Case Study

With APICS Education and RFID Technology, American Woodmark Corporation Targets Superior Work-In-Process, Inventory, and Quality Controls.

This case study was originally published as a Corporate Spotlight in the January/February 2016 issue of APICS magazine. The article, written by Managing Editor Elizabeth Rennie, can be found under the title "On-the-Mark Innovations."

Results

- Employees learned how the technology could help them perform everyday tasks faster and more accurately.
- Achieved 99.6 percent or better read rates
- This enhanced visibility has enabled significant cost reductions and a superior customer experience.

ASCM ASSOCIATION FOR SUPPLY CHAIN MANAGEMENT

At American Woodmark Corporation, kitchen and bathroom cabinets are built to order using more than 500 product lines and while holding no finished goods inventory.

The build process on an individual project starts only when an order is placed and processed, and each kitchen or bathroom cabinet is manufactured in sequence for delivery to the customer's home. To consistently grow market share, employees at the Winchester, Virginia-based business are focused on identifying ever-changing customer tastes and preferences and reacting quickly to these trends.

The company has more than 136,000 face components at the base-item level. Not too long ago, these components did not have any onboard identification, descriptive labels, or bar codes. They were produced, warehoused, picked, shipped, and received at sister facilities and then warehoused, picked, and built into the customer's kitchen. Yet, at each of the key points in the process, these items were identified only by sight to record the transactions.

Unfortunately, components identified by sight consistently carried a 6 percent error factor, corrupting inventory balances. American Woodmark leaders recognized that accurate inventories depended on accurate transactions, and accurate transactions required accurate component identification. That's why they began a radio frequency identification (RFID) improvement project. In the end, this program proved so successful that American Woodmark earned the 2015 APICS Corporate Award of Excellence in Innovation.

Aiming for accuracy

"We were spending a significant number of hours training and retraining our teams on door styles," says Dave Johnson, materials technology and project manager at American Woodmark. "Because all transactional activity was done by sight, our inventory accuracy was tied to the level of training provided to the teams."

In addition to the staff education component, Johnson says the improvement program aimed to achieve reductions in cycle count and data input labor, improved cycle count accuracy by capturing data from tags versus manual counting, and the ability to track doors throughout the manufacturing process for improved visibility. To accomplish these goals, decision makers sought a way for employees to mark components by applying a machine-readable mark that would be invisible to the customer. The marking also had to transition effectively from a white wood state to a finished state and be quickly identified at key points throughout the manufacturing process so as to not add to the cycle time. In addition, it needed to be applied early on in the process; quickly adaptable when a component changed form, fit, or function; and able to survive American Woodmark's rigorous manufacturing processes.

In order to determine the best technology to meet these criteria, an evaluation committee was established. Representatives from manufacturing, materials, engineering, and information technology (IT) approached the issues with a plan to install a scalable and expandable RFID solution. Cognizant of American Woodmark's vertically integrated manufacturing platform, employees analyzed the entire supply chain to determine where to place the RFID equipment to best support component flow. It quickly became apparent that this would require multi-plant installations, both within the organization and at external suppliers.

Several RFID integrators were interviewed to assist with the project, with the team ultimately selecting Fort Wayne, Indiana-based Northern Apex. Rick Raber, Northern Apex's chief technology officer, says his company supplied American Woodmark with the necessary hardware, which included readers, antennas, tag applicators, speed-control lasers, corresponding handheld devices, and a powered cycle-counting cart to provide consistent scan speeds. The motorized RFID cycle-count cart contains numerous antennas, a laptop computer, an RFID reader, a battery pack, and a wireless network connection. Each antenna is set to count a particular rack level, and doors or drawer fronts are vertically located in the slots. As the cart moves down the warehouse aisles, all rack levels are counted simultaneously. One side of an aisle can contain several thousand doors and drawer fronts, all identified and counted in one pass.

"The cycle-counting portion of the project required high read accuracy within the tag-rich environment of the American Woodmark warehouse facilities," Raber says. "It was important to leverage speed control, multiplexed antennas, and other significant customization within the cycle-counting cart to achieve the desired read results."

Fixed RFID readers were placed at key transaction points in the manufacturing process, particularly areas that would benefit from enhanced visibility, movement awareness, and process control, as well as spots where tags must be rewritten. The RFID reads are validated for proper format and content at each location. Then, the data is made available to the American Woodmark team for access and manipulation via shared tables.

"Data is used for reporting daily work cell production quantities, material planning, remakes, shortages, and quality data input," says Greg Weigel, American Woodmark director of manufacturing systems. "We also use [it] to close internal work orders, record scrap transactions in real time, accumulate scrap data quickly to use in root cause analyses and process corrections, update perpetual inventory balances from cycle counts, check accuracy of picks, support the direct-ship process, validate doors at the hinge station, validate drawer fronts at the fronting station, and check the accuracy of outgoing pallets."

To get employees up to speed on the new capabilities, American Woodmark used training modules and an awareness initiative, which Johnson describes as "a bit like 'RFID for beginners.'" Employees learned how the technology could help them perform everyday tasks faster and more accurately. In addition, the IT team trained technical support specialists at company plants to access and use the data that RFID provides.

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— Dave Johnson, Materials, Technology, and Project Manager

American Woodmark is an APICS corporate client and holds ongoing, in-house APICS certification classes for its employees. "We are on our third group going through the process," Johnson says. "We normally have 9–12 participants, and we conduct these classes at our corporate office."

Importantly, American Woodmark pays for its employees' APICS membership dues, all necessary certification materials, and all testing fees. To date, 11 participants have earned their Certified in Production and Inventory Management (CSCP) designations, and 3 have become APICS Certified Supply Chain Professionals.

Testing the solution

A cross-functional team was charged with assessing the proof-of-process pilot. This group was composed in a similar manner to the evaluation committee: Players included people from manufacturing who could provide input pertaining to process tracking and control, materials managers for inventory control and transactional activity expertise, engineers to offer process integration direction, and IT professionals for systems-integration guidance.

Weigel says this team conducted manual simulations, during which hundreds of inlays were applied by hand on door-insert panels and then sent through the normal door flow of build, sand, finish, pack, and transport. "We set up testing stations after each process to check read rates," he says. "We tested 100 percent of the doors to ensure that the inlays could survive our normal processing [and] achieved 99.6 percent or better read rates with these test doors."

99.6% **OR BETTER READ RATES**

Based on this success, the team presented the results to company leadership. Recognizing the RFID initiative's potential, funds were allocated to purchase required equipment and inlays. Soon after, 10,000 components were tagged, built, and finished.

The next step involved checking if an item number encoded to an inlay could be rewritten to a new item number as the component on a belt conveyor passed under a fixed array of antennas. "This was a critical test for the process we designed," Johnson says. "In our design, we planned to load white wood doors on the belt conveyor of an automated finishing line, input the finish color for the run, read the tag as it passed under the array, perform a lookup to determine the finished item, and then write the finished item number over the white wood item number. With some slight tweaks, this process worked without a hitch."

Trials along the way

Johnson says there are always surprises when implementing a project of this scope. "Extraneous reads created challenges for us," he admits. "In many of our areas, we have tag-rich environments. In others, we have lifts moving doors in and around individuals using RFID hand scanners. And in different areas, we have metal where signal bounce creates issues. The catch-22 is that the areas with the most transactional activity are also the areas with dense tag populations. So, the locations where the technology provided the greatest benefit often were the most challenging areas [in which] to isolate the read zone."

He and his team addressed this performance issue via several approaches. Where possible, they marked the floor to establish "keep-out" areas that would prevent tagged material from passing near readers. Where isolation was impossible, they installed shielding. Team members also experimented with different materials and form factors. Over time, they developed a level of expertise in choosing which material and configuration would work best for a specific location. In some places, they constructed enclosures—some configured with doors and some with roofs, reflecting the specific process and environment.

Making connections

Today, American Woodmark has deployed its RFID solution in seven company facilities and at four external suppliers. Depending on the location and process, RFID-enabled areas include purchased item receipt, door and drawer front build, finishing, quality, shipping, stocking, and cycle counting. Company leaders say the greatest benefits so far come from having an interface between what is happening in the "physical world" on the production floor and the "virtual world" of American Woodmark manufacturing systems. This enhanced visibility has enabled significant cost reductions and a superior customer experience.

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>
> *— Dave Johnson, Materials, Technology, and Project Manager*

Johnson says the real work started after the RFID infrastructure was put in place. "We have just scratched the surface of the value of the visibility RFID provides," he says. "RFID technology in and of itself does not fix anything; rather, it is an enabler. It allows for the capture of data very quickly and accurately in relative locations, which then requires the development of innovative approaches to turn this information into knowledge."

With the RFID backbone in place, American Woodmark is actively looking for opportunities to capitalize on the increased visibility and accuracy. For example, there are significant opportunities to expand the use of the technology to facilitate information to and from customers. Future projects also will include American Woodmark's doors, drawer fronts, and front frames. In terms of these items, employees are RFID enabling transactional activity and, where required, adding visibility points. In addition, dock doors will be able to track interplant shipments of all pallets within the internal supply chain.

"We see no end in sight to the potential applications," Johnson says. "You can always keep striving for improvement and never be content with the status quo. Visibility in real time as to how the supply chain is performing is a critical element to being a world-class organization.

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