

MODERN MATERIALS HANDLING

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Office Depot: Flexible automation

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Brent Beabout,
vice president of
global network
strategy and
transportation,
Office Depot

OFFICE
DEPOT'S

FLEXIBLE

AUTOMATION

By **Bob Trebilcock**,
Executive Editor

When Office Depot decided to consolidate three distribution centers and a crossdock facility into one, new state-of-the-art DC in Newville, Pa., the office supplies retailer looked for an automated materials handling solution that was efficient and flexible. More importantly, they wanted a system that would deliver a competitive edge in the marketplace.

They found that edge in a goods-to-person picking solution featuring two different mobile robots (Kiva Systems, 781-221-4640, www.kivasystems.com). One robot handles cases while a larger robot moves pallet loads in the facility that went live just a few months ago.

Betting a part of your distribution strategy on robotic materials handling may seem like a risky move, especially given the conservative nature of retail distribution. But, Office Depot is convinced that the time has come for robotics in the DC; after three decades on the manufacturing line, robotics technology is proven, reliable and, says Office Depot, a potential game changer (for more on robotics, see p. 26).

"We believe that the future belongs to the brave," says Brent Beabout, vice

president of global network strategy and transportation. "We are in a commodity business and the supply chain is a differentiator. We plan to be on the front end of that."

While some brick-and-mortar and dot.com retailers have implemented robotic solutions similar to the one in Newville to manage their direct-to-consumer orders, Office Depot is taking the technology deeper into its operations than other early adopters. "Most implementations are focused on one process, like each picking," explains Juan Guerrero, senior vice president of supply chain. "Along with each picking, we are also doing case picking and full pallet movements with the robots. We will handle everything but non-conveyables or items that are just too heavy to go through the system."

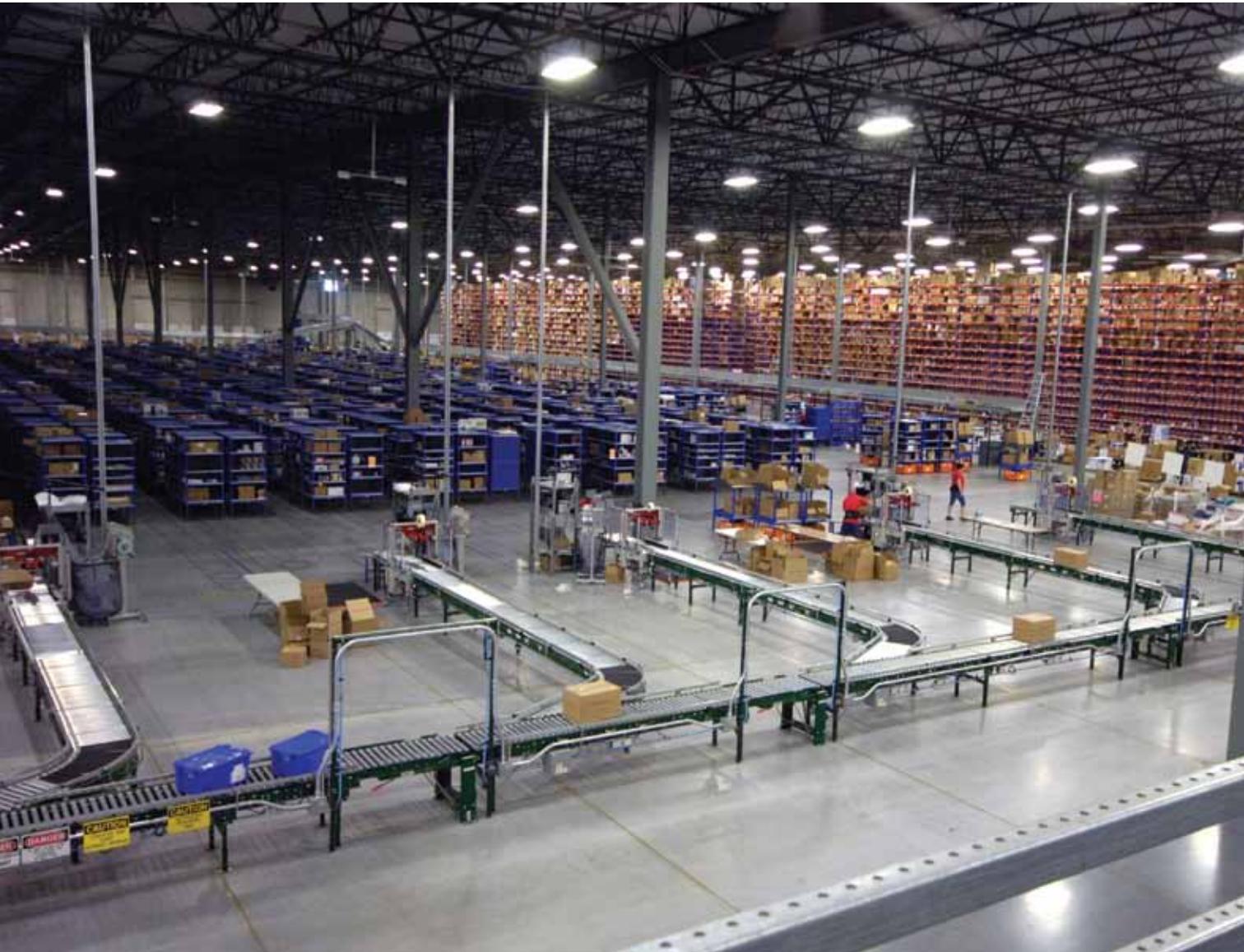
What's more, Office Depot is using the robotic system to manage order fulfillment across all of its sales channels and not just direct-to-consumer. This includes store replenishment and bulk deliveries to business customers.

In all, 100,000 square feet of the 600,000-square-foot building are devoted to the system including the picking stations, which feature 300 robots and



Bob Zelis, senior director (left) and Brent Beabout, vice president of global network strategy and transportation

Mobile robotics is powering Office Depot's new demand-driven distribution center.



Photos by Alan Wycheck/Getty Images

enough portable shelving space to manage three days of inventory. To minimize lift truck travel time, the mobile robotic system is augmented by a takeaway conveyor system and sliding shoe sorter.

Beabout and Guerrero say the robots have reduced the average travel by an associate from 7 miles per shift in a typical distribution center to less than half a mile; meanwhile the order cycle

time has been reduced from 2 hours to 20 minutes. "This system is going to move us from where we were, which was industry-leading customer service levels, to a point well beyond that of our competitors," says Guerrero.

Starting from scratch

Founded in Boca Raton, Fla., in 1986, Office Depot is a leading supplier of

office products and services, with more than \$12 billion in revenue, 1,500 retail store locations and 42,000 associates worldwide. The company does business in 52 countries.

The Newville DC was a result of a growth strategy that has been driven by acquisitions for much of the past 25 years. Those deals not only brought new retail locations under the Office



1. Picking instructions are delivered to a touchscreen. 2. Associates pick items from a portable module. 3. Picked items are placed on a portable module. 4. Mobile robots deliver the modules to the conveyor system (5) for induction. 6. Cartons are sorted to a packing station.

Depot umbrella, they also added warehouses and distribution centers. As of a few years ago, Office Depot had 33 buildings in its network, including several low-volume facilities. Typically, these came in two flavors: crossdocking centers to replenish retail locations and distribution centers to service business customers and direct-to-consumer Internet and catalog orders.

The collection of facilities was less than optimal. “We decided to use the recession to take a hard look at our network and optimize our systems,” says Guerrero. Today, the company has reduced that number to 17, with an ultimate goal of reducing the number of facilities in the network to 12.

To reach that number, Office Depot has closed and consolidated some facilities and upgraded the capabili-

ties in remaining facilities. Newville, which currently serves 107 stores in the Northeast, was different. In that region, where the retailer operated four facilities with a total of 829,408 square feet, there was a unique opportunity to reduce the overall footprint of operations by building a brand-new facility because the leases were coming due on some of the buildings.

“We wanted to take a holistic view of our supply chain, and not just what happens within the four walls of the DC,” says Beabout. “As we did the research, we realized that none of the existing facilities in the Northeast was really centrally located to where we were doing most of our business from a transportation standpoint. It made more sense to start fresh.”

Newville had several advantages

from a transportation standpoint, and it had an available pool of highly skilled potential employees: The company received 4,000 applications and interviewed 1,200 candidates to fill 250 slots. “You don’t get that kind of job pool in every area,” says Beabout.

New facility, new technology

Building a Greenfield facility also presented an opportunity to optimize the materials handling systems inside the DC with a new distribution model featuring two distinguishing characteristics.

Instead of operating separate DCs for store replenishment and direct-to-customer deliveries, Office Depot wanted a system that could integrate with its homegrown warehouse management system (WMS) to handle every line of business and sales chan-



our new pull model, every store will get a just-in-time delivery nearly every day of the week,” says Guerrero. “We’re beginning with the 107 stores served by Newville, and then we’ll roll this concept out across the country.”

After looking at traditional pick and pack solutions, including voice-directed pick modules similar to those used at other Office Depot facilities, Guerrero and Beabout chose mobile robotics, a technology they had been investigating for several years. The system uses a small robot to move mobile storage devices to and from associates at workstations, and a larger vehicle designed to handle full pallets. Once picks have been completed, the robots deliver the units to a conveyor induction station, where the shipping containers are placed on a conveyor and sliding shoe sortation system and are sorted to a shipping lane.

Several factors led to this choice:

Goods-to-person: In traditional pick modules, associates walk to pick locations. In the robotic solution, the robots bring the product to the associate’s workstation, saving steps. “A lot of the waste in the DC has to do with walking,” says Beabout. “In this case, that’s gone.” In addition to productivity improvements, the system was very accurate, which would reduce picking errors.

Dynamic slotting: The robotic system monitors the movement of SKUs and slots the inventory according to how fast the product turns over: The fastest moving items are stored closest to the workstations. That leads to better use of the robots and minimizes the size of the fleet required.

Proven and reliable: The robots were up to the task. “There was a concern about going away from a traditional automated materials handling system,” says Guerrero. “But, we did our due diligence. We visited systems that have been in operation in existing facilities, and we asked the hard questions you would ask about an automated system. The performance, recovery times from failure and risk management were robust enough for our operation.”

Flexible and scalable: There is no question that other automated materials handling solutions are effective in a goods-to-person environment, including mini-load automated storage and retrieval systems (AS/RS) and horizontal carousels. What tipped the scales in favor of mobile robotics was the flexibility to handle pieces, cartons and pallets and to easily scale in the future. “Reliability was important, but any solution had to be reliable for us to even consider it,” says Beabout. “We justified the system on productivity, the ability to co-mingle and pool inventory and the ease of adding to the system in the future. If your throughput or inventory grows in the future, all we have to do is allocate more floor space to the robotic system and add robots. We can do that overnight.”

According to Guerrero and Beabout, the building was also designed to further Office Depot’s sustainability goals. T5 lighting and energy efficient HVAC are used throughout the DC along with recycled materials wherever possible. Energy consumption is monitored, and Office Depot will use renewable energy resources to offset consumption. Finally, it was designed to have the lowest environmental footprint possible while still meeting throughput requirements. The company intends to seek Leadership in Energy and Environmental Design (LEED) certification from the U.S. Green Building Council.

Robotics may play a role there as well. “The facility is eerily quiet,” says Guerrero. “You don’t hear the robotics at work, so the only sounds are people talking, lift trucks or the outbound sorter, which is pretty quiet as well.”

While mobile robotics is providing answers to the distribution requirements in Newville, that doesn’t mean Office Depot will adopt the technology everywhere. “We don’t have stars in our eyes and we don’t pretend that robotics is the right solution for all of our facilities,” says Beabout. “We will assess each facility individually going forward. However, this was the right fit for this facility and our overall supply chain objectives.” □

nel where it operates. What’s more, it wanted the flexibility to scale the business during seasonal periods, or, ultimately, to easily scale up as the overall business managed by the system grows. “We have a lot of common SKUs across our different lines of business,” says Guerrero. “By pooling the inventory in one facility managed by a common WMS, we can reduce the amount of inventory we have on hand.”

Finally, and most important, the system had to have the capabilities to manage Office Depot’s transition to a true, demand-driven distribution network. Instead of delivering a pallet load of material that a store will sell through, the goal is to start the season with a minimal amount of product and then make store deliveries five days a week to replace only what was sold the day before. “In

Putting robotics to work

A goods-to-person picking solution managed by 300 mobile robots is at the heart of a new Office Depot distribution center.

By Bob Trebilcock, Executive Editor

While a fleet of mobile robots sounds complex, the processes designed and implemented by Office Depot are deceptively simple. The distribution center also includes a regional print facility (13) for printing jobs that are too large for an Office Depot retail location.

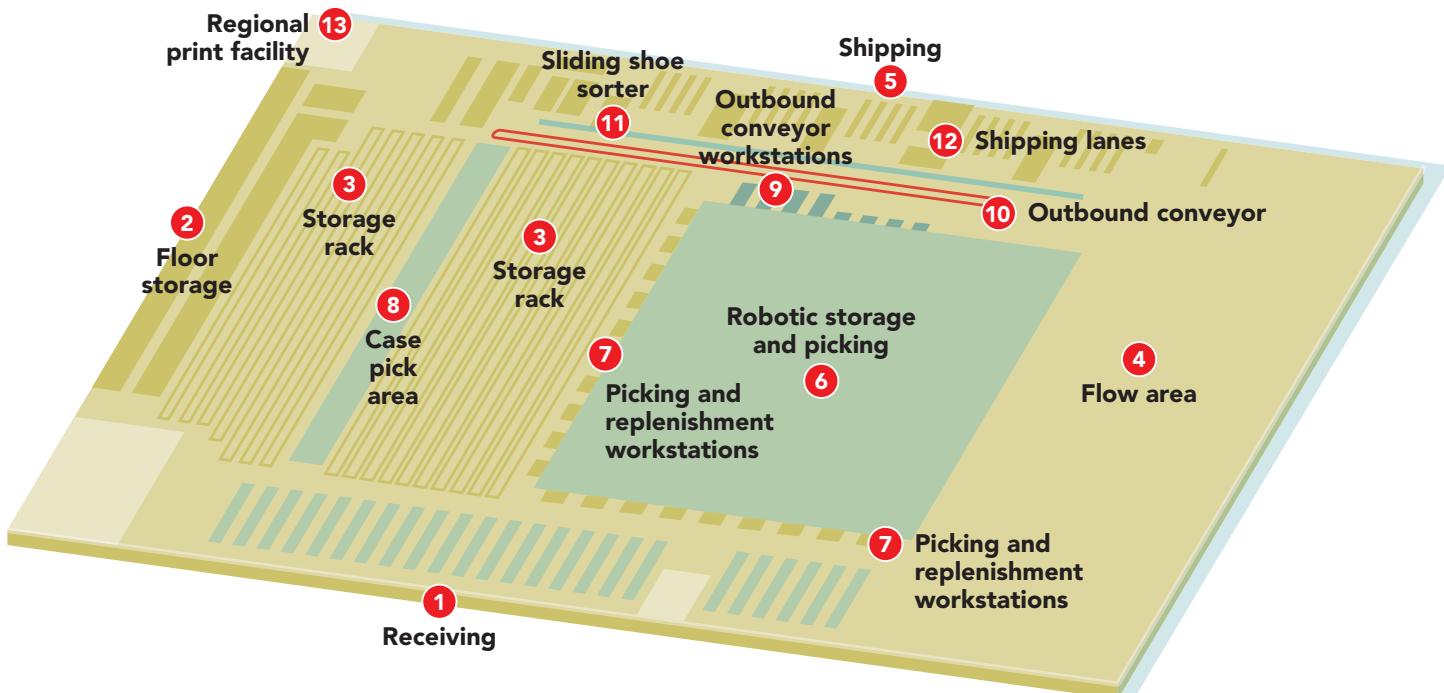
Receiving: When a trailer arrives at the receiving area (1), pallets are unloaded by lift truck. A scan of the pallet label enters the pallet into the warehouse management system (WMS). Once the contents have been compared against an electronic advanced ship notification (ASN) and accepted in the WMS, the product is ready for putaway.

Putaway: The WMS directs putaway and can choose three paths for newly arrived product. Product that isn't needed right away is transferred by lift truck to a bulk storage area, where pallets are stored on the floor (2) or in a pallet rack (3). The facility includes traditional pallet rack and sections of very narrow aisle (VNA) rack. Pallets with heavy or bulky materials such as paper are temporarily stored in a flow area (4) and then crossdocked directly to the shipping area (5). The remaining product is putaway into portable shelving units and stored in the robotic storage and picking area (6) serviced by the mobile robots.

**Office Depot
Newville, Pa.**
Size: 600,000 square feet
Products: Office supplies, technology and furniture
Throughput: 60,000 lines per day
Shifts: 5 days; 2 shifts
Employees: 250

When a pallet of material is delivered to the shipping area (5), it is processed through the sliding shoe sorter (11) and outbound conveyor workstations (9) to the shipping lanes (12) and outbound conveyor (10).

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Daniel Guidera

ered to a picking and replenishment workstation (7) near the picking area, the associate chooses the put-away function for the system. That signals a robot to retrieve a storage unit from the storage and picking area (6) and present it at the workstation (7). The associate scans the bar code label on a carton and places a device with a light on the carton. When the storage unit arrives at the workstation (7), a laser directs the associate to the right location on the storage unit. The associate presses a button at the workstation to confirm the putaway.

When all the cartons for that unit have been stored, the robot returns the unit to the storage area (6) and delivers the next unit to the workstation (7). The system determines the putaway location for the unit based on the velocity for that SKU. Fast-moving items are stored closest to the workstations, slow-moving SKUs are stored further away.

Picking: A limited number of large non-conveyables are picked from storage by lift trucks and delivered to the shipping area (5). Similarly, cases of product that are too heavy for the robotic picking system, such as paper or bottled water, are picked to a pallet in a case pick area (8) and are then delivered to an outbound conveyor induction workstation (9) where they are placed on the outbound conveyor (10). They are then sorted by a sliding shoe sortation system (11) to an outbound shipping lane (12). Product may

System suppliers

MOBILE ROBOTIC PICKING SOLUTION: Kiva Systems, 781-221-4640, www.kivasystems.com

CONVEYOR, DOCK CONVEYOR AND SLIDING SHOE SORTER: Dematic, 877-725-7500, www.dematic.com/na

RACK: Unarco Material Handling, 800-862-7261, www.unarcorack.com

LIFT TRUCKS: Crown, 419-629-2311, www.crown.com

BAR CODE SCANNING: Motorola, 800-722-6234, www.motorola.com

PRINT AND APPLY: Pyramid Controls, 513-679-7400, www.pyramidcontrols.com

SYSTEM DESIGN AND INTEGRATION: Office Depot, including a proprietary warehouse management system

be palletized for shipping (5) or it may be floor-loaded for parcel shipments.

Everything else, including totes for store replenishment, direct-to-consumer Internet orders and orders for Office Depot's business customers, are managed by the robotic picking system (6). The process is similar to putaway. The WMS system receives orders from Office Depot's order management system and forwards that data to the robotic system. The system then prioritizes the orders that must be picked first to meet shipping cut-off times or customer requirements.

To initiate picking, an associate logs into a workstation (7) and chooses the picking function. That signals the system to retrieve a pod with empty shipping cartons for orders (6) and deliver them to the workstation (7). Meanwhile, the system also delivers the storage units (6) with the inventory for those shipping cartons to the workstation (7). When a unit presents itself, a terminal at the workstation will display a picture of the SKU, the SKU

number, the number of items to be picked and the bin location where the product is located. A light also identifies the picking location.

When the associate scans the item, a light on the unit with shipping containers begins to flash to identify the right shipping container. Once the items are placed in the shipping container, the associate pushes a button on the unit to confirm the pick. When all of the orders for that unit have been completed, the robot delivers it to one of six lanes in the outbound conveyor induction area (9).

Packing/shipping: At the conveyor induction station (9), an associate places the cartons on the outbound conveyor (10). They are automatically scanned, which generates a shipping label that is automatically applied. The sorter (11) then sorts the carton to the correct shipping lane (12). As with other product, cartons may be palletized for delivery to a store, or they may be floor-loaded for a parcel shipment to a business or direct-to-consumer order (5). □