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Fixed Readers: Lasers and Imagers Converge

Lisa Terry

April 01, 2004

Smaller companies automating for the first time and upgrades for new standards are driving growth in stationary (fixed) scanners and readers.

Finding the best route to collecting vital data from materials on the move gets easier every year, thanks to new stationary (or fixed) laser and vision-based readers. End users can now choose from a range of solutions that are cheaper, faster, more accurate, and easier to deploy and maintain than they've ever been.

Today's world demands access to more data, faster. Typical concerns in business include such questions as "Where is my shipment right now?" "What lot did this batch of pills come from?" and "What is the history of this airplane part?" Automatic identification is the mechanism to encode, decode, and access all that data, making bar code use ever more pervasive and prompting supply chain participants to put more information on each marked item. While the increasingly mobile user community is focusing much attention on handheld solutions, fixed readers still have a vital, if less sexy, role to play in satisfying the need to know now.

That said, sales have not been brisk. "In the past couple of years, sales have been weak in stationary readers in general," largely due to the retail market, said Taylor Smith, senior analyst, Auto ID Solutions, for Venture Development Corp. (Natick, MA). However, in its October 2003 report, The 2003 Global AIDC Industry Business Planning Service, VDC projected an annual growth rate of 8 percent for the category over the next five years. "That growth is not as strong for laser, while we're still seeing relatively strong growth for imaging," Mr. Smith explained. The growth is coming from smaller companies automating for the first time and upgrades and replacements for implementation of more data-dense symbologies.

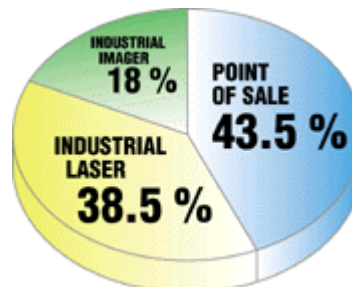
Technologies Converge in the Warehouse and on the Plant Floor

Even just a few years ago, stationary laser scanners were for reading bar code labels on moving materials, such as on a conveyor, and vision systems helped to capture images of those materials for dimensioning and other purposes. But evolution in technology combined with a drive toward two-dimensional symbologies that can contain more data drove interest in using vision-based systems for reading bar code, using the camera to capture an image, locate the bar code within the field, and decode it.

That has led to the increased use of imagers in fixed configurations, both linear and array-type vision-based systems. Both ever more closely resemble their fixed laser cousins. Imaging systems designed for bar code reading have a small field of view and use LED-based illumination systems that employ a narrow spectrum, compared to white light. In warehouse and manufacturing, "We've not yet seen a lot of increase in array imaging, but we have in linear imaging in fixed devices," said Tracy Hillstrom, product manager for Intermecc. "If you know how a bar code will be oriented



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on a line, you might use linear imaging, due to their lower cost and their ability to scan better" than array imagers in challenging circumstances such as a bar code that is dusty, laminated, or shrink wrapped.

"The highest ends of the market—the top 100 of Tier One—are shifting to vision-based systems" for material handling, asserted Darrell Owen, president of Datalogic's North American business unit. "People are looking to gather more data about packages and parcels and capture images of parcels that are not readable in order to push back costs," he explained. "At the very highest level, they're moving toward vision even if it's not necessary for the applications."

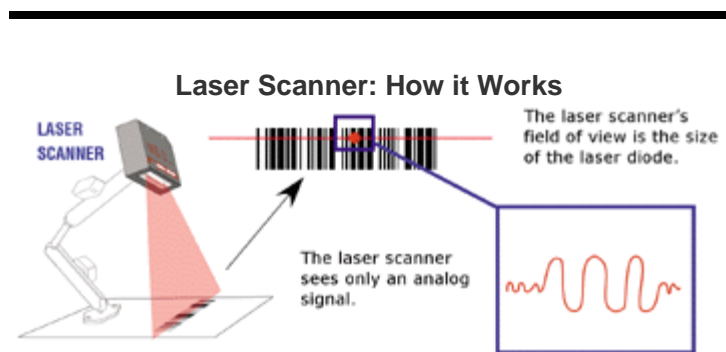
Smaller material handling operations are still shut out of vision systems due to price, Mr. Owen said. Manufacturing operations are farther along in their imager implementations due to their use of direct part marking and 2D symbologies, he added, applications that can be handled only by imagers. In industries such as automotive, aerospace, military, and others, items can endure extremely rugged conditions. In other cases like electronics, size precludes the ability to affix a bar coded label, so parts are marked via silk screening, etching, or dot peening.

"Ultimately, I think down the road there will be a full shift" to imaging, said John Ashodian, marketing manager, programs and services, for Sick. VDC's Mr. Smith agrees: "As functionality and performance [of imagers > increase and costs decrease, you'll see a migration."

Differences Persist

Despite their convergence in manufacturing and distribution operations, differences remain between the two stationary reader technologies, vision and scanners. Many vision systems do not yet duplicate the off-the-shelf, plug-and-play utility of fixed lasers, though manufacturers are closing the gap with self configuration routines and other steps designed to remove the need for an engineer in initial set-up, as well as steady increases in processor speed. Vision systems still don't decode as fast as lasers, though the need for decode speed differs from application to application.

ALTHOUGH INDUSTRIAL CCD IMAGERS are seeing increased attention in manufacturing, warehousing, and distribution, industrial scanners still accounted for more than twice the sales worldwide in 2003. (Information courtesy of Venture Development Corp., a technology market research and consulting firm based in Natick, MA.



AS THE LASER DIODE passes over the bar code, the photodiode measures the amount of light reflected.

Lasers "are an established technology, they're understood by a broad spectrum of people, and manufacturers have made them plug and play, so they reconfigure themselves when they're installed," observed Datalogic's Mr. Owen. "There is simplicity of use." Lasers also have field of view advantages. "Unless the read range of imaging comes up to that of laser, laser will be able to read bar codes that are much farther away."

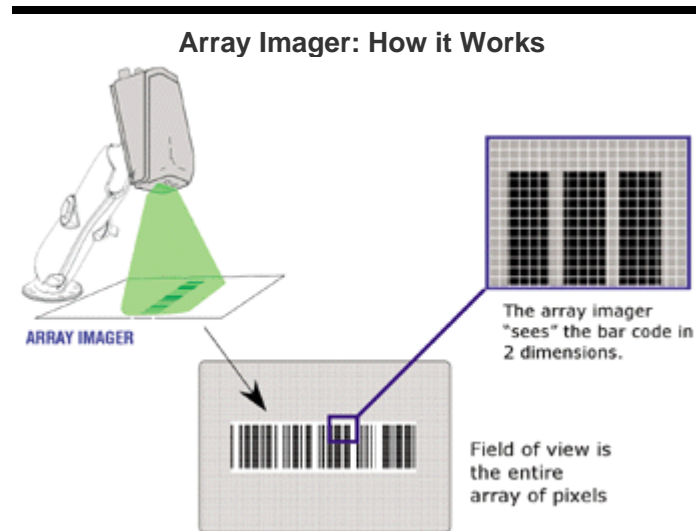
Because vision systems still must include optical, illumination, and decoding components, cost remains higher. As vision makers are working to drive costs down to enable sub-\$3000 list prices, fixed lasers are experiencing downward pricing pressure that makes parity a moving target.

Vision-based systems have reached decode speeds of up to 90 scans a second, but this

still pales in comparison to laser's 2000 scans per second, noted Dennis Kaill, president of Microscan. "You have pictures with a lot of pixels to look at. There are ways to make it quick and simple, but [vision scan rates > will still be significantly lower than a laser scanner.

Technology Wars: Visionary Applications

Most observers expect stationary laser scanning to remain the go-to technology for tried and true applications such as high-speed conveyor-based reading in warehouse operations. And vision systems will remain the only option for true 2D symbologies such as DataMatrix and Maxicode and direct part marking. But there is a middle ground in which users could shift from laser to array imaging if the price and application is a fit.



Array imaging is also gaining fans because of its ability to perform multiple functions, such as signature capture, optical character recognition, dimensioning, and reading multiple bar code labels in widely varying orientations. These imagers "have the capability to read the entire label with a bunch of different things on it," said Microscan's Mr. Kaill. "They can be very cost effective versus an omnidirectional scanner."

Imagers are creeping into stationary laser bar code reader territory in particular situations where their unique capabilities are required. "If you've got to read 150 to 600 pieces per minute with six to ten codes on a blisterpack, that's going to be a challenge" for a laser-based system, said Carl Gerst, ID product marketing manager for Cognex. "There are situations where a [laser scanner > can do the application, but it might not do it as well or as consistently, or the company might have to change processes to make it work. It becomes a cost/benefit situation."

Imaging offers "persistent data, so you have a better chance to read damaged symbology," added Datalogic's Mr. Owen.

Parcel logistics companies and overnight carriers are turning to vision because they're using higher capacity or lower aspect codes in limited space areas, added Sick's Mr. Ashodian.

Outside the Lines: Connectivity and Wireless

While questions of market linger, manufacturers continue to fine-tune the technologies. One increasing demand seen across the board is for more connectivity options.

"A lot more companies are putting their R&D focus on connectivity issues, making devices that easily connect to a variety of networks," said Datalogic's Mr. Owen. One Datalogic product, for example, has five interface options.

"In North America we're seeing demand for DeviceNet and Ethernet," added Sick's Mr.

Ashodian, which can easily be addressed by adding network connectivity modularly.

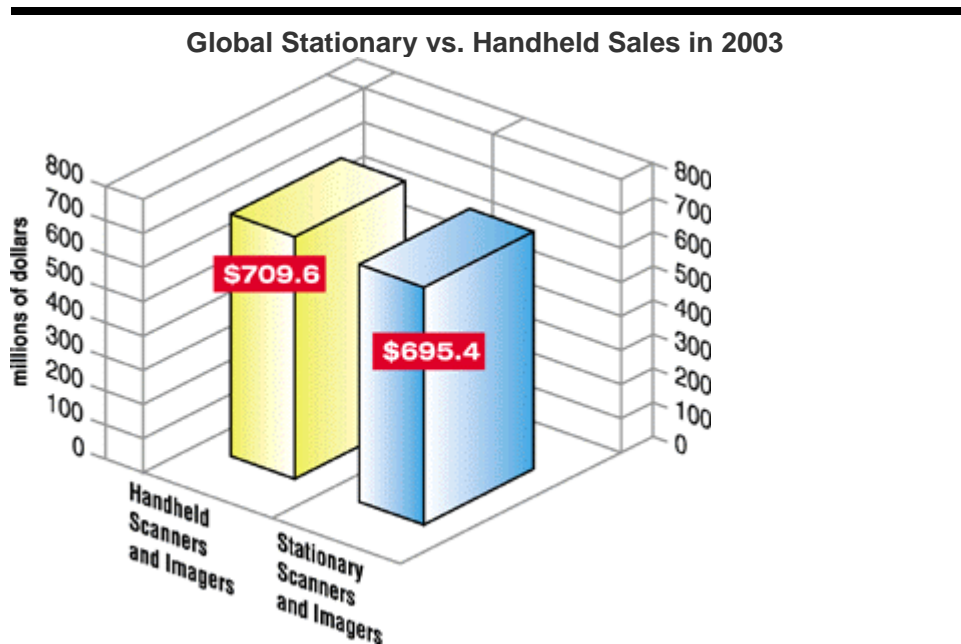
Ethernet "allows remote management, so you don't have to go to each scanner (for updates) and run diagnostics," noted VDC's Mr. Smith.

There is also a smattering of interest in wireless. "We're seeing interest for resets," said Microscan's Mr. Kaill. "Cables are a pain. People don't want to drag them around, and they're expensive." But few makers are incorporating wireless capabilities in their products, citing low demand; instead they enable users to employ add-on technology for this purpose.

In aspects such as processing speed, laser scanners operate faster than is necessary for most applications. "With the speeds laser achieves now, they can read [a bar code > multiple times as materials are conveyed]," noted Sick's Mr. Ashodian. "Processing is maxed out."

Attention on the laser front is instead trained on packaging the solutions in order to offer the right combination of features and functionality for particular situations. As with most mature technology, buyers these days get more features for the dollar than they did a few years ago.

"Our lasers and imagers are great products, but we win business based on pre- and post-sales support," said Microscan's Mr. Kaill.



HANDHELD BAR CODE SCANNERS AND IMAGERS outsold stationary (fixed) in terms of millions of dollars of sales worldwide in 2003, according to research and consulting firm Venture Development Corp.

Imagers Still Evolving

More research and development dollars these days are devoted to array imagers, where ongoing efforts include making products easier to deploy and maintain and less expensive. "Vision systems have evolved faster than the omnidirectional laser systems they're sometimes displacing," said Datalogic's Mr. Owen.

"There are three key enabling pieces" to a vision-based system, and all continue to be refined, said Cognex's Mr. Gerst. Improvements in the first component, the advanced algorithms that enable the reader to find and decode an image, are improving the reliability and robustness of products. The second piece, illumination, could once only be set up by an application engineer. That step is now being automated through "intelligent imager formation systems combining lighting technology, detecting the right light settings without the user knowing it's happening," said Mr. Gerst. Progress is also being made for the final portion, processing. "Two years ago, the processors built into embedded products were not powerful enough to run our algorithms," but today, at 500 to 600 MHz, manufacturers can build low-cost products that can handle the intensive processing

required, Mr. Gerst continued.

"There has been a general improvement in microprocessors," agreed Datalogic's Mr. Owen, with today's processors packing more wallop in a smaller package, with lower power requirements. "That makes vision systems more viable."

The bottom line is that vision systems are becoming much more laser like.

"There is a big emphasis on packaging solutions to make them well integrated and easy to use," said Cognex's Mr. Gerst. "A key end-user requirement is for systems to work as fast as possible with as little integration as necessary," agreed VDC's Mr. Smith.

Maintenance issues for the reader itself can actually be lower with imagers, noted Microscan's Mr. Kaill. "They're solid state, with no moving parts, so it will not wear out," unlike a laser which moves to perform its reads, and can break.

But vision systems still have room to improve. Vision "is not plug and play on that level. The infrastructure is not there in most cases to support vision systems" with the widely trained VAR network that exists for lasers, said Datalogic's Mr. Owen.

With either technology, end users are far more interested in solutions than tech talk. "You have to compete on the whole solution, not just the product," he said. "All products will work for 80 percent of the applications." It's the combination of the right product bundled with the right services that wins deals.

The Impact of RFID: Hold That Bar Code Purchase?

Of course, bar code symbologies are not the only method for encoding data. RFID is garnering attention these days, thanks to the Wal-Mart and Department of Defense mandates, among others. Most bar code reader makers see RFID as a complementary technology—a better fit for certain functions, but far from a displacing technology. RFID's challenges around metals and liquids, for example, could preclude its use there.

The short-term concern, instead, is that end users are deferring investment in new bar code readers while they wait for RFID needs to become more clear. "I've spoken with a lot of end users who are holding off spending until RFID shakes out," said VDC's Mr. Smith.


Re: Retail, Sun Rise in 2005

Meanwhile, both lasers and imagers are seeing adoption in markets beyond manufacturing and supply chain. Grocery stores have long been major users of stationary slot or presentation scanners and, most recently, bioptic scanners that allow orientation-free scanning for ease of use. There is some push to scanners reading multiple items in receipts, music CD bar codes, and other bar coded materials.

"In general, we see kiosks, ATM, self-service POS checkout on the rise," said VDC's Mr. Smith. In these applications, the technology might be laser or linear CCD, the latter offering similar performance to laser but with reduced speed, depth of field, and, perhaps, price. Another issue is Sunrise 2005. This is expected to drive upgrades of POS scanners in North America as retailers improve old systems to be able to handle 13-digit codes, or, in the case of recommended GTIN compliancy, to be able to handle 14-digit RSS (Reduced Space Symbology) codes.

Retail is also the market for hybrid handheld/stationary bar code readers, which can be used in presentation mode, or they can be picked up to scan large items. "People want to future-proof," said Intermec's Ms. Hillstrom. "In places where there used to be fixed, now there's a form factor available so you can pick it up or use it as a fixed reader, making processes more efficient."

Slow Evolution

 RESOURCES	
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Datalogic Inc. Hebron, KY 859.689.7000	Sick Inc. Bloomington, MN 952.941.6780
eSolutions Co. Mulberry, IN 765.742.9894	Venture Development Corp. Natick, MA 508.653.9000
Intermec Everett, WA 425.348.2600	

While imagers may be grabbing the headlines, stationary bar code reading is still largely a laser world. And array imagers account for just a small portion of the vision-based technology used for bar code reading.

Of the \$645.3 million stationary bar code scanner market in 2002, industrial CCD scanners accounted for just 17 percent of the market, and arrayed imagers were just 10 to 20 percent of that category, said VDC's Mr. Smith. 2003 saw similar trends.

Stationary reader manufacturers are filling out their lines with a range of laser scanners and vision-based systems with varying capabilities. With the potential of RFID and other automatic identification technologies added to the mix, end users are increasingly able to match the particulars of their application with a solution that specifically addresses those needs, no longer having to make do with a technology that's not quite right.

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