so in Europe. The use of such containers can offer strong cost advantages over disposable containers, such as corrugate boxes, over time, and also lead to improvements in overall supply chain efficiency through more standardization of container types and much less risk of product damage.

In addition, "Green Supply Chain" initiatives can also drive the move to use of reusable containers, although there is often some debate about what is really the most Green alternative. (See **Green Supply Chain Debate Increasingly Focuses on the Lowly Pallet**.)

What isn't controversial, however, is that there are barriers to greater adoption of reusable logistics containers. One of them is the upfront cost of investing in re-usable containers for the first time. The second is the challenge many companies have managing these assets. For example, even within a closed loop supply chain, such as retail DC to retail store and back, plastic totes have a tendency to get lost or end

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up in limbo somewhere in the logistics chain.

That means companies must invest more up front and over time in either buying more containers than they really need, and/or spend more money over time adding more containers to the "pool."

The challenges of course are even larger if the application is cross-company, where one party invests in the containers that are ultimately used by another. In this situation, disputes about what containers/platforms have been shipped, returned, etc. are common between trading and service partners, and probably an even higher percentage of containers are lost than with closed loop systems.

RFID Provides Solution – but Will It Hold Up in Real World Conditions?

RFID tracking of the reusable containers certainly provides a potential answer to the tracking and asset management issues, which in turn can sup-

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port an even stronger business case for the move to reusables.

While RFID has already been implemented by a number of companies to track re-usable logistics assets, there have been some lingering questions about whether RFID tags would really hold up under the challenging conditions to which reusable containers are often subject.

In attempt to answer that question, the Reusable Packaging Association (RPA), which obviously has an interest in seeing wider adoption of reusable platforms, contracted with several parties to conduct some fairly extensive testing of RFID tags attached to plastic totes under real world conditions. The summary result: the RFID tags held up extremely well in the test, under conditions that included low temperatures and significant water exposure, in addition to the rough handling the containers go through as a part of standard logistics flows.

In the first step of the research, tags were applied to plastic totes and subject to a variety of tough handling conditions, such as drops and vibrations, by the researchers at Michigan State University School of Packaging.

Those totes were then shipped to another testing facility in Ohio, where the researchers there performed extensive read testing on the totes after they have been shrink wrapped on a pallet. All told, the project team performed more than 160 hours of testing and more than 14,000 tests, using a handheld RFID reader.

According to the RPA, there were virtually zero issues with reading the tags after the stress tests at Michigan State. In fact, the RPA goes so far as to say that "In addition to proving durability, the data demonstrated that it is possible to get 100 percent read rates 100 percent of the time, which had never been achieved in the industry before."

Field Tests Show RFID Held up Well on Reusable Containers and Harsh Handling

Tracking Lettuce

The next phase of the project involved an actual field test of the tagged containers. Tagged containers were sent to the farms of several different growers of produce, where lettuce was packed directly into the containers. From there, it went to a cooling facility, then loaded and shipped to the DCs of trial participant Wal-Mart, at an average distance of over 1000 miles. Wal-Mart processed the totes in its DCs, then loaded them onto trucks and delivered them to its stores.

According to the RPA, "This scenario required that the tags utilized on the assets must withstand considerable temperature swings, wet and cold environments, shipping vibration and other transportation challenges and be successfully read when entering into an end users distribution system."

The tags on the totes were encapsulated in a plastic film, from two different suppliers. Tags from three different manufacturers (Alien Technology, UPM and Avery Dennison) were used.

Through the full logistics lifecycle, the RFID tags and totes underwent extreme changes in temperature, ranging from over a 100 degrees Fahrenheit in the field to 32

degrees in cold storage and over 170 degrees when the containers were later washed.

Additionally, the RFID tags were exposed to dry field conditions, wet and cold storage environments and subject to a variety of handling processes as the totes moved throughout the supply chain.

In total, 110 totes were tracked through RFID scans at various points in the process, such as issuance from the growers DC, receipt at a Wal-Mart DC, and return to the grower's DC. Field testing lasted more than a year. Of those 110 containers, 109 could still be consistently read after the field testing period, with readability defined as being read within three seconds while driving a pallet at a safe speed through an RFID dock door portal reader.

The RPA did say tag placement was important to achieving these results, but at press time SCDigest could not get any more details on the placement issue.

"The independent study concluded that RFID tags that are designed for single use could be used for multiple trips without any deterioration in performance if positioned correctly on reusable containers," the RPA says.