

Smart Robotics

Meet e-Commerce

Automation can help companies moving from case picking to piece picking for e-commerce fulfillment.

BY JIM MCMAHON

A problem that almost all e-commerce retailers are grappling with is how to adapt fulfillment requirements to meet the exponential growth of online ordering. Online purchasing in the United States is growing by more than 17 percent annually, according to the U.S. Department of Commerce, with \$193 billion in retail sales for the first three quarters of 2013. E-commerce orders accounted for 7 percent of total U.S. retail sales in 2012. By 2017, continued double-digit annual e-commerce growth is expected to reach 10 percent of total retail sales in the U.S., according to market analysts Forrester Research.

Interestingly, 80 percent of this revenue is coming from only about 10 percent of all e-commerce players. Amazon alone chalked up \$49 billion in sales during the

first three quarters of 2013 — 25 percent of all e-commerce sales in the U.S. during this period — followed by other big online players like Walmart, Apple and Dell. For e-commerce retailers, the challenge of handling their Internet fulfillment lies with predicting what their order volume will be in three, five or even ten years.

E-commerce Unpredictability

The real conundrum is that this e-commerce growth is entirely unpredictable. Some Internet fulfillment companies are reaching their five-year or 10-year goals in two years and have completely outgrown their warehouse space, forcing them to rely on leased facilities or 3PLs. This unpredictability is compounded by fulfillment challenges that virtually all e-commerce retailers are attempting to deal with — challenges that include the following:

- Large SKU counts
- Small number of pieces or lines per order
- Extreme peak season volumes
- Under-stocking due to unpredictable changes in market demand
- Customer expectation of fast 24 to 48 hour delivery
- High volume of returns from consumers.

Because unpredictability is a constant factor in e-commerce, flexibility and scalability in fulfillment operations is absolutely critical. As an e-commerce company's needs increase or decrease, its pick, pack and ship model should be able to accommodate these fluctuations.

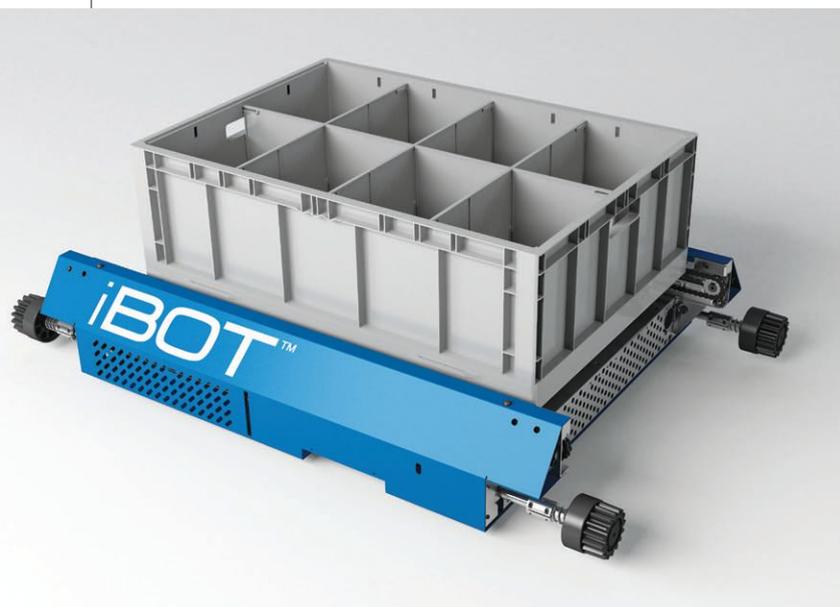
For bigger online retailers, the solution for improved flexibility and scalability has been to automate their fulfillment operations in an effort to support the fluidity that e-commerce demands.

Answering With Automation

Quite different from large Internet retailers, however, the 90 percent of all retail Internet suppliers that are small-

In goods-to-person picking, robotic shuttles can bring items to a picking station and return the totes to storage automatically.

OPEX Corporation





and mid-sized e-commerce companies are not highly automated. Typically, they utilize a conventional person-to-goods model for picking and packing, many operating on a manual paper-based system to compile orders. In such an order fulfillment model, inventory is stored in racking or on the floor, and the most efficient pick paths are determined by routing logic. This person-to-goods order picking paradigm has been used for decades with case picks and pallet picks with an established level of success. For e-commerce fulfillment, however, small-quantity, multiple-SKU orders are becoming increasingly difficult to handle with conventional manual-pick systems.

Where a picker had to spend 60 percent of the time traveling and 40 percent of the time picking, as is typical in a person-to-goods model, supply chain executives dealing with the rise of e-commerce orders are looking for more efficient solutions to minimize the amount of wasted time between picks and to increase the number of orders processed per person.

Every Step Counts

From the moment the online order is placed to when it is picked, packed and shipped, every step in the process must be handled efficiently, consistently and cost-effectively to maintain a positive customer experience and to ensure the fulfillment center remains profitable. In most e-commerce centers, picking is the most labor-intensive function and can usually provide the most cost-savings when automated.

Because e-commerce fulfillment deals almost exclusively with eases or piece-picked orders, reducing the number of times the picker handles the product is critical to improving efficiency. The right automated solution should facilitate

the minimization of touch points, which will result in more accurate orders, improved ergonomics, lower labor costs, reduced worker travel time and fewer returns.

For small- and mid-sized e-commerce retailers, however, it can be quite a challenge to justify the capital equipment ROI of automated systems. But upgrading automation does not necessarily mean outfitting the operation with extensive sortation and conveying equipment. Nor does it mean that elaborate automated shuttle-based systems, most of which are capital-intensive, are required. Recent automation options exist that can significantly lower capitalization costs and can exert a sizable positive impact on a small- or mid-sized e-commerce fulfillment center's throughput efficiency while reducing operating costs.

E-commerce retailers and particularly smaller operations should evaluate the selection of picking automation anchored on four criteria:

- The technology needs to generate results in productivity, accuracy and waste reduction.
- It needs to be flexible and scalable.
- It needs to be an affordable capital investment while achieving a solid short-term return on investment.
- The technology needs to become operational quickly with minimal disruption to operations.

Assessing Goods-to-Person

For dynamic e-commerce picking, highly automated goods-to-person systems provide accurate and rapid solutions. These systems can achieve performance levels of many hundreds of order lines per hour with precision and accuracy.

Travel time can kill productivity. For e-fulfillment operations where orders are smaller, automated systems allow the person to stay at a work station, eliminating travel through the warehouse.

OPEX Corporation



For e-fulfillment, automation needs to provide returns in the form of improved accuracy and reduced waste as well as cost savings.

OPEX Corporation

In the goods-to-person concept, incoming goods are placed into totes, which are stored in high-density automated storage and retrieval systems (AS/RS). As orders are required to be fulfilled, the appropriate SKUs are automatically retrieved from storage and brought to the picker at a pick/pack station.

Since the picker does not have to walk, the focus at the pick/pack stations is on ergonomics and high productivity, eliminating the significant travel time of walking in traditional person-to-goods picking operations. Because goods-to-person systems present operators with only the goods needed for orders, these systems cut down on the likelihood that workers will pick the wrong items. When combined with technologies like pick-to-light and screen-direct picking, they can also improve accuracy and productivity.

The biggest resistance to purchasing an automated goods-to-person picking system is the initial capital investment, even though the long-term benefits can significantly outweigh the costs. But smaller online retailers must scale up the efficiency of their picking operations to successfully compete with the big online players. The pressure is on to process, ship and deliver orders faster. At the same time, smaller e-commerce companies need to improve order accuracy continually to ensure their customers have a positive and memorable experience to keep them coming back and to minimize costly returns. Designing a solution that can handle both the fulfillment needs and investment requirements can be a challenge.

Automated goods-to-person solutions come in a variety of technologies and configurations, but not all systems fit the needs of smaller e-commerce retailers. John Kemp, president of Kemp Systems & Associates, a consulting firm that has provided distribution facility planning and engineering for well over three decades and for e-commerce fulfillment since the late 1990s, examined some of the key factors critical to goods-to-person system selection for smaller e-commerce operations. According to Kemp, the latest technology in

goods-to-person automation provides highly scalable and cost-efficient solutions for smaller e-commerce fulfillment centers. To better visualize this, Kemp focused on a robotics-based goods-to-person solution developed by OPEX Corporation. The OPEX Perfect Pick system closely approximates the functionality that smaller e-commerce retailers require.

Flexibility and Scalability

Retailers assessing a goods-to-person system for e-commerce need to factor expanding SKUs, fluctuations in throughput volume and potential reduction of SKUs. Seasonal influences and the rise and fall of the popularity of items offered on the Internet necessitate highly flexible and scalable requirements in a goods-to-person automated system.

“Looking at scalability from the most fundamental level, however, in terms of initial capital investment, most smaller Internet retailers could benefit tremendously from a more basic, and less costly, initial goods-to-person module,” says Kemp.

“The get-in requirements in terms of both systems and costs for virtually every automated, shuttle-based goods-to-person system is beyond the reach of most small and many mid-sized e-commerce companies,” Kemp points out. “A specialty e-commerce retailer that may only be handling 2,000 or 3,000 SKUs has a hard time justifying the capital expenditure of even the most basic module from traditional shuttle-based goods-to-person systems. Factoring over a five-year or 10-year ROI is a gamble most smaller e-commerce retailers are skittish to jump into, given the unpredictability of e-commerce markets.”

Kemp suggests, “With the approach OPEX has taken with Perfect Pick, the basic module of the robotics system was designed specifically to accommodate the needs of small Internet providers requiring a simply-designed, high-speed goods-to-person solution that could initially handle a small number of SKUs, yet could

be easily expanded to process a high number of SKUs as the business requirements change. Additional aisles and picking stations can be seamlessly integrated into the operation. This allows a significantly reduced capital investment compared with existing shuttle-based goods-to-person systems and a short-term ROI.”

System Simplicity and Uptime

The performance of any automated picking system is only as good as the system uptime. This is true of any distribution or manufacturing process, but for e-commerce fulfillment and its extremely tight delivery deadlines, system downtime can negatively impact customer relations, something small e-commerce retailers cannot afford.

“Simplicity of process operation is fundamental to minimizing breakdowns, wear and maintenance requirements, which ultimately means a higher probability of system uptime, and subsequent increased throughput, with lower operating costs,” Kemp continues. “Yet, traditional shuttle-based goods-to-person picking technology utilizes a complex system of transfers, lifts and conveyors. In shuttle systems, a shuttle moves down the aisle to a rack location and picks up a tote, pulls it onboard, then moves back down to the end of the aisle where the shuttle interfaces to a lift. Here, the shuttle is either transported down, or it passes off the tote to be transported down to a lower level where the tote is again transferred to a conveyor loop, which stages the tote to a picking station. After picking, the tote is then lifted up, transferred over and set back down on another conveyor, and sent back into the system. This is one pick cycle. That multi-touch process is repeated hundreds of times per hour with conventional shuttle-based pick systems.”

Use of transfers, lifts and conveyors adds complexity to any automated goods-to-person system, increasing the possibility of slowdowns and downtime and increasing the need for part replacements and necessary maintenance. These complications increase the cost of operation beyond the high initial investment represented by these added components.

“Central to the performance capability of any automated system is its ability to access 100 percent of SKUs within an aisle,” Kemp continues. “In conventional shuttle-based systems, each individual shuttle is held captive to a specific row, inhibiting that shuttle’s full access to all SKU locations within the aisle. Should a shuttle break down or require maintenance, the inventory within that aisle will be inaccessible. Such a system is susceptible to single-point system failure, and means fulfillment will be interrupted. Where this condition may be less serious in certain industries, for e-commerce retailers this is highly undesirable.”

Redundancy in automated handling systems can be expensive. In its solution, OPEX uses iBOT delivery technology. Kemp explains, “iBOTs are intelligent, wireless robots that store and retrieve totes within a system’s

racking structure. A key feature is the capability of each iBOT to access 100 percent of inventory within an aisle, in essence, permitting built-in redundancy for 100 percent system availability.”

The iBOTs are free to roam horizontally or vertically throughout the aisle to reach designated SKU/tote locations and pick stations, operating in real-time, Kemp continues. Depending on factors such as throughput requirements, number of pick stations, pick cycle times, etc., as many as 20 or more iBOTs could be deployed per aisle, with each iBOT having access to 100 percent of the inventory in its aisle. iBOTs can be added or removed from the system within a matter of minutes.

“When an iBOT carrying a tote is received at a pick station, the iBOT tilts for ergonomic positioning to reduce stretching or lifting on the part of the operator. Text and visual prompts on picking monitors, supported by pick-to-light, direct the operator to choose the required item(s) from the tote and indicate the appropriate order boxes in which to place them. When the operator indicates the final pick is complete, the system releases the current iBOT/tote, which then returns the tote to its location in the racking structure.”

This system also allows orders to be stored and retrieved simultaneously and on the fly as needed, as opposed to sequentially. This capability can make a significant difference in the speed and efficiency for optimum handling of orders on a high-throughput basis.

“The importance of energy efficiency in e-commerce fulfillment cannot be underestimated,” Kemp states. “In automated systems, the energy required to power vehicles that are moving totes represents the bulk of the energy consumed. To this end, the iBOTs are highly energy efficient — equipped with energy recuperation modules that utilize onboard ultra-capacitors to recapture energy during normal operation of deceleration and descent, so they do not have to leave the system to recharge. The ultra-capacitors can store relatively large amounts of electric charge very rapidly and are capable of delivering very large bursts of power in a highly efficient manner. Unlike batteries, ultra-capacitors store energy electrostatically. They are designed with a high lifecycle of five to 10 years without the need for frequent replacement associated with battery power.”

Embracing Smart Robotics

For smaller e-commerce fulfillment centers that are striving to make their operations more streamlined and profitable, goods-to-person systems embodying smart robotics technology can provide a realistic solution to improve order throughput and order accuracy while reducing labor costs and optimizing facility space requirements. **WT**

Jim McMahon writes on logistics automation.

The right
automated solution
should facilitate
the minimization of
touch points.

For reprints of this article, please contact Cindy Williams at williamsc@bnpmmedia.com or 610-436-4220 ext. 8516.