Camera-Based AutoID Systems
Boost Profits through Smarter Distribution
A grocer’s need to simplify customer checkout led to the first 1D barcode in 1948, but it wasn’t until lasers and microprocessors became commonplace in the 1970s that barcodes really took off. Today, the same can be said for camera-based autoID readers and 2D data-matrix codes. As this paper will show, thanks to advances in sensors and microprocessors, camera-based autoID systems have achieved cost parity with older, laser-based 1D barcode readers while offering the higher speeds, improved accuracy, and greater flexibility that modern distribution centers need to succeed.
A lot has changed since the 1970s — and not just the hairstyles and shirt collars. Customers don’t just want shorter lines at the grocery. They want no lines. They want e-tailing, immediate delivery, and simplified exchanges — whether it’s an industrial motor or women’s shoes. And not just for commercial off the shelf (COTS) products, but customized products manufactured to the customer’s unique needs.

More distribution channels coupled with shorter delivery times and growing product portfolios add pressure to all parts of the supply chain. Production, warehousing, and shipping all have to work faster, but successful businesses work faster with less waste.

The answer is obvious: distribution operations need better visibility from order through production and shipping with improved accuracy and greater flexibility to respond to high-volume/ small batch and other changing production and logistics needs in both automated and manual commissioning, fulfillment, sorting, and distribution operations. Let’s explore how camera-based autoID systems improve all of these conditions compared to older, laser-based scanner systems.

6 Ways Camera-based AutoID Beat Laser Scanners

First, it’s important to understand the differences between laser-based barcode scanners and camera-based autoID scanners.

Laser scanners shine a laser on a spinning mirror. The mirror moves the laser around a specified area, and a detector “senses” changes in reflectivity as it passes over the black and white areas of a 1D barcode. But this approach only works on 1D barcodes, not 2D or matrix codes.

Camera-based autoID readers do not have moving parts. They take a picture of the user-specified field of view, including the code, labels, container, etc., and use microprocessors to identify any code, type, or handwritten information contained regardless of orientation or position within the field of view, which can be significantly larger than the effective area of a laser-based scanner.

Based on these differences, camera-based autoID readers are better than laser scanners in the following areas:

- **FASTER.** Camera-based solutions don’t have to be “aimed” at a barcode and, therefore, can read a code in half the time of laser scanners in real-world applications.

- **BETTER.** Camera-based autoID units read the entire code and don’t depend on a narrow cross section of the code, so they can read damaged and defective 1D codes as well as 2D codes, machine type, and handwritten information where laser scanners cannot. They can also read codes in any color, while laser scanners have difficulty with colored codes, and can be programmed to read virtually any code, giving customers the flexibility to choose their codes based on existing operations and inventory tracking requirements.

- **SMARTER.** Camera-based autoID systems can acquire more information, such as the size and dimensions of a product, parcel, or carton. Laser scanners cannot.
**LONG-LASTING.** Camera-based autoID readers do not use spinning mirrors or galvanometers and, therefore, are less prone to failures.

**EFFICIENT.** Because camera-based autoID readers capture an actual image rather than sensing changes in light, the images can be archived to achieve accuracies approaching 100% compared to 95% to 98% for laser scanners. Images can also be used to troubleshoot labels, packaging, and other factors important to supply chain visibility and cooperation while simplifying charge-backs to suppliers, and credits for customer returns.

**COST-EFFECTIVE.** While a single laser scanner may cost a little less than a single camera-based autoID system, camera-based autoID systems do not care what direction the code passes within the camera’s field of view, eliminating the need for mechanical fixtures or manual labor to “line up” the laser scanner with the code. Even if camera-based autoID solutions weren’t more accurate and faster than laser-based solutions — and they are — reduced fixtures and labor costs mean that ROI for camera-based autoID is usually measured in months while providing benefits that last for years.

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**Camera-based AutoID for All Distribution Operations**

Camera-based autoID systems can improve all three types of distribution center applications, including:

- **Manual** — where an employee scans codes with a hand-held scanner
- **Semi-automatic** — where an employee brings the product to the reader
- **Fully automatic** — where products and packages are mechanically conveyed to the autoID reader, requiring neither manual intervention nor manual evaluation of the reading results

Camera-based autoID solutions exist for all three applications, making it possible to acquire more data faster than traditional laser scanners in a simple, efficient, and cost-effective manner. In the case of intralogistic operations, for example, the data can be acquired along the entire process chain, including:

- Returns management
- Incoming goods control
- Commissioning and shipping
- Outgoing goods control

The advantages of camera-based systems in terms of efficiency, productivity, and costs are evident in each individual process step. A company-wide configuration of cameras along the entire process chain therefore opens up enormous optimization potential.

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**AUTOMATIC DATA ACQUISITION FOR INCOMING GOODS**

Order processing data is acquired in the incoming goods department. The cameras read barcodes, 2D codes, and plain text, and an incorporated device measures the volume in order to correctly store the goods or detect defects/deformations on boxes that make storage impossible. Consequently, they provide significant information that is required for follow-up processes, e.g., in accounting and inventory management.

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**AUTOMATIC DATA ACQUISITION DURING COMMISSIONING**

In this case, complete shipping units (cardboard boxes) are assembled from various individual packages. Cameras identify the article to be commissioned (codes, text, and optionally the weight with the aid of a scale), as well as the completely assembled shipping unit. Goods can furthermore be located and displayed to the operator. Delivery receipts, invoices, shipping papers, and routing plans can be prepared in a largely automated fashion with the aid of the acquired data.
Case Study: Camera-based AutoID Improves Barcode Bottom Line

Whether your operation needs a single manual autoID station or an end-to-end autoID tracking network, or processes 1,000 or 100,000 packages per day, camera-based autoID solutions will significantly improve your bottom line.

Consider a simple scenario that compares a manual camera-based autoID system to a manual laser-scanner operation on an inbound return warehouse dock that handles 10,000 packages per day.

In the laser scanner case, the operator aims the scanner at the 1D code, presses the trigger, and waits while the scanner reads the code and then puts the box on the appropriate conveyor, bin, or pallet. Total time from beginning to end for each package: 6 seconds.

With a camera based autoID system, the operator picks up each box, passes it in front of the camera-based autoID system, and puts it on the conveyor, bin, or pallet. Total time: about 3 seconds.

Over the course of 1 year, the camera-based autoID system will save the warehouse $26,249 per year just on throughput.

However, the camera-based system also reads 1D barcodes at 99% compared to 98% for laser barcode readers.

Processing 10,000 packages per day, 1% failure rates equal 100 packages. If it takes the operator an average of two minutes to manually read, recode, and re-label a failed package, 100 packages means an additional 3.3 labor hours per day, or another $10,500 per year, or a total labor savings of $36,759.

For larger operations using fully automated solutions to process 100,000 packages per day, total labor savings exceed $360,000 per year, excluding the additional costs of mechanical fixtures to orient packages for the laser scanner and lower maintenance costs thanks to the all-solid-state camera-based autoID solution.

| CASE STUDY: Manual camera-based autoID system vs. laser scanner for handling incoming shipments/returns |
|-------------------------------------------------|-----------------|
| Number of objects per day                        | 10,000          |
| Handling time per object with laser scanner      | 6 seconds       |
| Handling time per object with camera-based autoID reader | 3 seconds       |
| Time savings per object                          | 3 seconds       |
| Time savings per day                            | 3 seconds x 10,000 = 8.3 hours |
| Time savings per year                           | 42 h/d x 210 d = 1,743 hours |
| Labor-based throughput savings per year @$15/hr | 1743 hours x $15 = $26,145/year |
| Labor-based rework savings per year @$15/hr     | 700 hours x $15 = $10,500/year |
| Total Savings for low-volume distribution center (10,000 packages/day) | $36,759 |
| Total savings for high-volume distribution center (100,000 packages/day) | $367,590 |

This does not include the elimination of manual identification stations and conveyor technology, as well as higher productivity.
Choosing a Camera-based AutoID System Supplier

A number of suppliers offer camera-based data acquisition systems. Consider these factors when making your selection:

**One company, one source.** Make sure your supplier has developed both the camera and processing hardware and the software solutions (e.g., code readers, OCR, etc.). This ensures that all system components are optimally adapted to one another. The integration of complete systems into existing facilities and processes also provides advantages in that tasks can be implemented in a bundled fashion and therefore more efficiently.

**One responsible contact person** at the supplier minimizes adaptation efforts and guarantees optimal quality of advice.

**Modular systems,** in which individual modules are used in a task-oriented fashion and additional modules can be subsequently integrated. In case your data acquisition needs increase, a quick expansion can be implemented.
Calculating today’s throughput and rework savings from camera-based autoID systems compared to older laser-scanner systems is a straightforward exercise, but what about tomorrow? Will camera autoID solutions stand the test of time?

In addition to being solid state — and therefore more rugged, requiring less maintenance and no mechanical fixturing, which eliminates another point of failure — camera-based autoID systems can read most codes on the market today and be programmed to read any code developed tomorrow.

Vitronic’s VICAM snap!, for example, can read all major 2D codes, such as PDF 417 and DataMatrix, and provide images of text for external processing engines running Vitronic’s powerful optical character recognition (OCR) software. And because VICAM snap! takes a picture of the entire label or side of the container, it can read all these items simultaneously without slowing throughput at 99.9% or better accuracy.

Unfortunately 99.9% isn’t 100%. The world is rarely perfect, so how does a camera-based autoID solution connect with the inevitable rework stations for badly damaged packages or goods? By including a network connection, VICAM snap! can send images of defective goods to centralized video coding stations, allowing one person to do the work of many.

Video coding stations can be installed at a central location in the company or directly on the conveyor belts in the form of manual workstations. Depending on the qualifications of the employee and the number of data fields to be supplemented, it is possible to achieve coding rates of up to 500 objects per hour/per station. This significantly accelerates incoming goods processing and reduces the handling costs per article by increasing the productivity of the employees.

Video images also make it easier to troubleshoot upstream equipment and suppliers. Web-based monitoring software makes it possible to archive read results (codes and plain writing), object information (such as volume and weight), and system information (camera station, video coding station).

These built-in quality-assurance features can reveal if the codes on the labels exceed the prescribed specifications, if wrapping straps interfere with the reading process, or if codes are covered during some step of the production, packaging, or shipping processes. The results of the analysis can then be made available to the supplier to correct the problem. These features enable the company to optimize external and internal processes, minimize errors, and reduce throughput times and handling costs.
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