

Automated data capture for efficient e-commerce fulfillment

For optimum fulfillment performance, e-commerce operators must capture dimensions, weight, condition, labels, codes, markings, photos, and 3D images; and they must also have the flexibility to easily process captured data within the framework of their specific WMS and ERP requirements.

According to a 2024 report from researcher Statista, the U.S. e-commerce market is projected to gross \$1,223 billion (USD) in 2024, up 14.8% from 2023. This trend is expected to continue — by 2029 U.S. e-commerce revenue is forecast to reach \$1,881 billion.

As e-commerce continues its rapid growth into virtually every market sector, retailers are anxious to expand their presence online to capture this market share. From the moment the online order is placed, to when it is picked, packed, shipped, and delivered, every step in the process must be handled efficiently, consistently, and cost-effectively.

Fulfillment is a critical aspect of the customer experience. Simply delivering the goods is no longer an adequate mission for the fulfillment center. The typical e-commerce consumer expects a wide selection of SKU offerings, order accuracy, quick delivery, and no-hassle returns.

Addressing e-commerce fulfillment challenges

A growing number of e-commerce operations are faced with the challenge of scaling up their receiving, storage, picking, packing, shipping, and returns handling processes to meet

e-commerce consumers' expectations. Traditional replenishment for brick-and-mortar retailers involves the movement and storage of unit loads and multi-SKU split pallets, which is inadequate for the needs of e-commerce fulfillment that requires each-picks, small-order fulfillment, and system scalability.

Added to continual SKU proliferation and seasonal product fluctuations, online retailers need to support both fast-moving SKUs and slow-moving items. Out-of-stock items can lead to late deliveries, loss of sales, and lower customer satisfaction. Online retailers need to closely assess their customer



The latest evolution of auto-ID and data capture supports automated e-commerce fulfillment.
VITRONIC Machine Vision

expectations against their fulfillment capabilities to remain competitive and profitable.

A successful e-commerce fulfillment implementation requires carefully planned processes, scalable operations, and highly efficient systems to address its inherent obstacles.

Automation and automated data capture

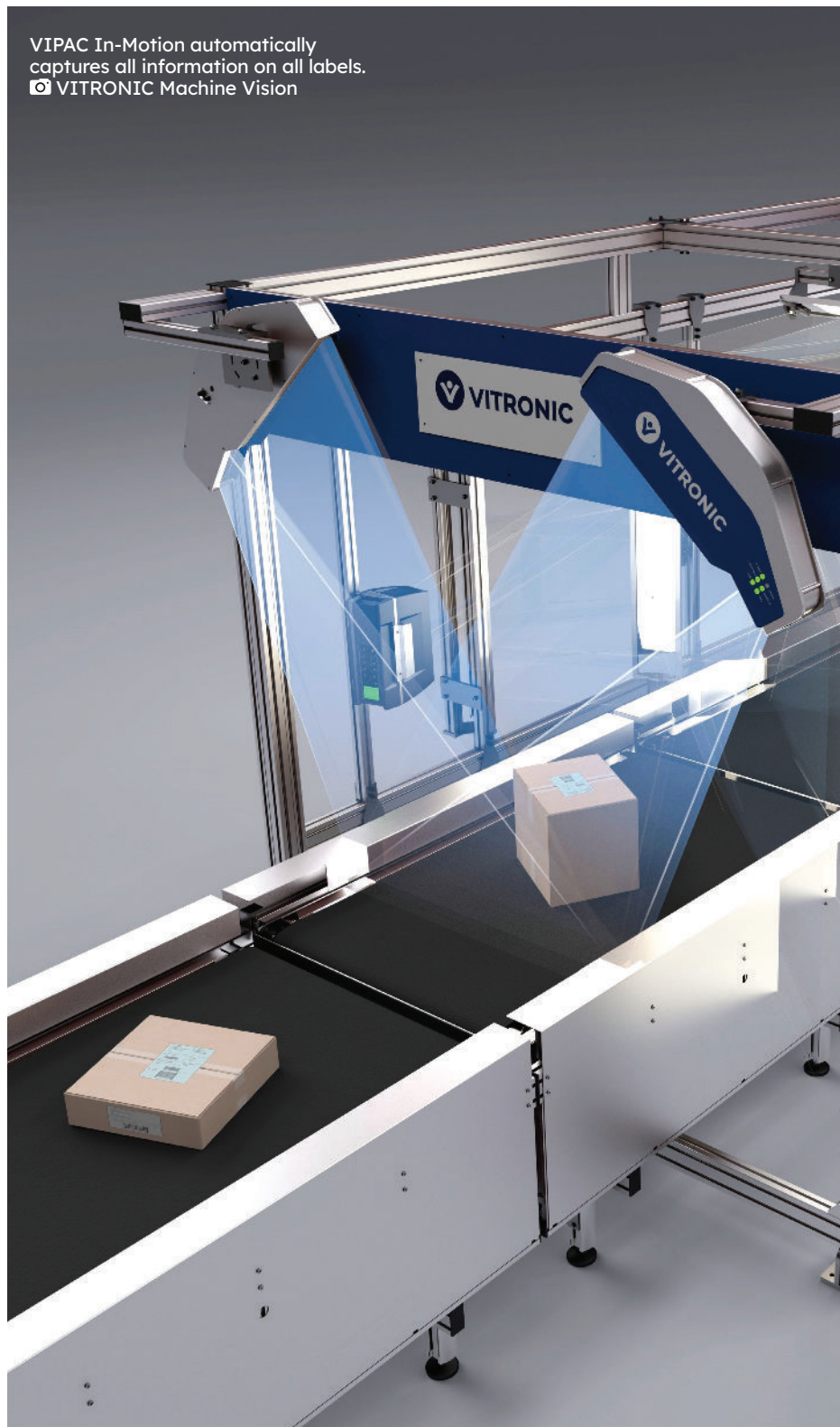
To compete in this highly competitive online retail arena and address its challenges, e-commerce fulfillment operations are increasingly turning to automation.

Increases in production volume, the need for improved accuracy, and the desire to reduce labor requirements are often the key drivers that initiate the move to an automated fulfillment system. Automation can be used to increase the number of orders that can be processed per hour, enable quicker on-time deliveries, improve order accuracy, reduce labor requirements, and enhance worker safety. As order volumes increase, automation is essential for e-commerce operations to meet consumer expectations for fast, low-cost deliveries.

Digital data capture is fundamental to success in automated fulfillment. The complex dynamics of e-commerce fulfillment has created a need for the precise detection, dimensioning, and tracking of every SKU, item, and package through receiving, storage, pick/pack/ship, and return processes.

Most e-commerce fulfillment operations scan their inventory and outgoing orders manually, sending information through the company's warehouse management system (WMS) and then to its enterprise resource planning (ERP) and shipping carriers. Manual hand scanning of incoming inventory, inspection of returns, and other e-commerce fulfillment processes

VIPAC In-Motion automatically captures all information on all labels.
VITRONIC Machine Vision



One of the latest Auto-ID data capture systems for e-commerce fulfillment.
VITRONIC Machine Vision



can be time consuming and inherently prone to human error, made worse by labor shortages and high turnover.

To achieve faster and more accurate order processing, e-commerce retailers have progressed to automated data capture systems, which also have the capability to permit greater visibility to what inventory is in-stock, in-transit, and on-order, and can track inventory and orders throughout the entire distribution network.

As material flows through the warehouse for fulfillment, it is identified, weighed, dimensioned, inspected for quality, and its location is tracked. That data holds tremendous value, as it provides a detailed record of every process from end-to-end. It can identify processes that are operating well and ones that can be improved, and it can also identify defects and prevent those items from reaching customers.



The latest automated scanners for returns can process up to 25,000 incoming pieces, bags, or packages per hour.
VITRONIC Machine Vision

But not all automated data capture systems provide comparable levels of performance when it comes to the comprehensiveness of information they can capture, and the flexibility to custom-integrate with various WMS and ERP platforms.

Latest-generation of automated data capturing

Recent advances in automated data capture have enabled a more universal

and integrated approach in support of e-commerce fulfillment by deploying sophisticated automated detection, dimensioning and traceability solutions — data capturing systems encompassing receiving, storage, picking, sorting, packing, and returns processing.

Center-stage in this data capture evolution are automated point solutions. These discrete systems can be positioned within existing fulfillment processes to deliver a heightened level

of automated data capturing, while providing system flexibility and universal connectivity. These automated point solutions are applicable for e-commerce operations looking to switch from manual to automated fulfillment and already automated e-commerce centers desiring an increased capability of data capture and management.

The latest generation of enhanced data capturing systems allow faster unloading and sorting, quicker allocation of goods for pick/pack/ship, and more efficient handling of e-commerce returns.

Optimizing data capture for e-commerce operations switching from manual to automated fulfillment

For e-commerce companies struggling to secure funding to begin fulfillment automation, it is important to carefully evaluate which technologies best suit

their specific needs. It makes sense to proceed in stages, automating the processes that promise the highest or quickest return on investment.

The transition can be challenging for small e-commerce retailers that have been totally dependent on manual processing of their incoming SKUs, picking, shipping, and returns.

Employees must be trained on the operation of the new systems, and new skillsets may be necessary. However, there are all-in-one scanning and sorting systems with easy-to-use software that integrates seamlessly with WMS, that makes the transition easier for companies and employees alike. With these scalable and flexible systems that can adapt to future growth, tasks shift from repetitive, manual tasks to monitoring and controlling the automation systems and software.

An excellent example of a new-generation data capture and package

sortation system specifically designed for e-commerce fulfillment companies, is VIPAC Smalls-Sort sorter from VITRONIC Machine Vision.

VIPAC Smalls-Sort is a fully automated, all-in-one smart sorting and data capture system for e-commerce fulfillment's smaller SKUs and packages. Its modular and flexible configuration encompassing infeed, dimensioning, weighing, and scanning (DWS), outfeed and sorting, makes it an all-in-one auto-ID, data capture and fulfillment solution for e-commerce operations transitioning from manual to automated fulfillment. The system can also function as a subsystem of a larger fulfillment operation, depending on the e-commerce center's needs.

Supporting the immense amount of data capture is an easy and intuitive software with a graphical user interface delivering in-depth options for data access and throughput statistics.



Automated data capture supports rapid and efficient processing of e-commerce orders.
VITRONIC Machine Vision



Maximizing data capture for e-commerce operations with existing automated fulfillment

As goods and packages transition between stages in the e-commerce supply chain, their identification, quantity, physical attributes, and other data must be verified to support traceability, and compatibility with material handling equipment, storage, and transport systems.

Distribution includes movement of goods and packages within the four walls of e-commerce fulfillment operations, where incoming goods from distribution centers and suppliers, picking and shipping, and handling returns from customers must be able to be tracked, prepared error-free, and delivered on time. This capability is enabled by auto-ID and data capture systems.

As good as these systems are, the latest evolution of auto-ID and data capture technologies designed for high-volume e-commerce fulfillment centers combine a more comprehensive suite of information recording. For example, scanning, imaging, and recording up to six sides.

One of the most technologically advanced auto-ID and data capture systems designed for large e-commerce

fulfillment centers is VIPAC In-Motion, from VITRONIC. The system automatically captures all information on all labels. That includes all codes and plain text, even if they are damaged, behind film or difficult to read. It can generate real-time images of each pallet, carton and shipment, and archive the images together with the captured data.

The VIPAC In-Motion can process up to 25,000 units per hour (pieces, bags, SKUs, or packages), recording the following information:

- 1D/2D/3D bar code data on multiple labels simultaneously and up to all six sides of an object
- Weight of goods, packages, and bags
- Package dimensions as small as 50 x 50 x 10 mm (length, width, height)
- OCR, including handwritten addresses and notes
- RFID
- Hazardous labels
- Special characters or symbols
- Deformation inspection, detecting damaged items

For pallet scanning, the VIPAC In-Motion provides a range of camera options and configurations that can

be used to scan multiple parcels and containers stacked on pallets, in both static and in-motion states.

Equipped with the Auto-ID system, they can create images of the complete pallet, which are saved to archive. The system can capture dimensions and weight, all codes and plain text. Error-free data records with images provide clear evidence regarding the quantity, weight, volume, and integrity of each pallet shipment, the dimension data is certified as legal for trade.

The VIPAC In-Motion detects pallets that have not been loaded uniformly, protrusions, deviations from the pallet standard, and checks whether pallets are stackable. Pallets can be processed up to 75% faster than manual capture, with a scan rate up to 400 pallets per hour.

VIPAC Static Pallets - MetriXFreight

For static measurement of pallets VITRONIC has just released VIPAC Static Pallets - MetriXFreight.

VIPAC Static Pallets - MetriXFreight uses two to six time-of-flight (ToF) cameras mounted above the measuring zone that take a 3D picture of the pallet in one motion. The ToF cameras produce a depth image, each pixel

of which encodes the distance to the corresponding point on the pallet. These cameras can be used to estimate 3D structure directly, without the help of traditional computer-vision algorithms.

The image and measurement data of the pallet is fed back to the operator via a graphical user interface in real time and into the customer's ERP. VIPAC Static Pallets - MetriXFreight delivers speed advantages up to 50% faster than conventional pallet-scanning systems.

Incorporating data capture throughout e-commerce fulfillment operations

Incoming goods, automating processes, and data capture for incoming goods is essential for e-commerce companies wanting to speed up their fulfillment processing. But this speed does not come at the cost of accuracy, as errors are greatly reduced, while capturing and measuring all goods. With incoming goods, different supplier labels present a challenge. Since these labels are not standardized, they make the processing of incoming goods more difficult.

VITRONIC's Auto-ID solutions decipher a large range of labels automatically. Incoming goods can be imaged, recorded, and sorted for efficient processing and storage.

Outgoing goods inspection and shipping

Outgoing goods that pass through Auto-ID systems record all codes and are precisely measured for weight and volume, allowing optimal loading of vehicles for transport. This automation accelerates processes considerably, and increased volumes can be handled easily while also reducing errors and saving costs.

During the processing of outgoing goods, each package and pallet is imaged and recorded. The systems transmit all shipment data to connected merchandise management systems.

Damaged shipments can be identified and sorted out immediately. The benefits include secure tracking, clarity in case of irregularities, and smooth claims management.

Returns processing

As the volume of returns increase for retailers, the more important it is to automate the processing of returned goods to ensure they are handled quickly and with as few errors as possible.

VIPAC Smalls-Sort provides a returns processing capture that is 400% faster than manual handling by imaging and recording and permits the precise posting of data in customer ERP systems. While the VIPAC In-Motion Scanning Tunnel can process up to 25,000 incoming pieces, bags, or packages per hour, recording multiple levels of information.

These automated systems permit a heightened capability to ensure customers can be refunded the correct amount once returns have been checked and categorized.

Design flexibility and compatibility

A critical feature of the latest evolution of auto-ID and data capture sortation systems and tunnels is their flexibility and compatibility in design to adapt to any software protocols at play in e-commerce fulfillment centers. The systems can

easily be integrated into any fulfillment operation with connectivity to any WMS and ERP.

These in-motion auto-ID systems enable complex and error-prone processes to run quickly and smoothly, create visibility across the value chain, and provide the data needed for Industry 4.0.

Embracing automated e-commerce fulfillment

Only with automated fulfillment, combined with the latest evolution of auto-ID and data capture, can e-commerce companies deliver fast and error-free delivery, and continue to expand and face the challenges of demanding retail consumers.

While automation and digitized auto-ID require significant investments, companies are finding that when the right data is captured and applied to optimize processes from receiving through delivery, compelling ROI is realized. **DW**



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