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RFID Gains Traction at John Deere

Topics/Verticals: Operations, Asset Tracking, Retail, Manufacturing, Logistics

The heavy-machinery manufacturer is using EPC Gen 2 tags to aid quality control, monitor work-in-process and streamline production.

By Beth Bacheldor

Oct. 12, 2007—John Deere, the Moline, Ill., manufacturer of agricultural and construction equipment and residential lawn mowers, has been testing and using passive RFID in its manufacturing operations for at least two years. Now, the company is ramping up its efforts. In May, John Deere began using EPC Gen 2 RFID tags to ensure products meant for repair don't end up at retail stores. This month, the company is launching an EPC Gen 2 pilot in one of its factories, to monitor work-in-process (WIP) and ensure parts are at the right spot at the proper time. The firm is also integrating an RFID system with its manufacturing execution system (MES) in another factory, to improve production efficiencies and accuracies for a product it is now launching.

According to Mark Moran, technology architect at John Deere, the company had a specific goal in implementing an automated tracking system to monitor outbound logistics operations that move products to retail stores: It needed to be sure products coming off the line with quality issues and marked with repair tags didn't end up on delivery trucks bound for retailers. Moran described his company's RFID initiatives at the EPC Connection 2007 conference in Chicago earlier this month.

Mark Moran

"Occasionally, products that had repair work to be done made their way out to retail shops," Moran says, adding that although it doesn't happen often, even one time can be very problematic. "Every time a product with a repair tag goes out, that erodes the John Deere brand."

Now, an EPC Gen 2 RFID label is affixed to each laminated paper repair tag placed on a defective product at the end of the manufacturing line. These products are pulled off the line and set aside to be sent back for repairs. RFID portals at eight dock doors have been equipped with built-in filters that trigger lights and horns if a tag is read, ensuring that no RFID-tagged products are loaded onto delivery trucks bound for retailers.

Although John Deere's passive UHF RFID implementation on outbound logistics has been going well, Moran says—particularly since switching to EPC Gen 2 tags at least a year ago—the company did not opt for passive UHF right out of the gate. Instead, it hosted what he calls an "RFID Bake-Off" last spring, testing EPC Gen 2 mount-on-metal tags, active tags and ultra-wide-band (UWB) tags in a real-time locating system (RTLS). All three tag types performed well during the "bake-off," providing accurate reads 100 percent of the time. The least-expensive solution was the UWB RTLS, while the most expensive was the active tag system.

Ultimately, John Deere chose EPC Gen 2 tags, since it already had experience with the technology and

required no additional server or middleware. "We just put the tag on," Moran says. "The smart readers have filters that trigger the alarm. All that really matters is that there's a pattern—which is the tag's unique ID number—that the reader can recognize via the filter. If the filter sees this set of characters, then it reacts."

The RFID-enabled WIP monitoring process, going live now in a different John Deere factory, is more complex, though Moran declines to name a specific location, or reveal which products are involved. Parts are placed in totes tagged with EPC Gen 2 inlays, and the RFID system monitors the loaded totes as they leave the factory, are transported via a third-party logistics provider to a supplier that paints the parts, and are returned to John Deere. RFID interrogators have been installed at the factory, and at a facility operated by the logistics provider. According to Moran, the pilot will involve the tagging of 300 totes used to transport about 75 different types of parts.

Prior to launching the RFID tracking system, John Deere tracked the parts in different types of totes as they moved through the WIP, by manually scanning bar codes attached to the totes. The bar codes represented what Moran calls kanban ID numbers, and were correlated with specific parts and processes in John Deere's SAP enterprise resource planning (ERP) system.

The company leverages just-in-time manufacturing and kanban processes throughout its operations, ensuring that parts and materials arrive when needed for production, rather than ending up as inventory. Kanban, the Japanese term for signal, establishes a "pull" instead of "push" system of moving goods through the factory. Kanban numbers are utilized to signal the start of steps, such as raw-material replenishment, that flow in reverse order (from shipping of goods to receiving supplies) in a production line.

Previously, the bar-code system had not been as reliable as needed. Workers sometimes failed to scan the bar codes, or the system was unable to read them. In fact, Moran notes, the company found that bar-code scans were accurately captured only 85 to 98 percent of the time.

Missed bar-code scans can cause a parts shortage that ultimately shuts down a manufacturing line—a costly event that can happen four to six times a year, Moran says. Even if the line isn't stopped, he adds, many resources are wasted when parts need to be tracked down.

Therefore, John Deere now plans to test EPC Gen 2 tags affixed to the totes via adhesive. Each tote will contain four RFID labels, which will have the same serialized kanban and EPC numbers encoded to their chips. Reads of the kanban number will be used the same way as the bar codes: Middleware will push the numbers up to the SAP system, where the kanban numbers and their correlated information reside. Reads of the unique ID number on the four tags will then be used to document tag-read accuracies and failures.

Assuming John Deere is able to read the tags consistently and accurately, the pilot is expected to run for about a month. "Then we will look to more broadly roll it out," Moran says. The 300 totes involved in

the trial represent approximately one-tenth of that factory's tote population.

The third RFID implementation is being installed in a new manufacturing line for a new product. Central to this implementation is its integration with John Deere's MES, which provides line operators the specific instructions required at each step of the manufacturing process. Mount-on-metal EPC Gen 2 tags, encoded with unique ID numbers representing product serial numbers, will be affixed to each product. RFID interrogators positioned throughout the assembly line will read the tags, and middleware will pass the tag data on to the MES.

"From that scan, the MES will know which product has come to that manufacturing station, so the MES will know what instructions to give," Moran explains. The integration of MES and RFID will obviate the manual bar-code scanning process that would have had to be in place had John Deere implemented a bar-code system to trigger the MES' instructions. Building this product would have involved 50 to 60 bar-code scans (one at every station in the assembly process, each taking 6 to 8 seconds). Not only do RFID reads take milliseconds, the use of RFID eliminated many of the scans required with bar coding. "You save a few seconds a whole bunch of times," Moran states, "and that starts to amount to a lot of savings."

These RFID implementations—tracking outbound logistics, monitoring WIP and streamlining the MES process—are only three of about a dozen passive UHF RFID projects John Deere has conducted this year. One of its earliest RFID projects, back in 2005, paved the way for the others: The manufacturer began implementing a UHF passive RFID system in July of that year, to help it track engine parts placed in reusable plastic totes and sent from a facility in Fargo, N.D., to an engine assembly plant in Waterloo, Iowa. With RFID, John Deere was able to track parts automatically by reading the unique IDs encoded to the reusable passive RFID tags attached to the totes as they moved through portal readers in the shipping and receiving docks at both facilities.

The RFID system also tracked the totes as they were unloaded at the Waterloo site and sent to a third party for cleaning before being returned to Fargo. The totes were sometimes misplaced, and the company had to purchase new totes as a result, even if there had been no increase in production to merit the purchase. By reading the RFID tags attached to the totes as they left the Waterloo assembly plant, John Deere was able to determine which totes were in the cleaning cycle and bound for the cleaning facility. That pilot is no longer in operation, but Moran says the company leveraged the experience, and is even reusing some of the RFID readers used in it.