

Cardinal Health Deems RFID Pilot a Success

The drug company has not yet determined, however, how to achieve satisfactory read rates of individual tags on pharmaceutical items packed in cases on pallets.

By Beth Bacheldor

Nov. 21, 2006—Drug manufacturer and distributor [Cardinal Health](#) recently wrapped up its months-long RFID trial, which included the pallet-, case- and item-level tracking of pharmaceuticals. The \$74.9-billion-a-year company says the technology's read rates are highly reliable, even at the unit level, and that UHF RFID is a promising technology for protecting and securing pharmaceutical supply chains. There's more work to be done, though, when it comes to achieving an acceptable read rate of individual tags on pharma items packed in cases and assembled into pallets.

Cardinal Health manufactures pharmaceuticals for nine of the world's top 10 drug companies and distributes one-third of all pharmaceutical, medical, lab and surgical products in the United States. The trial—which the company kicked off in late June to understand better how RFID tags are applied, encoded and read at normal production speeds—required about five months of planning (see [Cardinal Health Readies Item-Level Pilot](#)).

The trial bolstered the sentiment that EPC Gen 2 UHF tags are robust enough to use in the pallet-, case-, and item-level tracking of drugs, versus having to utilize a combination of UHF and HF tags. In fact, tests yielded an overall successful read rate of more than 99 percent when reading totes—plastic containers filled with bottled drugs to fill specific orders from pharmacies—as they move down a conveyor at a distribution center.

"There were a lot of doubts as to whether the UHF technology could work in very close proximities, such as what is in our packaging lines or production lines," says Julie Kuhn, vice president of operations technologies at Cardinal Health, headquartered in Dublin, Ohio, "and there was speculation as to whether we could use UHF in a tote environment, where you have many different kinds of packages and products—foils, blister packs, bottles, liquids, solids. In both of those scenarios, we felt the technology is very useable."

Cardinal Health shared the findings of its trial at last week's [RFID Health-Care Industry Adoption Summit](#) conference in Washington, D.C. There, Kuhn told attendees that the team experienced "many, many days where we had 100 percent read rates at the tote level," adding that the results were "highly encouraging."

Cardinal Health decided to share the details of its trial because company executives believe their experience is relevant to the pharmaceutical industry, and that it can help other firms trying to increase their understanding of RFID. In addition, says Kuhn, "we wanted to share data that says you can make one frequency work."

For some time, it had been thought that UHF—the preferred choice for case- and pallet-tracking—wasn't technically sufficient for item-level tracking. UHF didn't seem to work as well as HF for tighter, smaller read ranges. That debate has been quieted (see [RFID Vendors Unite to Promote UHF for Items](#)), and Cardinal Health's results should help even more.

Case-level reads also proved successful. In fact, Cardinal Health achieved read rates on cases of between 99.4

percent and 100 percent as the distribution center received them.

During the trial, Cardinal Health read tags at several points along its supply chain. At the company's Philadelphia packaging plant, it affixed printed RFID labels, embedded with Alien Technology UHF 915 MHz EPC Gen 2 tags, to individual packages of brand-name prescription drugs. The labels were automatically applied to the individual product items and cases, and manually applied to pallets; once applied, each label was encoded with a unique Electronic Product Code (EPC). RFID interrogator antennas on packaging lines, as well as RFID portals at dock doors, read the labels as the goods moved through the packaging plant and were shipped out to a distribution center in Findlay, Ohio.

RFID interrogators at the DC read the tags as the drugs were received and shuffled through the picking and packing processes. Finally, tagged unit-level drugs mixed in totes with non-tagged items were sent to a pharmacy in the Midwest, where an RFID portal at the store's dock door scanned tags as products moved into the facility.

In the course of the pilot, Cardinal Health says it learned that trying to read tags on individual items packed in cases on pallets is very unreliable. Item-level read rates in that scenario were very low—between 7.8 percent and 14.3 percent. Kuhn says the read rates were impacted because of physics. "It has to do with the radio frequency not being able to penetrate all the contents of the pallet," she points out. Cardinal Health even had the readers send RF waves to excite the item tags on pallets for 60 continuous seconds, but still it could not achieve acceptable read rates. Especially surprising was one test of items in totes placed in a wheeled metal cart instead of in cases on a pallet. In its DC, Cardinal uses such carts to carry multiple orders packed in totes, just as it uses pallets to move multiple orders packed in cases. Each cart has three or four shelves and is able to hold a total of about 30 totes. The read rate for tagged items on carts, however, was no better than the read rate for tagged items on pallets. "We thought we'd get better reads because the items weren't packed in as tightly, so there was more air between them, and we let [interrogators] spin for 60 seconds," Kuhn says.

Cardinal Health also decided to follow the practice of allowing the reading of item-level EPC tags at a single point along the supply chain—such as when goods leave a distribution center—to serve as the record for other points along the chain, rather than performing another item-level interrogation. The process is known as inference because Cardinal infers that the initial read was accurate, and that nothing has happened to change the status of pallet or cases. With the inference reading, Cardinal has an electronic record of all those individual item-tag numbers, which becomes part of the advanced shipping notice (ASN) for that pallet and its cases. The ASN is held in a database and correlated with the tag ID numbers for the items on that pallet.

Inference is used to avoid the problems that result if a read at subsequent points in the supply chain aren't as accurate as the first read. If a company were to read the item tags in a case at the staging area, for instance, with only 98 percent accuracy of items—a distinct possibility given that read rates aren't always 100 percent at the item level—employees would have to sort through the case manually to verify the product count. For internal operations, where an ASN is present, inference will suffice. But it doesn't work as well for the extended supply chain, where partners either don't, or can't, receive item-level ASNs.

"We were hoping we wouldn't have to use inference," Kuhn acknowledges, "but it may not be a big deal in our own operating environment because we already exchange advance shipping notices."

Kuhn and other Cardinal Health executives agree, however, that inference may not be acceptable to legislators and regulators, such as the U.S. Food and Drug Administration, which is focusing on drug-pedigree programs to stem the number of counterfeit drugs entering the U.S. pharmaceutical supply chain. Pedigrees, either electronic or paper-based, document a drug's chain of custody as it moves through distribution channels.

RELATED_ARTICLES "If, in fact, in a packaging or distribution process, you read something and saw all

the items, and then at the next stop didn't see all of them, from a regulatory perspective, that might very well kick off a recall [of the items]," said Renard Jackson, the company's executive vice president of packaging services, at the conference. If item-level read rates were consistently 100 percent, he added, "we might not need inference."

With a successful trial under its belt, Cardinal Health is ready to move on to the next stage. Though Kuhn declines to share details, she says the company will continue to build on the knowledge it has gained. "We'll now start to integrate RFID with our operational process," she says, "but we're still very much talking about learning. We're past trying to figure out the technology, and now we need to figure out how we can make it work in our environment."

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