

# MAKING THE CASE

MAKING THE CASE FOR

## INTELLIGENT VISION-BASED SORTATION & TRACKING SYSTEMS





# E-commerce age fulfillment drives the need for smart, digitized sorting and tracking

**F**OR ALL THE STRATEGY THAT GOES INTO E-COMMERCE SUCCESS, ultimately it comes down to moving the right items and packages to customers quickly and efficiently. If operations can't identify goods accurately and control the movement of automated material handling equipment with precision and speed, the result is unhappy customers and loss of market momentum.

The challenge is that moving goods isn't as straightforward as it once was. E-commerce orders are typically at the each or item level, not full cases or pallets.

Packaging is changing too. Instead of boxes with uniform dimensions and edges, there is more use of polybags and shipping envelopes. According to research firm Technavio, polybags accounted for over \$31 billion of roughly \$82 billion global e-commerce packaging market in 2015 and constituted the fastest growing segment.

Operations face other immense pressures. According to MHI's survey-based 2018 Annual Industry Report, customer demands on the supply chain were seen as the biggest industry pressure, with 73% calling it extremely or very challenging. Hiring qualified workers is the second most acute challenge, with 64% rating it extremely or very challenging. The 2018 survey also found that adoption of robotics and automation, which stood at 34%, is predicted to top 53% in two years, and 73% in five years.

Think for a moment, about the impact of these mega-trends. For one, you have smaller, more frequent orders that need to move quickly through increasingly automated facilities,

and second, the packaging will more often be smaller bags that can be difficult to detect and handle. The result is that companies need to evaluate whether they have the right sensing, reader and digital image management technology to provide the information needed for effective handling, tracking, and fulfillment over this stream of smaller items.

"In the past, the focus with reader technology was just in getting the scan, typically on a one-dimensional

bar code label," says Tom Wik, national product manager, vision and identification with SICK, Inc. "The goal was to get a good read—to move product from here to there. While that's still necessary, now operations are wanting more information about everything surrounding the read, like label condition and orientation, package condition, and how packages are being presented to the reader. That extra information allows you to make your processes more efficient."

**"With vision you can capture valuable information from every tray on a loop sortation system to see if there is something on each tray so that you can keep the system highly utilized."**

— Bruce Muir, national sales and marketing manager for storage and conveyor, SICK

SICK is a global provider of intelligent industrial sensors, including vision-based bar code readers that capture and digitize information to help optimize package flow on conveyors, sorters, and automated storage systems. Automated materials handling systems rely on automatic ID technology to scan bar codes so that goods can be handled and routed according to the correct material flow. Other sensors such as photo eyes, dimensioning systems,

and digital weigh scales also are essential to cost-efficient shipping, since carriers apply dimensional weight pricing formulas that make it advantageous to use right-sized packaging.

Vision-based readers are shaping up a key enabling technology to meet these challenges. While laser-based readers still have their place, vision-based readers are needed to read two-dimensional codes. What's more, the high-resolution digital images that are captured "digitize" what the

reader sees and the characteristics of the goods moving through the process.

This repository of information about package and label characteristics can be used for

everything for assessing the root cause of no read events to make automated equipment run better. Vision-based reading and sensing can, for example, help ensure that automation like sortation systems are being fully utilized. Given the labor crunch in warehousing, it's crucial that operations investing in automation like loop sorters that use tilt trays or other mechanisms to handle small packages are able to maximize the throughput potential.

## E-COMMERCE AGE FULFILLMENT DRIVES THE NEED FOR SMART, DIGITIZED SORTING AND TRACKING

**CUSTOMER DEMANDS**  
on the supply chain were seen as the  
**BIGGEST INDUSTRY PRESSURE**

**73%**  
called it  
**EXTREMELY**  
or **VERY**  
**CHALLENGING**

**HIRING**  
**QUALIFIED WORKERS** is the  
**SECOND MOST ACUTE CHALLENGE**

**64%**  
rated it  
**EXTREMELY**  
or **VERY**  
**CHALLENGING**

**73%**

**FIVE-YEAR**  
**FORECAST**

Adoption of  
**ROBOTICS AND**  
**AUTOMATION**

**34%**

**2018**  
**SURVEY**

**53%**

**TWO-YEAR**  
**FORECAST**

SOURCE: MHI'S SURVEY-BASED 2018 ANNUAL INDUSTRY REPORT

"There are physical limitations to the speed of loop sorters, before items start flying off the system," says Bruce Muir, SICK's national sales and marketing manager for storage and conveyor. "In that situation where speed is limited, there needs to be a focus on making sure every tray is filled, to ensure you are getting the most productivity out of that asset. With vision you can capture valuable information from every tray on a loop sortation system to see if there is something on each tray so that you can keep the system highly utilized."

Intelligent vision readers and sensors make it possible to fully understand package attributes as soon as they enter a facility and have a digital record of package

condition as goods exit. This sets the stage for both proper internal routing and efficiencies while also being able to prove package condition as you transfer ownership to customers or logistics partners, points out Justin Hildman, systems manager for application solutions with SICK.

"When you receive product you're taking ownership, so one of the key challenges is to speed up and perfect that process by using intelligent reader and sensor technology to capture codes, dimensions, and other pertinent package attributes," explains Hildman. "Digitally capturing package characteristics sets the table for many different things you can do to improve your processes."

# Intelligent vision solutions meet digital age fulfillment and tracking needs

**T**HE BARCODE WAS FIRST USED BACK IN 1974, and one-dimensional codes still serve a crucial role in product identification and tracking. But in this era of high velocity e-commerce, just being able to scan a bar code isn't enough for optimal performance.

To excel in today's environment, there's a growing need to digitize package characteristics as soon as goods enter a facility and use intelligent vision and sensing technologies to keep automated materials handling equipment running efficiently.

This shift in data capture and sensing best practices calls for a full toolbox of solutions and services, led by intelligent, vision-based readers that digitize factors like package condition, label orientation, and bar code read events. The idea is to have a digital, visual record of key points in your process so you can improve operations and ensure items get shipped quickly, efficiently, and in good condition, explains Tom Wik, national product manager, vision and identification, for SICK.

"Now people need more information than just the barcode 'read' itself," says Wik. "This added information provides value because ultimately it makes it easier to efficiently handle and ship products."

**"Vision gives you that bigger, two-dimensional field of view that takes into account different variables that can impact being able to capture the information you need."**

— Tom Wik, national product manager, vision and identification, SICK

SICK is a global provider of intelligent industrial sensors whose broad portfolio includes vision-based readers, laser-based readers, and other sensor intelligence to support item detection, zone control, trace and trace, and dim/weight/scan systems. SICK works directly with enterprises who need to support their material handling or production flow

operations, as well as with integrators and vendors of automated equipment who want the best sensors and readers as part of their solutions.

SICK's intelligent vision and sensing portfolio addresses multiple functions, including:

- Investigating the cause of no read events.
- Providing a visual record of package condition.
- Ensuring equipment such as conveyors, diverts, and sorters are working correctly.
- Providing high-resolution images of labels and bar codes, which can help determine if a printer is beginning to malfunction or needs maintenance.





- Rapid identification of damaged goods or difficult to convey/handle products in receiving so that these items can be routed quickly and correctly, thus avoid slowdowns or manual interventions later on.

**“We can mount vision readers above a conveyor scan point and reliably read codes and capture information without having to worry about repositioning whenever things change.”**

— Tom Wik, national product manager, vision and identification, SICK

- Integrated dimensioning and weighing to speed up cost-effective fulfillment.

- A full range of services and support.

At the core of these capabilities are vision-based readers that use camera technology to instantly “read” barcodes while also digitally capturing information about package attributes and read events. Vision technology is needed for two-dimensional codes such as PDF417, Data Matrix, or QR Codes, which increasingly are used for product identification or transport information.

Vision-based readers such as products from SICK’s Lector Series are constantly capturing digital images at key points in industrial and materials handling processes. In some cases, this digital information is processed instantly “on the edge,” but the readers also are capable of sending images to a central data repository for later analysis using standard network protocols.

“What image archiving provides is a way to explain events that have

happened within your processes,” says Wik. “Vision enables a database of images so that you can analyze and find the cause of ‘no-reads. It may be, for example, that labelling equipment is not putting labels on correctly. Or,

maybe the box or envelope has moved around the conveyor more than expected. That extra information allows you to

investigate and make your process more efficient.”

Vision-based readers solutions also provide for ease of use in terms of reliably getting accurate barcode reads, even when conditions change, such as smaller labels or if a SKU gets a new package. This is because vision-based readers naturally have a wider field of view than laser-based scanners. Additionally, a vision-reader configuration on a line might actually involve multiple readers or a combination of reader types to give a very broad field for visual information capture. This results in a flexible or “forgiving” configuration that doesn’t have to be tweaked every time variables change.

“Vision gives you that bigger, two-dimensional field of view that takes into account different variables that can impact being able to capture

the information you need,” says Wik. “We can mount vision readers above a conveyor scan point and reliably read codes and capture information without having to worry about repositioning whenever things change.”

SICK’s consultative sales approach and expert support services can guide user organizations or automation suppliers on how to create complete solutions for intelligent tracking, image archiving, and improvement of material handling systems. Bruce Muir, SICK’s national sales and marketing manager, storage & conveyor, explains solutions might incorporate camera-based readers, sensors, dimensioning products, and software for image archiving and analysis. The goal is to apply enough technology specific to solving critical challenges while keeping the cost of the system down.

For example, on conveyors moving polybags, a critical issue is to be able to detect the leading and trailing edges of bagged items so that the conveyor is fully utilized. SICK’s array sensors, for example, use a light band to sense the leading and the trailing edges of polybags with great precision.

**“You need sensors that fit the application. It’s all about configuring what is best for a specific application in a way that keeps the solution affordable while also generating the information needed to ensure the performance of your automated systems.”**

— Bruce Muir, national sales and marketing manager for storage and conveyor, SICK

## SERVICES ENSURE SUCCESS THROUGHOUT THE PRODUCT LIFECYCLE

Most providers of technology such as sensors and readers can provide some buying guidance or after sales support and services, but to ensure the most successful solution over time, it takes a broad range of services.

SICK's portfolio of services and support can start with consulting (either on-site or via phone) and help in selecting appropriate products, but that's just the start. SICK offers a full menu of pre- and post- sales support, maintenance, and lifecycle services including:

- SICK's team can meet with clients on site to understand application needs first hand, and from there, come up with a scope of work and configuration using appropriate products and technology.
- Customer Project Management (CPM) resources are used for complex projects. A single point of contact is assigned to ensure timely communication and facilitate accurate information exchange of throughout the project. Any necessary changes to schematics or the bill of materials for the project is coordinated through CPM as they arise.
- Integration engineering, so that system elements such as readers, photoeyes or 3rd party devices are linked to appropriate warehouse automation control systems, fieldbuses, or other control or industrial software.
- Training, which can be customized for different job roles, from basic training for supervisors, front line workers, to more advanced training for an organization maintenance, control engineering, or plant engineering staff.
- On-site technical support as well as preventative maintenance services.
- 24 x7 help line.
- Extended warranty and bench repair programs.
- On-site performance inspection visits in advance of peak seasons for order fulfillment. This popular option ensures readers, sensors, scales—everything in the solution—is working correctly.
- Safety services for asset protection and operator safety.

Customers can choose what they need from this portfolio of services, explains Jill Oertel, SICK's service product manager. "It's up to the customer to determine what services they choose to employ. It's a broad and deep portfolio of services and support that spans the whole lifecycle of our solutions, but it's also very customizable."

"You need sensors that fit the application," Muir says. "It's all about configuring what is best for a specific application in a way that keeps the solution affordable while also generating the information needed to ensure the performance of your automated systems."

The digital images generated by vision-based readers can be searched using software tools such as SICK's Package Analytics. This software can be used to look for likely causes such as poorly printed or applied labels, or items that have shifted out of the field of view. This searchable repository is an example of how vision-based readers can be considered "intelligent" and thus provide added value.

For example, Package Analytics might show a label is in the wrong place on an item, or that a barcode's contrast is degrading, pointing to the need to perform maintenance. A small tweak to industrial equipment, points out Wik, can cut down on no reads and the extra handling involved in fixing no reads. "The information generated by vision readers allows an operation to make some improvements to their systems so that they can run their operation better," says Wik.



## CASE STUDY:

# Camera-based identification empowers retail industry DC

**W**AREHOUSES THAT USED TO FOCUS ON REPLENISHING RETAIL STORES with pallet sized shipments have transformed into fulfillment centers adept at shipping e-commerce orders direct to consumers, supporting buy online, pickup in store, as well as handling store replenishment.

That adds complexity to order profiles, not just in terms of extensive piece picking, but in terms of being able to route, track, and process goods accurately and efficiently from start to finish of the material flow.

Just consider the challenges a typical distribution center (DC) for an omni-channel retail chain must meet. The operation has to breakdown and store smaller items for e-commerce fulfillment; it may need to cross dock goods, and know which goods are non-conveyable or require special handling. On top of that, the operation should monitor and capture the condition of goods, especially as they enter and leave the DC.

The key to all of this is being able to capture data, and not just transactional data from bar codes, but also images that digitally capture package characteristics including dimensions, label condition, and other factors that could impact order fulfillment or customer satisfaction.

On the inbound side of an e-commerce era DC, image-based readers and optical dimensioning sensors can capture the full range of information needed to trigger the correct handling of the goods.



## INDUSTRY 4.0: Digitize to Improve

**T**he Industry 4.0 name refers to a fourth industrial revolution led by digital technologies. Under the Industry 4.0 concept, the physical world of making, moving and shipping things can be closely mirrored by digitizing events and processes from the physical world. Most importantly, once you digitize the physical world, you can make it more productive.

This notion of digitizing physical events and processes is why technology such as intelligent, vision-based readers and the other digital sensors SICK is known for are so important to the next wave of industrial improvement. Vision and digital sensors capture more attributes and variables about the physical realities of industrial and supply chain processes.

Whereas at one time “data collection” resulted in only a partial or time-lagged knowledge of the physical world, with solutions such as vision-based readers, digital array cameras, and dimensioning sensors, an organization can digitally capture all sorts of package attributes and have near real-time knowledge of what's moving down a production or warehouse line.

This more complete digital view of the process, aided in some situations by edge computing capability in the sensors, makes it easier to squeeze added productivity from assets and labor resources. That's how smart, vision-based readers and sensors fit into the Industry 4.0 concept, and more importantly, how they drive improvement.

SICK offers details on [Industry 4.0](#) ready solutions, and further context on [Industry 4.0 and sensor intelligence](#).

The Industry 4.0 concept has its roots in Germany, where the government worked with manufacturing and technology companies to refine the goals and supporting technologies.

SICK, as a global company headquartered in Germany, has long been involved with these efforts, including being a stakeholder in Plattform Industrie 4.0, a joint project between government, industry, and academia to create a better understanding of Industry 4.0. Further background on Industry 4.0 can be found via Germany's Federal Ministry for Economic Affairs and Energy.

While enterprise and warehouse management systems typically hold data on stock keeping units (SKUs) and orders, sometimes package characteristics, package sizes, or other physical attributes might change unexpectedly. A retail industry DC with image-based identification can in effect “digitize” package attributes and trigger efficient decisions with that knowledge.

Image based readers and dimensioning solutions located in the receiving area accurately identify which goods need to be cross-docked, which goods are too large or otherwise non-conveyable (e.g. they have straps that could damage sortation systems), and which goods can be routed down an automated line to a storage or picking system. Omni-channel DC might leverage the following types of camera-based identification and sensing solutions from SICK:

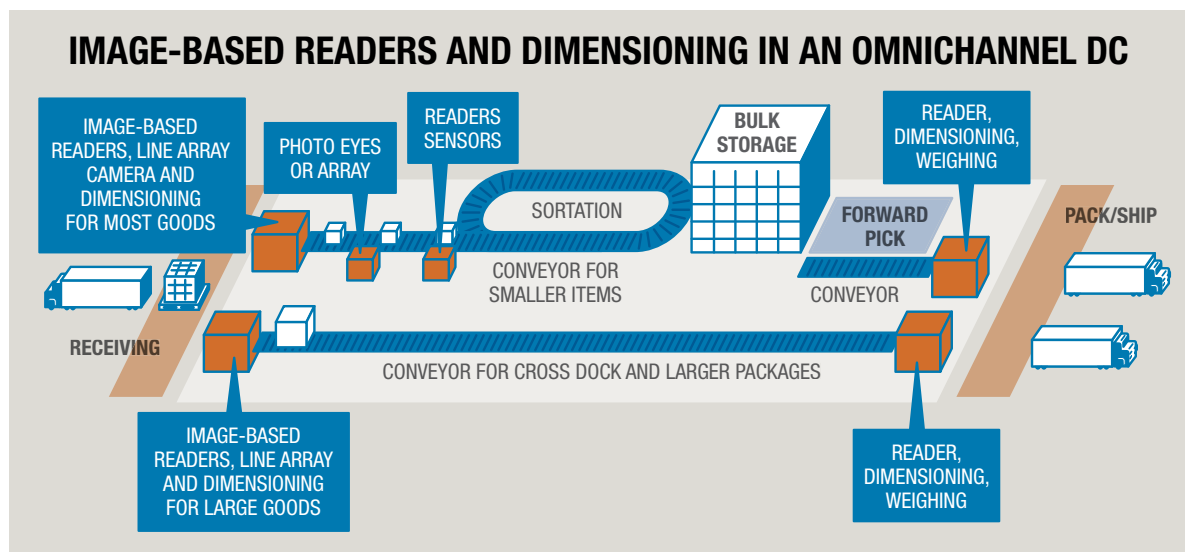
- At receiving, a combination of a line array camera to capture full images of entire packages and smaller image-based code readers like the Lector65X to read codes and capture label and package conditions. The data capture area near receiving can also include dimensioning solutions, such as SICK's Volumetric Measurement System (VMS) to dimension and assess larger packages so they can be properly routed, or a SICK VML for high speed measurement and master data capture of incoming smaller packages.

are able to precisely detect the leading and trailing edges of small items such as polybags. Photo eyes and light array sensors act as triggers for camera-based readers, as well as to trigger automated functions such as divert logic in material handling and warehouse control systems.

- On the shipping side of our retail industry DC, camera-based bar code readers, dimensioning sensors, and integrated digital weigh scales can be positioned in stations near pack/ship lanes to perform any final bar code

the Cloud for archiving, while SICK's Package Analytics software allows for centralized querying and analysis of attributes.

SICK's camera-based readers also are capable of edge intelligence for near real-time routing and handling decisions. Here the camera devices can use machine learning tasks built in at the device level to take quick actions whenever damage is detected, or hazardous material labels are present and special procedures should be followed.



- Within conveyor and sortation lines that lead to either bulk storage, forward pick areas, or straight to shipping, additional image-based readers to capture codes and digitally capture information package and label condition, label orientation, or package position as they move down the lines. Reader devices can be triggered by SICK's digital photo eyes, or by light array devices such as SICK's Ray10 that

data collection, weigh and dimension shipments to ensure they are accurate, and capture digital images that can be used to prove that shipments left the DC in good condition.

Centralized software for package analytics is an important component of being able to prove package integrity. A small controller located near network connected image-based readers can consolidate image data and send it to

With the right mix of image-based readers, dimensioning solutions, inline weighing, image archiving and analytics, a retail industry DC can not only read bar codes fast and accurately, the DC's systems will know the full scope of package, label, and other physical conditions so that goods will be optimally routed and traced for both efficiency and customer satisfaction.



# MAKING THE CASE: Digitizing with intelligent vision yields traceability and efficiency benefits

**E-COMMERCE COMES WITH MANY EXPECTATIONS.** No consumer wants a damaged package or incorrect order delivered to them. For that reason, companies engaged in ecommerce fulfillment know that they need to be ready to prove that what they shipped was correctly labelled and in good condition.

For operations managers, the expectation is that warehouse operations will be kept as efficient as possible, even with all the complexities involved in processing and shipping small ecommerce orders

So how do you meet these expectations? Well, the short answer is that it's not easy, but by using intelligent, vision-based readers and associated sensors, you can capture the information you need to help address both external customer service expectations, and internal marching orders for efficiency. Vision enables benefits that help with various shipper responsibilities, including:



- **From a customer service or product management point of view**, the ability of vision-based readers to capture and archive digital images of read/scan events allows the organization to prove it shipped out undamaged, correctly labelled products. This same digital repository of read events, when combined with software such as SICK's Package Analytics, allows for analysis of no reads so that the organization can keep no read event or misrouted products to an absolute minimum.
- **For operations managers in warehousing and logistics facilities**, intelligent vision readers and associated sensors such as photo eyes or vision-based arrays can pinpoint the location and gaps between bags or boxes moving on automated machinery such as conveyors or sortation systems. Precise and accurate sensing of leading and trailing edges of products, and pinpoint control over gaps between items or the presence of product on assets like tilt tray sorters helps ensure that high-end automation is fully utilized. This helps operations managers meet throughput goals with existing materials handling systems.
- **Operations managers also benefit** from how intelligent vision readers and sensors can correctly route incoming goods as soon as they enter a facility. Digital identification of the full range of package attributes such as dimension, weight, labelling, and whether it can be reliably conveyed and sorted under the normal material flow, or should be dealt with as a non-conveyable, adds efficiency to materials handling.
- **Quality control and compliance teams** can use the high-resolution images generated by vision readers to investigate problems with labels or packaging with incoming shipments, with no reads or misrouted goods in the facility, or to help ensure outbound goods are correctly labelled and in good condition.
- **For plant engineers, control engineers, or maintenance personnel** who are tasked with maintaining and reconfiguring bar code reading and automated materials handling systems, vision-based readers support

greater ease of use because they have a broader, more flexible field of view than laser-based equipment. So as bar code labels or other package attributes change, there is less need to reconfigure the product identification infrastructure to capture code data.

- **For IT leaders and managers**, SICK's solutions and integration services ensure that digital images can be easily networked and stored within your IT infrastructure. Added process power at the reader and sensor level also allow for an edge computing approach in which some logic can be processed and executed locally at the device level, while other digital image data can be sent to the Cloud for storage and potential analysis using artificial intelligence techniques. From the IT perspective, intelligent vision means captured data is easy to communicate via standard networks and comes with prebuilt software options for package analytics.

- **For senior executives and company leadership**, the move to intelligent vision-based readers supports the strategic need to excel at ecommerce fulfillment in a cost-efficient way. Not only are vision-based readers necessary for 2D codes, the digital images and package attributes they capture are able to reduce no reads and maximize utilization of automated materials handling assets. Digital data repositories fed by intelligent vision also set a foundation for deep learning and analysis of material handling processes.

Regardless of your role in an organization, intelligent vision sets the table for a range of process improvements, sums up Tom Wik, SICK's national product manager for vision and identification.

"It all comes back to having more information," says Wik. "It's not just being able to read a code, but having knowledge of a range of package attributes, such as whether the label applied correctly, as well as solutions that integrate the dimensioning, so you can properly route and handle a product. At the end of the day, the level of digital, visual information is going to allow organizations to be more efficient in the way they produce, handle and ship their products."



# How intelligent vision-based sorting and tracking benefits your organization today

**T**RACKING AND MANAGING THE FLOW OF PACKAGES EFFICIENTLY RELIES ON **INFORMATION.** Not just static data represented by a barcode, but increasingly, all types of information relative to how goods are routed, sorted, processed, and shipped in distribution centers, factories, and other facilities.

The velocity and small-item packaging involved with e-commerce heightens this need for more information—including digital images—about read/scan events, label and package conditions, and package characteristics so that operations can run optimally.

If you can digitize information vital to material handling, leveraging image-based readers and other intelligent sensors, and tap into online archiving of images and read events, you can route goods in a better way during operations, and perform analysis to prevent misreads or low utilization of equipment. The digitized information can reveal issues with package condition, label quality, or spacing/gaps issues on automated lines.

With online storage of images, an organization can apply analytics to continually improve on read rates and have a handy archive to “prove” package condition. Here are a few key areas that are ripe for improvement with intelligent sensors and image-based readers:

- Lower than expected read rates in critical areas of a warehouse, leading to costly exception handling, shortages in downstream pick/pack areas, or incorrect orders. Image-based readers can address this challenge by capturing images that show the full range of package, label presentation, and label characteristics that impact read rates. Bad labels, packages that are too close together or too far from the read zone, are problems that can be solved with image-based readers and associated analytics.

- Suboptimal utilization of high-end sortation, conveyor, or other materials handling equipment. A combination of image-based readers, photo eyes, and digital array sensors (sensors which sweep a beam of light to detect what’s passing by) can be used to precisely track the leading and trailing edges of hard to detect items such as polybags. Knowing the leading/trailing edge of bags, as well as tracking whether asset components like tilt trays are occupied with goods, helps keep loop sorters and other materials handling assets fully utilized.

- Inability to rapidly or accurately capture full product characteristics on the inbound/receiving side. Because image-based readers and supporting technology such as dimensioning sensors can capture information such as dimensions, label quality, as well as bar code data, the operation is better able to route received goods to the proper area. If a supplier label is damaged, it’s better to know that right away,



or if a package is too large to be conveyed, it’s better to route that package differently from the start. Image-based readers and dimensioning sensors, placed at key points near receiving, allow for smoother workflows.

- No way of being able to quickly prove the condition of packages which leave your facility.

Image-based readers and archiving of images and read events are the foundation for being able to prove-out package/shipment condition. Analytics software that can quickly call up read events by day, time, and location also help address this issue.

In summary, being able to digitize package characteristics and read events is the next evolution in smart materials handling and traceability. While traditional bar code readers still have a role, to keep increasingly automated fulfillment centers as productive as possible, image-based readers and smart sensors are becoming a must.

Smart readers and sensors that address needs such as dimensioning allow operations to stay on top of changes in product mix and packaging attributes, as well as keep pace with the level of order velocity and complexity being driven by e-commerce.

This digitization of package and read event characteristics may sound difficult to achieve, but with SICK’s comprehensive services, the right solutions can be chosen, implemented, and maintained. SICK’s experts can help match the right readers and sensors to the application, and its services team can perform maintenance on an ongoing basis, as well as come in before crucial peak seasons to make sure the sensors will perform as expected.

To find out more about how image-based reasons and intelligent sensors can improve your operations, visit [sick.com](https://www.sick.com)



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