EXECUTIVE BRIEF

Machine Vision Solutions and Stationary Industrial Scanners

Rapidly Growing Opportunities

ideas & insights

March 2019 - Track 2, Topic 3

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with David Krebs, Executive Vice President

INSIDE THIS REPORT

This research analyzes the key strategic issues, trends, and market drivers for stationary industrial scanners and imagers. Market analysis (historical, prior year, and forecast revenues and unit shipments), vendor considerations, and growth opportunities are offered across the following dimensions: technology types, end-user industries, distribution channels, and geographies.

WHAT QUESTIONS ARE ADDRESSED?

- Imager adoption is rapidly increasing across industries and regions; what will be the impact on laser scanner adoption and investments?
- Where are the next growth centers for stationary industrial scanners in terms of regions and vertical markets?
- What is the role of material handling solution providers and systems integrators in meeting market requirements for application development and multi-functional industrial scanning solutions?
- How will today's e-commerce sales boom affect industrial scanner/imager investments in warehouses and distribution centers?

WHO SHOULD READ THIS REPORT?

This annual research program has been carefully designed for senior decision-makers at barcode technology and solution provider companies, including those individuals with the following roles:

- CEO and other C-level positions
- Corporate development and M&A
- Marketing: Product Management, Marketing Communications professionals
- Business development and sales
- Channel development, management, and strategy
- Senior management of leading retailers

VENDORS LISTED IN THIS REPORT

- Allied Vision Technologies*
- ATS Automation
- Banner Engineering
- Basler Vision
- Baumer Group
- Camtek
- Code Corporation*
- Cognex*
- Datalogic*
- Dr. Schenk Inspection Systems
- Erhardt + Leimer
- Flir Systems, Inc.
- Hamamatsu
- Hitachi Kokusai
- IDS Imaging Development Systems GmbH
- ifm electronic gmbh
- ISRA Vision
- JAI
- Kappa Opto-Electronics GmbH
- Keyence*
- KLA (KLA-Tencor)
- Laetus GmbH
- Leuze*
- Mars Token Solution
- Matrox Imaging
- Mettler-Toledo
- MV Tec
- National Instruments*
- Newland Digital Technology
- Omron*
- Opto Electronics
- Orbotech*
- Pepperl+Fuchs (VMT)
- Perceptron
- ProPhotonix
- Seidenader Automation GmbH
- SICK*
- Teledyne DALSA e2v
- Toshiba Teli
- Viscom AG
- VITRONIC
- Vitrox

*Vendor is profiled in report

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IBS Market Analysis - Americas

IBS Market Analysis - EMEA

IBS Market Analysis - APAC

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IBS Competitive Analysis - Americas

IBS Competitive Analysis - EMEA

IBS Competitive Analysis - APAC

EXECUTIVE SUMMARY

An exciting opportunity for vision and scanner vendors is being found in end users' basements and backrooms, as adoption of industrial automation for manufacturing, labeling, packaging, warehousing, shipping, and tracking all related activities is growing rapidly. Today's Machine Vision and Industrial Barcode Scanning systems furnish material improvements for end-user corporations, enabling e-commerce, track and trace for pharmaceutical and medical device makers, proper quality control for high-end electronics manufacturing, and much more. Although VDC's dual accompanying forecasts, for Machine Vision and Industrial Barcode Scanning, are separate and unrelated, sales of both product sets are intertwined. Many of the largest vendors sell both product categories.

Machine Vision

Machine vision is and will be a key driver for companies retooling to build digital factories. As manufacturing and related operations become increasingly capital intensive and automated, one plant manager told VDC, "We can replace operators, but still need their eyes." Factories of the future will leverage vision systems across numerous industries. Food and beverage makers ensure product freshness and integrity; drug-makers maintain traceability and product efficacy, plus prevent counterfeiting, electronics makers would not be able to manufacture flat-panel goods such as smart phones, televisions, monitors and tablets without it. Products from shampoo to solar panels are be made with vision systems.

How has machine vision changed? A lot of people think of vision as a separate system that needs special expertise. "That's the separate system that we'll set up later, when we want to do inspection on the production line," is user mentality, literally or figuratively. While this is true in some cases, many customers are starting to see value in integrating vision with more of their measurements, not just the typical production tests. More and more, the machine vision system is being used throughout the entire production line, rather than just at the end to inspect the finished good.

KEY FINDINGS

- **Overall Market Size and Growth:** VDC sizes the global machine vision solutions market at nearly $XX in 2018, up XX% from $XX in 2017. Our prior five-year forecast called for the market to reach $XX by 2018, indicating that machine vision has outperformed VDC's earlier expectations. Forecasting five years to 2023, VDC predicts growth to $XX, a XX% CAGR.

- **Key Technology Trends:** Image-based technology continues to gain share versus laser. In 2018 the image/laser split was XX%/XX%; three years ago it was XX%/XX%. Two- and three-dimensional imagers, plus smart cameras, are proliferating. Services revenues have decreased as a percentage of revenues in VDC's market forecasts. This reflects i) more user-friendly technology; ii) maturation of the user community, and iii) much of the services are being provided by systems integrators; VDC's forecast covers solution providers and not systems integrators.

- **Key Regional Trends:** Machine vision and industrial barcode scanning offer significant opportunity in every geographic market. Whereas many AIDC technologies are in wide use in the United States yet much smaller in APAC, MV and IBS are biggest in Asia-Pacific, due to the concentration of manufacturing, especially of electronics and photovoltaics. Five years ago Europe was the largest market, partly because an inordinate number of vendors are German and headquartered in other major European Union nations. The Americas, and in particular the United States, offer a major market, especially due to the strong economy and ensuing investments in operational efficiency.

- **Key Industry and Application Trends:** Numerous industries are adopting machine vision. Whereas five years ago this was mostly for Manufacturing and Pharmaceutical, today's list includes: Automotive, Life Sciences and Medical Devices and Equipment, Consumer Packaged Goods, Electronics/Semiconductors, Energy, Flat Panel Display / Glass, Food & Beverage, Packaging, Pharmaceuticals, Printed Circuit Board, Manufacturing / Industrial Machinery, Tolling, Traffic, and Transportation & Logistics.

- **Key Competitor Trends:** Hundreds of vendors are participating. Beyond historic leaders such as Cognex, Datalogic, Keyence, Omron and SICK, VDC Research's forecast tracks revenues of 40 vendors, virtually all with revenues from MV and IBS exceeding $XX and many above $XX. Our directory covers almost 100 vendors, and VDC is aware of hundreds of additional vendors and systems integrators. Some make just a single product category such as 3D sensors or smart cameras, while the largest vendors offer a full array of hardware, software, and services.

  The proliferation of vendors poses opportunities for entry, expansion, and merger and acquisition opportunities. As an example, Datalogic broadened its opportunities by acquiring PPT Vision to enter machine vision, leveraging its industrial barcode scanning technology. As an opposite example, Omron acquired Microscan, adding IBS to its MV portfolio. Many more opportunities exist. Currently the industry is highly fragmented, and VDC expects significant growth and consolidation in the coming 5 to 10 years.

Global Machine Vision Drivers and Trends

- **Sensor Fusion:** Being able to integrate cameras with many other types of sensors, and combine and synchronize the information to gain valuable insights from cameras, as a piece of a larger system, offers invaluable functionality.

- **Robotics and Guidance:** Robots — plus cobots, or collaborative robots that work with people — have enjoyed widespread use in process manufacturing, and are now becoming pervasive parts of machine vision installations in many more applications such as packaging, warehousing, parcel handling to load and unload containers. While some robot guidance systems are barcode based, today's more advanced systems are image driven.Guidance is an important component of machine vision solutions and necessary for robotics. According to one user, "Every robot needs an eye."

- **Deep Learning:** Given the impossibility of programming all product catalogues into all systems, deep learning is crucial for rapid rollout and scalability of systems. Algorithms and artificial intelligence are a critical success factor for machine vision systems which handle millions of products, which change daily. Deep learning has broader applications, such as in manufacturing of flat-panel displays and printed circuit boards. Large manufacturers utilize systems to create databases of millions of images from inspection systems, from which it can train and improve defect detection.

  Deep learning is a relatively new development, yet is growing rapidly. According to one of the world's largest systems integrators in this field, "We program with data rather than with code," This is an improvement over rule- and model-based inspection systems. As this suggests, advances in deep learning are intertwined with the proliferation of image-based technology, and driving the growth and value of machine vision.

- **Metrology:** Metrology is the ability to accurately measure items captured in images, as opposed to merely identifying objects and detecting defects. Distinguishing metrology from inspection, metrology heightens the quality achieved from inspection. 2D and 3D clearly improve metrology, but the "trick" is to materially improve information without adding substantial amounts of hardware. The cost per data point should not increase, even though users have additional information. Some vendors are using software to improve metrology data, generating 2D and 3D information without adding proportional costly sensing hardware. As metrology continues to advance, facilitated by improvements in software coupled with decreased cost of sensors, metrology will offset inspection, particularly in microscopic electronics applications such as flat-panel display, printed circuit boards and many consumer electronics devices.

- **Traceability:** Virtually every vendor underscored the enormous importance of track and trace. From food to pharma, and in numerous other industries, the ability to track items back to their origins offers countless benefits, even if such tracking is very rarely actually done. Machine vision materially improves this by expanding into traceability. Traceability entails not only capturing barcode-embedded data, but also information such as the date and block code, optical character recognition, and increasingly pattern recognition (metrology). Traceability can also be used for object identification.

Machine vision is likely to open tertiary benefits in the long term. For example, track and trace being implemented today will follow products through their entire lifecycle. Imagine the potential for manufacturers of high-priced goods — automobiles, personal computers and related devices, household appliances, medical devices such as pacemakers, and more — to be in touch with consumers when these products are due to be replaced or serviced? This is already occurring, and it facilitates lifetime loyalty between manufacturers and consumers.

Industrial Barcode Scanning

- **Market size and growth:** While only about 1/12 the size of machine vision, at the current size of $XX, collective industrial barcode scanning technologies have grown by a XX% CAGR in the past three years, from 2015 to 2018. Conservatively, VDC Research forecasts XX% annual growth for the next five years, with an even higher XX% annual increase in imagers, as opposed to lasers. The market for stationary industrial barcode scanners is expected to reach $XX globally by 2023.

- **Key Technology Trends:** 1D to 2D to 3D: The breadth and sophistication of scanners, coupled with continuous price reductions, is driving adoption of industrial barcode scanning. Two- and three-dimensional equipment offers more functionality, and, depending upon the implementation environment, can cost less per inspection point than using one-dimensional scanners for the same setting. This spurs the market in general, and the upgrade/replacement market, giving end users a reason to replace existing installations.

- **Key Regional Trends:** At $XX in total revenues for industrial laser scanners and imagers in 2018, the Americas market is XX% of the global market. VDC forecasts the stationary industrial barcode scanner market in the Americas to grow to $XX by 2023, a CAGR of XX%. Sales of Courier Express Parcel (CEP) systems has been one of the biggest growth drivers. VDC forecasts the stationary industrial barcode scanner market in Europe, the Middle East, and Africa to grow to $XX by 2023, up from $XX in 2018, a CAGR of XX%. With so many vendors originating in Europe, especially Germany, EMEA anecdotally leads the world in terms of adopting fully-functional systems. VDC sized the Asia-Pacific market for industrial barcode scanning at $XX in 2015, and now marks it at $XX for 2018, a XX% CAGR during the three years.

- **Key Industry and Application Trends:** Industrial barcode scanning finds itself in an increasing number of applications. The largest include manufacturing, transportation & logistics, Courier Express and Parcel (CEP), packaging, warehouse automation, and traffic. Several more applications exist. As two different types of examples, there are sub-verticals, such as automotive within manufacturing and airport luggage handling within transportation & logistics, plus there are many other applications.

- **Key Competitive Trends:** Unlike machine vision which has hundreds, VDC tracks just a dozen Industrial Barcode Scanning vendors, and the majority have annual revenues at roughly $XX or above. The industrial scanning vendor field is reasonably consolidated. Every major vendor also enjoys significant presence in machine vision. The only one which didn't, until recently, is Omron, which acquired Microscan to incorporate industrial scanning with its product offering.

Global Industrial Barcode Scanning Trends and Drivers

- **Track and Trace / Traceability:** Customers from retailers to pharmas, apparel makers, and many more need to track items from source to delivery, for use cases ranging from customer service to returns management, recalls, anti-counterfeiting (authenticity), and much more. Track and trace is gaining sophistication. Image-based scanners can capture information not based on alphanumeric data, such as product condition. Barcode decoders are being developed to carry and disseminate this information with perpetually growing customization and sophistication. With direct product marking and other durable methods of marking, traceability can and should extend for the lifetime of a product, not just until it is delivered.

  Having said that, some contributors noted that much track and trace data stays within the factory. Supply chain partners aren't using it. Being able to transport all data, often via clouds, for reference, mining and analytics, is still in the future.

- **Analytics:** Vision software provides much more information and intelligence than it did as little as a few years ago, giving end users reason to invest. What information is most important, and what are the best use cases? VDC research suggests that users seek analytics to better contextualize their data, yet many users don't know what to do with it. Often times the important information they're getting from codes is the quality of the image itself. For instance, you can tell if the camera has moved slightly, which can impact the percent of successful reads.

- **Industry 4.0:** VDC research indicates roughly XX% penetration globally of Industry 4.0 across automated factories, and vendors express a need to offer it to align with expected customer roadmaps. Some vendors noted that they expect the inflection in demand for Industry 4.0 to begin in roughly 2020 or 2021.

- **Pricing:** Pricing is very competitive in established markets, not so in new applications. In established markets, there will be 10% or less difference between cost per reader for all competitors, and often everyone is within XX%.

ABOUT THE AUTHORS

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Currently serving VDC's AutoID & Data Capture practice, **Andy Adelson** has spent his career as an analyst, consultant and research expert. During the first half of his career, Andy excelled as an IT industry analyst, covering several technologies which were precursors and adjacent to AI&DC. He has provided continuous syndicated services, plus consults to clients for their more complex challenges. During the past decade, Andrew held executive sales and management roles with research and insights providers. Andy also serves on the Board of the New England chapter of The Insights Association, the largest US trade association for research professionals. Andy earned an MBA from Babson in Marketing, and a BA from the University of Michigan in English and Economics.

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ABOUT VDC RESEARCH

Founded in 1971, VDC Research provides in-depth insights to technology vendors, end users, and investors across the globe. As a market research and consulting firm, VDC's coverage of AutoID, enterprise mobility, industrial automation, and IoT and embedded technologies is among the most advanced in the industry, helping our clients make critical decisions with confidence. Offering syndicated reports and custom consultation, our methodologies consistently provide accurate forecasts and unmatched thought leadership for deeply technical markets. Located in Natick, Massachusetts, VDC prides itself on its close personal relationships with clients, delivering an attention to detail and a unique perspective that is second to none.

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