

A 13-week project, which involved using EPC Gen 2 passive RFID tags to monitor the inventory levels of denim jeans, improved accuracy by 27 percent, while reducing labor costs.

By Mary Catherine O'Connor

Aug. 26, 2009—Adding to the growing body of research and studies it has developed in relation to the use of RFID in the supply chain, the [RFID Research Center](#), a part of the [Information Technology Research Institute](#) (ITRI) at the Sam M. Walton College of Business at the University of Arkansas, has published the results of a 13-week item-level tagging initiative it had conducted at [Bloomingtondale's](#) stores last fall. The study's authors determined that when the retailer relied solely on its current inventory management system (which shows what should be on hand based on what has been received in shipments and what has been sold), the accuracy of the inventory decreases over time. But when inventory was counted using RFID, the accuracy was improved by 27 percent. The researchers also found that using RFID to identify and count individual items took, on average, 96 percent less time than using bar codes for the same task. Finally, they found that using RFID to determine which items had been stolen helped further improve inventory accuracy.

Retailers devote a great amount of resources toward improving inventory accuracy because inaccurate inventory levels can lead to either out-of-stock products, resulting in lost sales or overstocks, necessitating that retailers discount product prices in order to sell excess inventory. Some studies have shown, however, that retailers' perpetual inventory counts (that is, the amount of stock retailers believe they have in their stores at any given time) can be more than 55 percent inaccurate.

The item-level tagging study involved two Bloomingtondale's stores—a control store and a test store—in northeastern United States. At the test store, [Avery Dennison](#) EPC Gen 2 passive UHF RFID tags were placed on men's and women's denim jeans. The tags were attached to the items as they arrived at the test store, and sales staff were instructed to remove the tags at the point of purchase. Returned merchandise was retagged by a store associate using an RFID printer-encoder. There were anywhere from 800 to 10,500 RFID-tagged pieces of merchandise in the test store at any time during the pilot (the number varied based on how many products were received and how many sold on a day-to-day basis).

For counting the tagged inventory, staff were supplied handheld [Motorola](#) EPC Gen 2 UHF RFID readers. During the first five weeks of the pilot, store staff used both RFID readers and bar-code scanners (reading the bar code printed on the product hangtags) to count the RFID-tagged stock in the test store. They also scanned the bar codes attached to the same SKUs in the control store. They did these counts in both stores three times per week, counting stock of denim jeans both on the sales floor and in the back room. Hardgrave's team used this data to establish a baseline for the inventory in the men's and women's departments in both the test store and the control store. For the remaining eight weeks, counts (both bar code and RFID counts) were conducted two times per week by a contracted inventory service. The inventory service followed the same procedures throughout the study to count inventory on the sales floor and in back-room storage areas. The data collected during these remaining eight weeks was used to compare with the baseline data.

In the test store, the inventory "was counted by both bar code and RFID to get a comparison of accuracy and to compare to system counts," says Hardgrave. "It also provided an efficiency measure of RFID over bar code." While the accuracy of RFID compared with bar code was not made public in this particular study, other studies have shown the RFID 95 to 100 percent accurate, while bar code is 80 to 85 percent accurate.

In addition, RFID readers were mounted at all employee and customer exits and entrances in the test store, in order to monitor whether tagged merchandise was leaving or entering the store.

The researchers found that when the data in Bloomingtondale's inventory management software was not adjusted by actual counts done with the RFID readers, the accuracy of the inventory levels declined over the 13-week period, as would be expected. However, once the inventory management system was adjusted for the actual counts done with the RFID readers, the inventory accuracy improved by 27 percent. Specifically, overstocks (meaning the inventory management software indicated fewer of a particular item than there physically was in the store) were decreased by 6 percent, while understocks (meaning the inventory management software showed a greater quantity of a particular item than was physically in the store) decreased by 21 percent.

The amount of time it took to conduct physical inventory counts using RFID was compared with the time it took to count using bar code scanners, and Hardgrave found that on average, 209 items could be counted per hour via bar code, whereas 4,767 items could be counted per hour via RFID. Overall, the net result is a 96 percent reduction in cycle-counting time by using RFID rather than bar code. His finding is that if Bloomingtondale's devoted the same amount of time and resources doing physical counts using RFID technology, it could perform those inventory-counting events 26 times per year. Currently, the stores take physical inventory counts (using bar code scanners) only once or twice a year. "Certainly, inventory accuracy is higher when taking and updating inventory counts bi-weekly than it is when taking inventory counts annually," says the report.

While loss prevention was not a focus of the study, it did provide anecdotal evidence that RFID can be used as an effective means of tracking inventory that is stolen. Hardgrave and his team compared all of the RFID tag reads collected by the RFID readers mounted at the store entrance and exits points with the bar code data collected at the points of sale in the test store. This way they could account for the RFID-tagged items that were sold but from which the sales clerk forgot to remove the RFID tag. Once these items were removed from the list of tags collected at these readers at the entrance and exit points, it was determined that several RFID-tagged items were, indeed, stolen during the course of the study. In two cases, the thieves were apprehended.

Based on this finding, the report notes that even if it were not tied into a security application, the use of RFID readers at store exits and entrances would help retailers understand which products are being stolen and this would help them further refine the accuracy of inventory levels, since perpetual inventory records currently do not account for stolen items.

This 13-week study is part of a larger research effort that Hardgrave and his team is undertaking, in order to demonstrate and quantify the business value of RFID in retail environments (see [Dillard's, U. of Ark. Study Quantifies RFID's Superiority to Manual Inventory Counts](#) , [Cold Chain and Item-Level Tracking Will Drive RFID Adoption](#), [University of Arkansas Kicks Off Apparel and Footwear RFID Study](#). A copy of the study is available for download at [ITRI's Web site](#) (enter "RFID" as the keyword).