



WHITE PAPER

E-COMMERCE FULFILLMENT

Automation is Key
in E-Commerce Fulfillment



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As retailers integrate e-commerce into their operations, employing the right systems to dynamically process orders is of critical importance.

The vast majority of the world's consumer products have been distributed to retail stores in bulk, and the most efficient method for handling this merchandise has predominantly been pallet movement and full case selection. But now, e-commerce is fundamentally changing the nature of the retail supply chain. Due to the rapid increase in online sales, many retailers are outgrowing this traditional supply chain model. In addition to scheduled weekly store deliveries of pallets and cases, retailers must now factor in split case picking, item level touches and multi-line item sortation to fulfill fluctuating volumes of online orders which frequently require delivery to consumers within 24 to 48 hours.

Although piece pick has been a staple of catalog fulfillment for decades, the sheer volume of Internet orders and their fast-growing presence over just about every consumer market segment presents a unique logistics scenario.

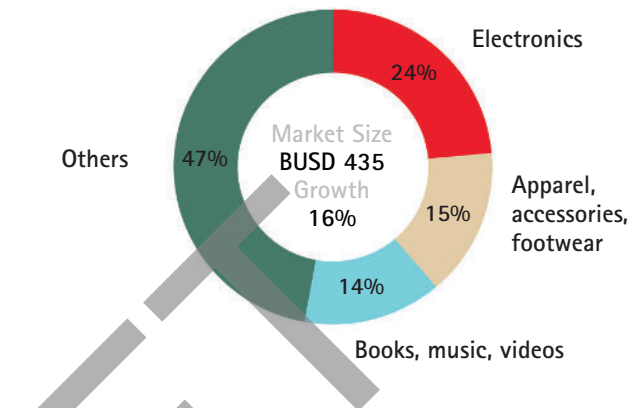
To warehouse operators, this scenario poses a significant challenge and complexity that requires changes to their supply chain systems, distribution networks and processes. Efficiently optimizing inventory, storage space, labor, costs and time in e-retailing is required to attain not only customer satisfaction, but a profitable operation.

A proven approach to managing this challenge is automation which has the flexibility to adapt to expanding and changing e-commerce conditions. This paper examines some of the latest warehousing and distribution technology being employed for e-commerce distribution.

Expanding E-Commerce Market

During this current recession, many Euro stores have struggled, while online businesses have continued to expand. According to Datamonitor's Global Online Retail 2011, the global online retail sector had total revenues of \$434.6 billion (USD) in 2010, representing a compound annual growth rate (CAGR) of 16.3 percent for 2006 to 2010. 2010 alone had a growth rate of 17.8 percent.

European online retailing growth performed even stronger, with a CAGR of 22.3 percent between 2006 and 2010. In 2010, Europe accounted for 37.4 percent of total global online retail sales, \$162.6 billion in revenue. By 2015, Datamonitor projects European online retail sales will reach \$316.2 billion, representing 38.2 percent of the \$887.2 billion global online retail market.



Global retail market segments: % share, by value, 2011(e)
Source: Datamonitor 2010

E-commerce growth is spanning all retail sectors. Datamonitor reports that electronics sales proved the most lucrative for the global online retail market in 2010, with total revenues of \$102.4 billion, equivalent to 23.6 percent of all online purchases.

Representative of this rapid growth in the electronics sector are for example Internet retailers in Norway. In 2010, Scandinavia's leading Internet computer products and consumer electronics retailer posted sales of more than \$700 million (USD), while servicing 675 000 active online customers. Since 1996, the company has grown to host nine separate webshops, some of which rank as the first and second largest e-commerce sites in Scandinavia. Komplet prepared and shipped 1.4 million orders, nearly 4.3 million items in 2010.

Online sales of apparel, fashion accessories and footwear generated revenues of \$66.1 billion worldwide in 2010, equating to 15.2 percent of total e-commerce revenues. Books, music and videos accounted for 14.1 percent of global online sales. The remaining 47.1 percent of 2010 global online purchases include food products (grocery and beverage), health and beauty products (pharmacy, vitamins and cosmetics), hard goods (appliances, furniture, sporting goods and tools), and leisure and travel goods and services.

Purchases of larger products online, like appliances and home furnishings, are also escalating. A retailer in the UK, has experienced dramatic growth in the largely traditional home furnishings sector. The retailer attracts consumers with its 'try in store, buy online' marketing approach for its large furniture items.

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Online grocery shopping in the European market has continued to experience a rapid evolution in recent years. IMAP's Retail Industry Global Report 2010 states that this growth is, "Facilitated by the ongoing development of the Internet and related technologies. From a consumer perspective, the convenience factor of placing an order online and having goods delivered to the door is perhaps the biggest appeal to consumers looking for ways to save time or have physical difficulty carrying products."

One of the leading grocery and consumer goods distribution groups in the world operates more than 15 000 stores, but also sells its products through an online grocery store, which is the leading French online supermarket in terms of sales. It allows customers to shop on the Internet and select from product listings including fresh and frozen items, at the same price that they would pay in stores, with the added benefit of home delivery.

The UK, however, has the most developed online grocery market, according to Datamonitor, with 15 percent of adults having shopped for their groceries online in 2009. This, no doubt, has been influenced by grocery retailers, which have invested in several automated online grocery fulfillment centers. The grocery retailer's online sales grew 7.3 percent for its year ending February 2010.

Grocery online sales in the UK are expected to reach \$11.8 billion by 2014.

Evolving E-Commerce Distribution

Traditional retailers are increasingly embracing e-commerce channels. Retail store orders may involve shipping full, or mixed pallets of product to arrive within a one-week to two-week delivery window, while an e-commerce order might consist of several, different-category single items wrapped in a custom package delivered within one to two days.

Internet retailers need to support an ever increasing SKU proliferation that typically includes fast moving items and many very slow moving items.

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. In e-commerce, it is the distribution center that provides much of the customer experience. Simply delivering the goods is no longer an adequate mission for the fulfillment center. Speed of order fulfillment, order accuracy, diminished returns and customer satisfaction need to be critical priorities.

The typical e-commerce consumer expects: cross-channel services such as 'click-and-collect' and 'order-to-deliver'; wider online SKU offerings; online storefronts; order accuracy; fast and free delivery; free returns; and a mobile retail site.

Of these expectations, the consumer demand for free and fast delivery is causing supply chain managers the biggest challenge, which retailers need to closely assess to remain competitive. Also a factor is the threat of under-stocking, influenced by unknown or seasonal demand. An online retailer does not want to find itself unable to meet demand and face loss of sales and goodwill.



Traditional retailers are increasingly embracing e-commerce channels

When these consumer needs are compared to the challenges of distribution in an e-commerce environment, it presents significant obstacles for e-fulfillment. These challenges include:

- a) Large SKU counts with a long, slow moving tail;
- b) High and unpredictable growth;
- c) High penalty for poor performance resulting in potential brand damage;
- d) Uncertain business terrain that demands flexible and adaptive solutions;
- e) Demand for real-time and accurate inventory visibility;
- f) Small number of order lines per order;
- g) High returns from end customer;
- h) Extreme peak season volumes.

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Traditional fulfillment for retail stores encompassing receiving, put away/storage, picking, transport through the DC, sortation, VAS, packing and shipping is a poor option for handling the needs of e-commerce. In many large distribution facilities, these functions may be entirely suitable for distribution to stores, but e-fulfillment requires scalable operations and highly flexible systems to address its inherent obstacles.

Automation Flexibility is Key

Within e-commerce distribution, where unpredictability is a constant factor, flexibility in the supply chain becomes critical. Flexibility can be derived from implementing the right automation that can support the fluidity that e-commerce services require.

A stepped approach to e-commerce automation, especially where future demand is difficult to predict, is often the best route. With scalable software and infrastructure in place, retailers can build out automation as their e-commerce business grows. In essence, the automation can be targeted. Automation that addresses specific tasks, such as picking for fast- or slow-moving SKUs, can sometimes turn a better ROI than completely automating a full warehouse.

The gold standard of flexibility for any e-commerce business is to be able to easily increase fulfillment throughput and SKU density over time. Such a system should enable e-commerce retailers to pick, pack and ship orders and returns faster and more accurately, while reducing labor costs and shipping errors.

E-commerce fulfillment is fundamentally a piece pick operation, which is historically a hands-on procedure. The right automation facilitates the minimization of manual touch, resulting in more accurate orders, improved ergonomics, lower labor costs and travel time, lessened returns and saves space by operating in a smaller footprint.

Much of the recent investment in automation by e-commerce retailers has been driven by a desire to improve order picking processes. The most basic form of automation for e-commerce, for use with low volume order lines, would be to augment manual order picking with IT support, such as pick-to-light or hands free voice systems. As volumes increase, then person to goods type solutions with some mechanization, like batch picking and sortation, can be implemented.

For high volume e-commerce pick order lines, highly automated robotic and shuttle-based systems provide the most efficient goods to person solutions. These systems can achieve performance levels of many hundreds of order lines per hour with precision accuracy.

These high speed systems can also much more efficiently speed the processing of return orders, which becomes a major benefit in e-commerce, considering the high percentage of return orders.

Supporting these flexible e-commerce systems, traditional pallet and case handling equipment can be effectively utilized to replenish inventory.



Shuttle-based automated storage system

Automated Solutions for E-Commerce

To manage this diverse mix of product SKUs for e-commerce, retailers can access a number of automated systems to handle this throughput efficiently and cost effectively. Systems with the flexibility to adjust to market conditions quickly and accurately, like for increases in SKU range and shortened lead times. Following are key automation solutions:

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Optimizing Space Utilization

Maximizing efficiency in e-commerce fulfillment centers is accelerated by an efficient use of space, both in footprint to minimize travel, and vertically going 3D, to maximize cube storage. Those e-commerce warehouses that are the most productive and cost efficient have achieved a high density of space utilization.



Highly compact bin storage system

This is exemplified in the latest automated robotic and shuttle-based pick systems which optimize cubic space utilization to effect faster pick cycles. They have a space configuration that allows for the maximum number of tote/tray positions to fit into a specified cubic space, therefore reducing travel cycle time to and from the pick stations and the tote/tray locations.

Picking Solutions

High-Speed Tote/Tray Pick Systems – Of any area in e-commerce that has been most affected by automation improvements, it is in the storage and picking of individual, mixed SKU products.

Traditionally a hand pick activity, the need to prepare small quantity, mixed SKU orders of packaged goods to ship and arrive on schedule with near zero tolerance of errors is a growing critical function if an e-commerce warehouse is to be run as a cost-efficient, successful operation.

These recently introduced and highly automated systems support goods to person pick stations, and employ very light robots or shuttles that rapidly transport individual totes and trays, providing high volume piece pick throughput.

Inbound product loads are put and stored in trays or totes. Product is then automatically retrieved in sequence to build customized orders. Variations exist in these systems' capabilities. Some are designed to store and pick smaller numbers of fast moving SKUs, while others are better equipped for handling larger quantities of slow moving SKUs.



High-speed picking station

Some recently introduced models have significantly increased speed of order processing, without losing any degree of accuracy. Some are capable of processing at rates exceeding 1 000 picks per hour. These newer systems provide more than high throughput and cost efficient distribution, they also deliver a higher density of storage capacity, and more modular flexibility.

Modular in design, these newer systems are ideal candidates for e-commerce, being highly adaptable and expandable as needed, and unrestricted to one size or form. One system can be configured to fit different building heights, span multiple levels and even surround obstacles in the warehouse, such as pillars or walls.

For example, if the need warranted in the future, the system could be extended without interfering with warehouse throughput. Additional storage space can be added by simply extending the system without interfering significantly with ongoing warehouse operations.

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Another innovation in some piece pick systems is the elimination of single point system failure, in effect, providing near 100 percent system availability. By employing the use of multiple, independently controlled robots, if one section of the system was to be disabled for repairs, the system would continue to operate at 100 percent functionality because of built-in redundancy. This capability truly supports e-commerce, where ship deadlines are very tight and throughput interference is unacceptable.

To improve delivery of goods to the picking stations, some of these automated systems have equipped their robotic and shuttle vehicles with an autonomous onboard intelligence capability to further optimize speed and efficiency of processing. Additionally, some systems automatically recognize faster moving SKUs and move the tote/tray locations closer to pick stations for faster cycle times.

Also, to allow added picking flexibility, the latest systems allow integration with external, manual pick stations into their robotic/shuttle systems, such as for handling single items and small cases. A function that can give added flexibility for e-commerce warehouses which handle, for example, larger items such as furniture or large appliances.

System components, such as trays and totes used in these robotic/shuttle systems can be made of stainless steel and rated for heavy wash down for handling packaged food products like meats or fish in grocery applications that require compliance to sanitary regulations for cleanliness.

The latest automated robotic/shuttle systems are extremely energy efficient, minimizing energy consumption by operating on low energy requirements and maintaining excellent weight to payload ratios. Some are also equipped with energy recuperation modules to generate and store electricity from the lifts and shuttles while in operation.

Robotic Stacker Cranes for Picking Totes/Trays and Cases – Another system, designed for picking totes/trays and cases direct from high-bay warehouse shelves, for e-commerce piece picking, utilizes a versatile gripper head mounted into an automatic stacker crane. The crane, instructed by controls software, travels automatically to the correct picking location. The gripper head then extends to support the case.

The load, which can weigh up to 25 kg, is then brought onto the crane's carriage platform for transport to the output station. This technology can be combined with belt conveyors to form an efficient pick to belt solution. This case pick system can deliver high pick rates per hour and consistent, reliable picking.

High Speed Pick Stations – Ergonomically designed goods to person pick stations integrate seamlessly with automated robotic/shuttle pick solutions, automated buffers and order fulfillment systems, light goods conveyors and customer order software to achieve high volume pick rates.

Ideal for high-throughput e-commerce requirements, the latest 'smart' pick stations can be custom designed to meet varied performance objectives. These can include separate picking stations, combined picking and packing, and batch picking operations (for fast movers) with a level of speed and efficiency unavailable before.

These pick stations can accept multiple totes to ensure that the picker always has product available to pick. Pick-to-light is frequently used, in combination with the workstation monitor, to help guide the picker and provide additional instructions.

Cycle times, from the receipt of the customer's order through picking and shipment, can be as low as twenty minutes with high speed pick stations which can eliminate all walking within the warehouse, and can reduce the labor force by more than 50 percent. Many non-value added services and DC processes can be eliminated, such as put-a-way, pre-pick, staging and feeders. This presents an ideal solution for the quick delivery requirements of the rapidly growing e-commerce market.

Light Goods Conveyors

Light duty, modular conveyors are necessary to connect automated systems to e-commerce pick stations and shipping. Some of the latest of these conveyor systems are designed with a sustainable, modular design and smart controls for high performance light goods handling. Designed to be plug and play for handling totes/crates and cases, they feature integrated energy management systems.



Conveyor system for cartons and totes

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High-Bay ASRS

High-bay automated storage and retrieval systems (ASRS) fill the need for efficient pallet throughput, and full and layered pallet storage for supporting e-commerce fulfillment. These high-bay ASRS store and deliver pallet loads for replenishment to automated robotic and shuttle pick systems.

High-bay ASRS systems optimize cubic space usage, not only by their vertical stacking capability, but also by minimizing aisle cubic footage. By eliminating the need for forklift trucks, aisles can be made significantly more narrow, allowing up to 3.7-meter (12-feet) wide aisles to become just 1.5-meter (5-feet) wide. This space can then be used smartly for more pallet positions.

The ASRS are software controlled, and can automatically deposit, store and retrieve unit loads from defined storage locations. They allow full pallet load and layered pallet inventory to be moved quickly, safely and precisely within a warehouse environment.

For e-commerce, they allow larger items, such as furniture and large appliances to be stored as pallet loads in the high-bay, then quickly retrieved and delivered to a pick station.

ASRS cranes are now designed to deliver optimized energy efficiency. Warehouse cranes are typically optimized for peak throughput, performing many moves in and out of the racking. These modern systems reduce energy consumption by operating at variable speeds depending on the demand load in the warehouse.

Data Interchange

Because of the digital nature of e-commerce, its infrastructure permits integration of systems that help unify information across inventory, order management, promotions, merchandising and distribution systems.

E-commerce allows companies to record the relevant details of each pallet, parcel, and item being shipped. Parcel shipments can be tracked and proof of delivery quickly confirmed. A customer's transportation costs and performance can be analyzed, thus helping the retailer negotiate lower rates and improve service.

Retailers now have the opportunity to record every customer transaction and track consumer behavior and sentiment. The result has been the emergence of new retail supply chains, including functions such as 'click-and-get', that are consumer focused rather than product focused.

Automated warehouses are ideal candidates for the precise and efficient tracking of products because of their highly automated and computer controlled systems. The warehouse's warehouse management system (WMS), along with controls in the ASRS, tote/tray pick systems and conveying systems are capable of monitoring batch numbers, production dates and weight as the unit loads, cases and SKUs are stored and moved through the facility.

This level of supply chain analytics allows retailers to maintain precise control on their products through every stage of the supply chain handling, from manufacturing through storage, picking, shipping and receipt of products.

With the emergence of such a broad offering of automated systems, a new level of flexibility and efficiency, above and beyond the capabilities of conventional automated and manual material handling systems, can now be realized for the movement of retail e-commerce products.

Successful E-Commerce Applications

Many companies faced with growing e-commerce fulfillment challenges have embraced technology as a solution.

A European company, which is engaged in online retailing of electronics goods, has successfully deployed a high speed tote storage and pick system. Consisting of 62 000 bin locations for high-density storage of SKUs, the system has the flexibility to expand to 100 000 bins as future needs arise. Seventy robots are utilized to transport trays from bin locations, delivering items quickly and efficiently to 22 pick and pack stations. The system allows a scalable state-of-the-art storage and picking process with the capability of handling increasing numbers of small quantity orders.

Another huge company in Europe, expanded its picking capability to better integrate its logistics processes, particularly with its online segment which required a fast and scalable solution for fulfillment of its fashion accessories. To achieve this, the company integrated a high-density, high speed shuttle system capable of retrieving product from 36 000 SKU storage locations. Forty shuttle vehicles were employed, capable of achieving 2 400 in-and-out feeds per hour. The system improved picking efficiency, increased throughput and reduced operating costs.

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SUMMARY

As retailers embrace e-commerce, employing the right systems to dynamically process orders is of critical importance. Following are a number of proven systems used successfully by e-commerce retailers.

Automated E-Commerce Pick Systems

Automated Systems for Rapid Picking of Diverse SKUs – Swisslog's Smart Carrier, one of the latest generation of streamlined storage and transport systems for light goods, is exceptional for its ability to consolidate and release totes with product at high rates in required sequences. Ideal for both fast and slow moving SKU's. Its extreme modularity and scalability has the flexibility to integrate exterior pick stations.

Another is AutoStore, distributed by Swisslog – an automated storage and piece pick system for handling high volumes of fast and slow moving SKUs. Highly scalable and flexible, it can easily be configured to fit different building heights and obstacles. Utilizing independently controlled robots, AutoStore eliminates single point system failure. AutoStore provides the highest density of cubic space utilization of all automated storage and pick systems.

Click&Pick – Ideal for e-commerce applications, combines high speed picking with an innovative inventory system. Ergonomic goods to person workstations, with pick rates exceeding 1 000 pieces per hour.

Automation Supporting E-Commerce

High-Bay ASRS – These systems will continue to fill the need for high throughput pallet load storage and for e-commerce automated pick system replenishment. Swisslog's Vectura crane provides a uniquely flexible and modular design. The system fulfills the need for almost any application and provides single deep, double deep, triple deep and multi-deep storage.

High Speed Workstations – Swisslog's ProPick high speed workstation is designed for outstanding efficiency in a high performance goods to person application for light goods. Ergonomic and scalable design means each station becomes a comfortable workplace supporting efficiency and sustainability.

Miniload Cranes for Efficient High-Bay Picking of Cases, Totes and Trays – With Tornado, Swisslog provides one of the fastest miniload cranes in its class for moving less than pallet loads into and out of the high bay for case, tote and tray picking.

Modular Conveyors for Light Goods – QuickMove, a Swisslog conveyor system with a sustainable, modular design and smart controls for high performance light goods handling with zero pressure accumulation. Designed to be plug-and-play for handling totes, trays and cases, it features an integrated energy management system.

Data Interchange/Warehouse Management System – Swisslog's system integrated WarehouseManager maximizes supply chain efficiency by automating key processes from inbound goods arrival and processing through inventory storage to fulfilling outbound shipping orders.

ABOUT SWISSLOG

Swisslog (www.swisslog.com) is a global provider of integrated logistics solutions for warehouses, distribution centers and hospitals. The company has considerable knowhow and special expertise within the retail e-commerce sector. Its comprehensive services portfolio ranges from building complex warehouses and distribution centers for food manufacturers, wholesale distributors and retailers, to implementing Swisslog's own software for intra-company logistics solutions with an extensive number of projects realized.

Swisslog's solutions optimize customers' production, logistics and distribution processes to increase flexibility, responsiveness and quality of service while minimizing logistics costs. With years of experience in the development and implementation of integrated logistics solutions, Swisslog provides the expertise that customers in more than 50 countries around the world rely on.

With Global Headquarters in Buchs/Aarau, Switzerland, Swisslog currently employs over 2 000 staff in 20 countries worldwide.

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