5 SUPPLY CHAIN TECHNOLOGIES THAT CUT LABOR AND SYSTEM COSTS

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HOW AI, MACHINE VISION, SMART DEVICES, HANDS-FREE SCANNING AND OPTIMIZED PIXEL DENSITY REDUCE COSTS AND MANUAL LABOR EXPENSES

World events in 2020, including the pandemic outbreak and international political tensions, highlighted vulnerabilities in the global supply chain. In most cases these vulnerabilities manifested themselves as tighter labor pools coupled with increased demand. This combination of increased work and decreased labor created the perfect storm for many supply chains leaving them crippled and unable to deliver for their customers.

Advanced automation technologies can help mitigate these vulnerabilities for warehouses and distribution centers working to keep up with demand. Specifically, five technologies can improve supply chains by reducing labor resources, labor costs, and costs associated with traceability.

ADVANCING TECHNOLOGIES

In a span of just two years (2020-2021), the pandemic drove many of the trends in supply chain, e-commerce, and the labor force. In short, there was an enormous increase in online purchasing; likewise, the expectation for end-to-end traceability, including last mile, also increased enormously. Unfortunately, the available labor force to meet these expectations dramatically decreased. These challenges drive the incorporation of automation into production, packaging, and the supply chain. While this is not a new phenomenon, five new technologies deliver greater benefits to supply chains significantly reducing the cost of labor and traceability:

- **Machine Learning**
- **Vision Detection**
- **Smart Scanning devices**
- **Hands-Free Scanning**
- **Optimized Aspect Ratio**

AI & MACHINE LEARNING

Almost every parcel travelling in supply chains is tracked and traced using barcodes. Driven by regulatory requirements, customer expectations, or needs within the enterprise traceability is crucial to supply chains. Therefore, maintaining a contiguous tracking history is important. In most cases a tracking history is interrupted by a barcode No Read. A barcode No Reads kills the efficiency of traceability systems and wreaks havoc on sorting processes. No Reads result in automated systems becoming manual, so how do you prevent this?

Camera technology in traceability devices provides plenty of images for every Read and No Read. When a No Read event occurs, vision algorithms and artificial intelligence can extract value from these images. Using these tools, AI can pinpoint the No Read root cause in an automated way. For example, the label shown here should be recognized as a broken barcode classification.

AI can automatically do this classification along with aggregation and reporting. This is the key to quickly helping us understand major No Read causes and promptly define corrective action.
One example of implementing AI to prevent No Read is the No Read Classifier Engine. This is software Datalogic has added to the Web Sentinel plus platform. This engine automatically processes images related to No Read, classifying them into different categories. Using this information, reports and queries can be run on the database. For example, a trend report can show the hourly trend of No Reads on a certain day.

Parcel with broken barcode classification

Drilling down into the report could show several parcels of the same shape, from the same customer with labels placed across the seam. Rather than have this continue, a corrective action with that customer can be issued. Without the automated classification, this issue may not have ever been identified and the manual work from No Reads would have continued.

There are many ways AI can be used to prevent No Reads. Corrective action, preventative maintenance and other activities can be done as the AI system sees No Reads and categorizes them. All of this is done in real-time.
AI analysis makes improvements possible without spending large amounts of time to manually check parcel by parcel, image by image. Even at a very low throughput of 4000 parcels per day, you would need to spend multiple hours per day for manual classification to get to the root of a problem. This technology has a great benefit keeping automation running and workers focused on real high value tasks instead of manual rework.

Parcel with broken barcode classification

VISION DETECTION

Supply chain applications have become more complex as items of varying shape, size, and type are being purchased and fulfilled through e-commerce. The carboard box and poly bag are not the only type of packaging moving through supply chains. As e-commerce grows, so do the shapes and sizes of parcels. Large or irregularly shaped, non-conveyable items require manual measurement, sorting, and data collection. A new data collection system based using dynamic vision detection called Mass Flow Detection can automate and eliminate the need for manual sorting for these large, irregularly shaped, non-conveyable items.

Vision systems deliver the ability to collect and do more with data. For example, a parcel with a missing label may still be identified through its shape, color, or optical characteristics. Vision systems can process data applying algorithms that allow them to detect and decipher items in 3D.

The Mass Flow Detection System can determine if an image shows one irregularly shaped item or multiple parcels touching. The system provides volume data for each item, using advanced real-time image analysis to recognize and separate items. Multiple scanners generate hundreds of images, which are stitched together to provide a high-resolution top view.

Mass Flow Detection of items on a conveyor

Scanners collect barcode data from each item, and a color camera takes a multisided view of each item running over the belt. The color JPEG image is saved within a bounding box, created by 3D measurement data. The image and the bounding box provide proof of the object's condition. All the data is aggregated creating a complete picture of the item's physical characteristics (size, shape, weight), traceability data (barcode) and condition.

The Mass Flow Detection System is revolutionary. The system eliminates the need for manual work that is currently performed to properly size items that don't fit or travel on traditional conveyor systems. Moreover, its high accuracy certifies it for Legal for Trade applications. In applications where clients provide dimensional data for their non-conveyable shipments, the Mass Flow Detection System can audit shipment to endure accuracy of the shipment and facilitate revenue recovery when shipment data is incorrect.

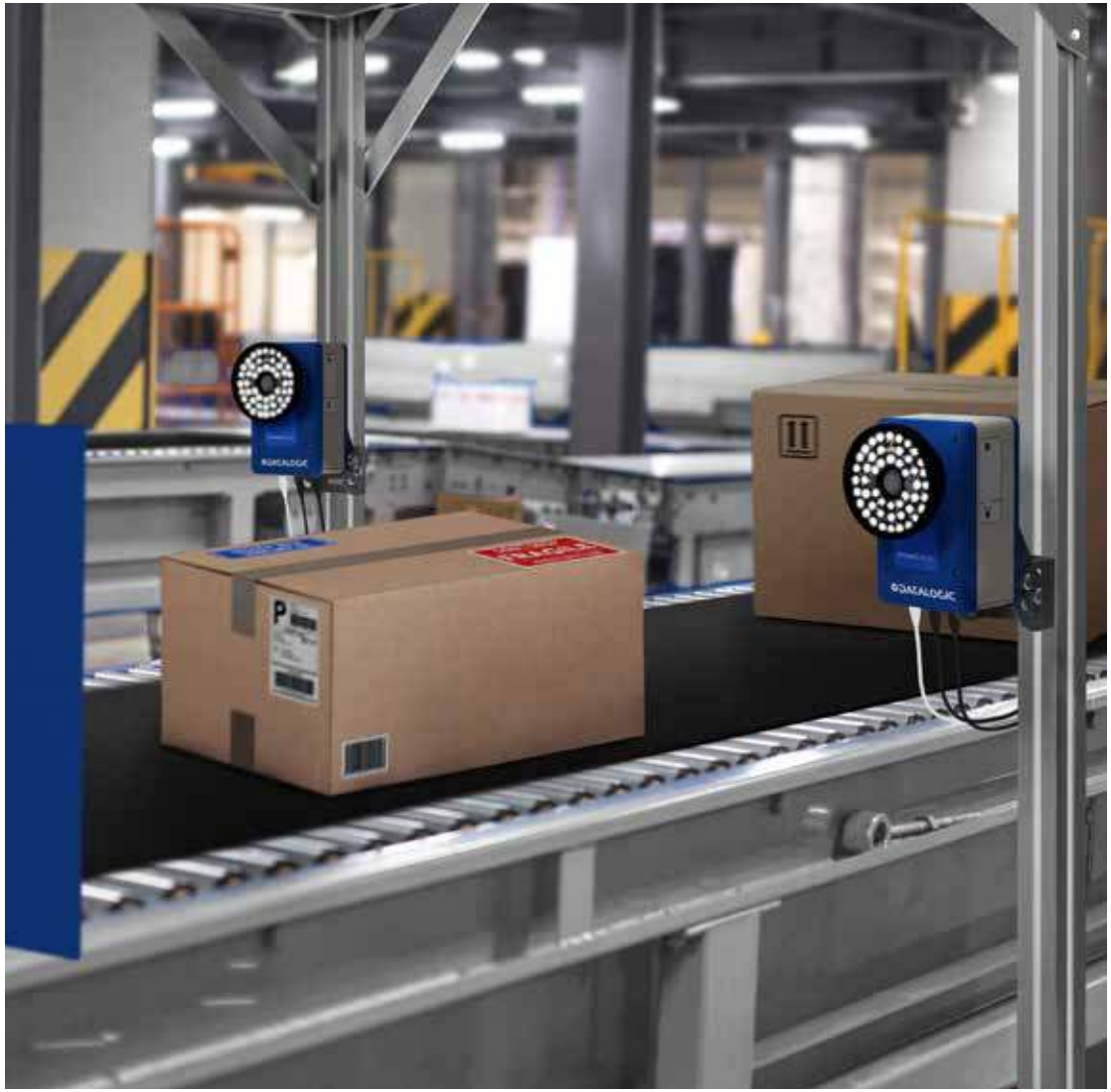
Mass Flow Detection of items on a conveyor

SMART SCANNING DEVICES

Technology advances are driving the creation of smarter devices. This is particularly true for data capture devices, specifically barcode imaging scanners. Most scanners are considered dumb devices, they have one function which they are specifically designed to do. To do this function they require other ancillary devices such as power supplies, proximity sensors, cabling, switches, and programmable logic controllers (PLCs) to operate properly.

A new generation of Smart Scanners is emerging.
One example is the AV900 from Datalogic, a Smart Scanner that can be programmed directly and can operate autonomously without much of the ancillary devices traditional scanners require. Smart Scanners reduce the system cost of traceability systems in two ways.

First, their built-in intelligence reduces the componentry required to operate. Second, this same intelligence when coupled with higher resolution imagers reduces the number of scanners required and makes the solution more effective with enhanced features.



For example, fast and wide conveyor systems would require two standard barcode scanners with 5 megapixels of resolution. These devices would need Dimensioners, power supplies, proximity sensors, cabling, switches, or programmable logic controllers (PLCs) to ensure that the right parcel gets to the correct location. A Smart Scanner such as the AV900 delivers 9 megapixels of resolution allowing one device to replace the traditional units. Importantly the intelligence within the Smart Scanner directly increases its functionality and effectiveness with new features such as three different focusing modes:

- Fixed focus
- Dynamic focus
- Sequential focus

Sequential focus is the most powerful mode in the smart scanner. In this mode the scanner can be programmed to look for barcodes at different positions, with different frame rates. The information for sequential focus is sent directly to the Smart Scanner and stored locally. The sequence is executed directly without the need of a computer or PLC. This type of intelligence illustrates how smart scanners do more than just scan barcodes; they cut the cost of traceability systems.

HANDS-FREE SCANNING

The movement of parcels and products through supply chains is not only increasing in number but increasing in variability of size, weight, and shape. All increases impact the labor effort required to keep things moving through the supply chain. Each step in a supply chain is a point where traceability information is gathered either for process tracking, regulatory requirement, logistics tracking, customer disclosure or all of them. Reading barcodes at each step is a conceptually simple process that is repeated thousands of times per day by individuals and millions of times per month by enterprises. This simple process yields traceability clarity and confidence but can come at a significant cost in manpower and time when aggregated.

The act of picking up a scanning device, aiming at a barcode, reading the code, and returning the device adds up in time and affect on workers. Items that are either too big to handle in one hand or oddly shaped requiring two handed handling must wait until the barcode data collection process is completed before moving to the next step. This delay is repeated for each of these items at each step as it travels the supply chain.

Hands-free scanning eliminates these delays by delivering a means to seamlessly handle the item and record traceability data. Benefits from hands-free scanning are more than just time saved by eliminating handing of a handheld device; hands-free operations are preferred by workers due to their improved ergonomics. Keeping a movement fluid without interruption eliminates potential injury situations. Implementing hands-free scanning can be accomplished in two powerful ways.

Hands-free scanning captures data as items are moved through the field of view. No need to pickup a handheld device.

HANDSCANNER

For workers moving throughout the enterprise handling inventory and materials in tasks such as picking, kitting, and put-away, the HandScanner is the ideal device. HandScanner is the smallest and lightest wearable scanner on the market. Its Bluetooth interface makes it easy to connect to mobile computers, smartphone, vehicle mounted computers and other smart devices.

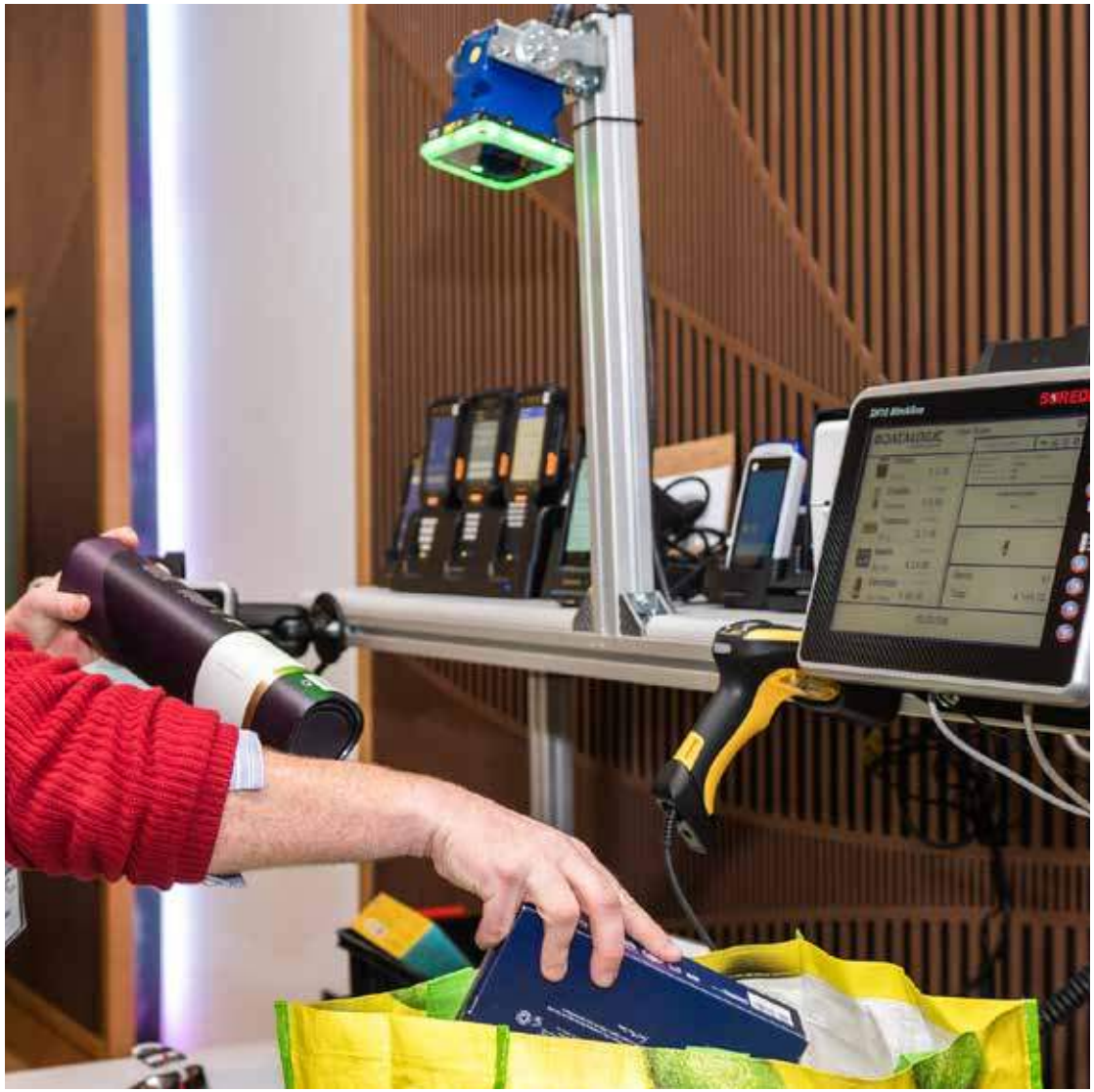
With the HandScanner workers have both hands always available for doing whatever task is being performed. The scanner is mounted on a glove that worn throughout the shift. Each time a scan is required a simple movement of the thumb activates the scanner. It is a small device making it light and easy to wear. Its long-lasting battery delivers productivity all shift long.

When it is time to recharge, the unit is easily removed from the glove and placed in a charging dock. In just a short time the HandScanner is ready to go to work. If you can't wait for the charging to complete, a new device can be easily snapped on to the glove and work can begin again.

OVERHEAD SCANNING

In operations where scanning is done at a specific location within the enterprise a second hands-free method can be implemented using an overhead scanner. Operations such as receiving, palletization, and fulfillment are ideal for hands-free overhead scanning. The Matrix 320 Hands-Free kit was designed specifically for these types of installations. The Matrix is a unique device with the power and optical performance to detect barcodes on parcels as they are being moved through the field of view.

One ideal application for overhead scanning is ecommerce fulfillment. Every e-commerce order is picked and packaged for shipment at a fulfillment station. There, the contents must be verified against the order to ensure the correct items are sent to the correct customer. Depending on the size of the enterprise, thousands of items are scanned every day or every hour. Using an overhead hands-free scanner creates significant time savings by eliminating the deliberate scanning operation. Instead, scanning takes place as items are moved into the shipping box. The benefits of hands-free overhead scan are instantly noted as items are moved from the picking tote or cart to the shipping box. Every item is moved in one smooth motion. There is no stopping to pick up a scanner, no aiming, no trigger to press and nothing to put away. Instead, the task becomes one of moving items from one location to the next. As this process is executed, the Matrix 320 scanner, which is positioned overhead, is actively detecting and decoding barcodes on each item. Studies have shown that using the hands-free scanning kit for e-commerce fulfilment reduces process time by as much as 30%.



Two other operations ideally suited to overhead hands-free scanning are manual sortation and receiving palletization. These tasks have similarities where parcels must be transferred from one location to another and be tracked along the way.

In sortation, items are scanned and identified for placement in specific locations, totes or gaylords. Similarly, in receiving palletization incoming parcels and materials are received from incoming couriers and palletized for distribution to other parts of the enterprise. Incoming shipments of materials, subassemblies and components can contain a large quantity of parcels. Moreover, the size of the parcel may require two hands for handling. In these instances, the use of a handheld scanner to scan the parcels individually significantly adds to the process time. Overhead hands-free scanning eliminates the scanning operation and performs it automatically.

The Matrix 320 Hands-Free Scanning kit can be used to scan a parcel retrieved by workers for placement in the correct tote or pallet. In this use, the scanner is placed overhead near the end of the conveyor; as workers pick up the parcel and move, the motion brings the parcel under the field of view of the scanner and the barcode label is read.

The kit can also be used to verify the correct parcel has been placed in the correct pallet or gaylord. In this use, the scanner is placed overhead near the pallet or gaylord so as workers approach with a parcel, the motion brings the parcel under the field of view of the scanner. These operations mimics the work done in the fulfillment station on a larger scale.

Implementing overhead hands-free scanning is a simple task with the Matrix 320 Hands-Free Scanning kit. The system has been designed to be installed in the same manner a handheld scanner would be. Specifically, just as handheld scanners interface using a USB connection, the Matrix 320 Hands-Free Scanning has the same interface. Simply mount the scanner in the appropriate location and route the cable to a USB port and it is ready to use. The large depth-of-field of the Matrix 320 makes it easy to ensure parcels of various sizes and workers of various heights will accurately and easily detect barcodes on parcels.

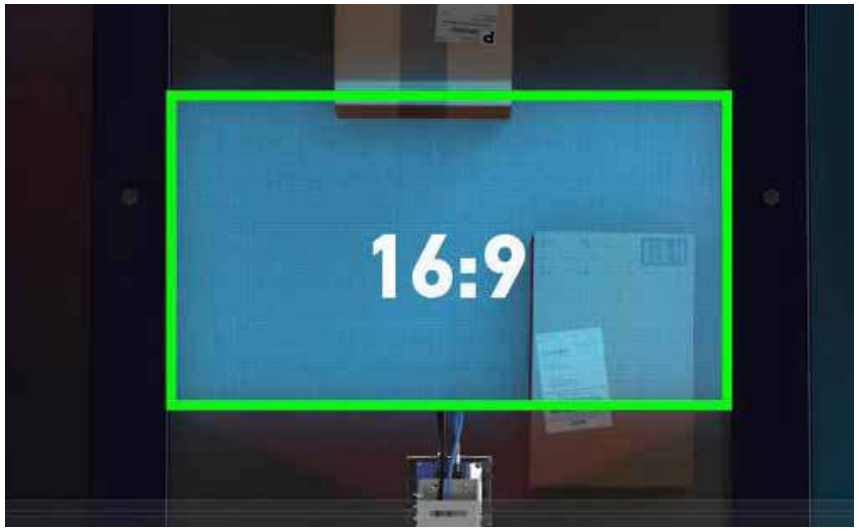
OPTIMIZED PIXEL DENSITY

While high resolution remains an important specification in many industrial applications, how that resolution is utilized can be even more important. Most barcode scanners have a 4:3 aspect ratio, creating a field of view that resembles a square. If one of these scanners is positioned to scan a 2-foot conveyor covering the full width, the field of view is 2 feet x 1.5 feet, with pixels evenly spaced over that area. Most barcodes are detected close to the starting edge of the field of the view, meaning that many of the available pixels go unused, creating serious system inefficiency and problems for barcode detection.

If an application requires an increased field of view, the scanner must be raised to cover the width of the conveyor. Increasing the scanning area reduces pixel density in the field of view and impacts how well the scanner can detect and decode barcodes. Poorly printed, damaged, or low-contrast barcodes can become difficult or impossible to read. A common solution is to add more scanners, but this increases cost and complexity. Optimizing the aspect ratio is a better way to solve this this challenge and it provides a better fit for industrial applications. For example, the Matrix 320 from Datalogic delivers a 16:9 aspect ratio, a flatter rectangle than the 4:3 aspect. Changing the aspect ratio provides a wider field of view making it more effective to cover conveyor applications while maintaining high pixel density. The real benefit comes when reading poorly printed, damaged, low-contrast, or multicolor barcodes. The 16:9 aspect has more pixels in the read zone enabling higher read rates.

Often, when a barcode scan fails, a person must intervene to make sure the package continues to its destination. This human involvement is required to ensure the accuracy of a parcel's traceability data. An optimized aspect ratio provides more pixels in a rectangular field of view, which greatly increases the number of readable labels. Fewer failed reads increase traceability and reduces labor costs. While aspect ratio might seem basic, optimizing it for better detection plays a critical role in reducing labor costs and traceability effectiveness.

Parcels travelling on a conveyor with a 4:3 FOV barcode scanner



Parcels travelling on a conveyor with a 16:9 FOV barcode scanner

TECHNOLOGY TO STAY COMPETITIVE

Machine learning, vision detection, smart scanning, hands-free scanning and optimizing aspect ratio provide tangible, quantifiable advantages for traceability improvement. Moreover, they deliver real business benefits that increase the enterprise bottom line. Companies not utilizing these technologies will find it increasingly difficult to stay competitive. Technology is not stagnant, improvements in traceability systems will continue to bring benefits to enterprises willing to adapt while laggards fall farther behind.

To see how these technologies can benefit your enterprise, contact your local Datalogic representative or visit: www.L-Tron.com

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