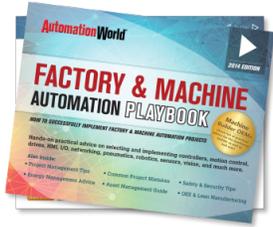


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# Track Parts and Materials on the Fly

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Using the latest RFID and image-based technologies, manufacturers like Lockheed are going beyond barcodes to gather real-time data on materials, subassemblies and processes. This is enabling a deeper dive into data analysis to improve production.



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**By Stephanie Neil, Automation World Contributing Writer**

Handling and logistics just may be the most under-appreciated aspect of manufacturing. Let's face it: Moving raw materials, components, parts and finished goods isn't exactly the most exciting water cooler conversation. Nevertheless, it's an integral ingredient in a formula for success, especially in an environment where quality control and traceability are paramount.

In fact, savvy manufacturers are realizing that the strategic use of traditional product tracking technologies can provide a competitive edge in the form of faster, more efficient production. In addition, the ubiquity of the barcode and the proliferation of radio-frequency identification (RFID) technology on the plant floor is feeding into the big data trend by providing a deeper layer of information that can be analyzed for process and product improvement.

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And it doesn't stop there. We live in a visual world where the fusion of sensors, cameras and image-based data—traditionally entrenched in inspection and robot-guidance applications—could eventually represent a colossal change in how we track, trace, manage and maintain the entire product lifecycle.

Ultimately, the mission is to not just have insight into a particular product and its components, but to interface with the end product and the customer. To that end, the future of material handling and product tracking will tie directly into customer requirements.

Sound far-fetched? Not at all, says Gary Forger,

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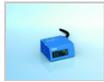
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managing director of professional development at the Material Handling Institute. For example, consumers are buying products online, from a catalog, or at a store. Having a 360 degree view of that multi-channel customer trickles down to distribution and even production.

“The customer demands on companies are changing,” Forger says. “And companies must adapt to fulfill the needs, interests and requirements of their customers.”

To do that, there has to be context around how everything fits together. And it all starts at the point of data collection. “If you don’t collect the data, you won’t have anything to work with,” he adds.

Meaning that boring barcode reader is pretty important now, isn’t it?

**Tracking tools of the trade**

There are a variety of automatic identification and data capture (AIDC or Auto-ID) technologies: From linear (1D) and two-dimensional (2D) barcodes, to the many

flavors of passive and active RFID, to optical character recognition (OCR), to smart sensors, vision systems and even voice recognition. Choosing the right technology for the application and, perhaps more importantly, ensuring it’s compatible within the manufacturing infrastructure, is the critical part.

So, where to start? According to industry experts, there are specific regulations, standards and good manufacturing practices (GMPs) for every industry.

**Therefore, there are a handful of things to consider:**

- The requirements for tracing products in production and through the supply chain (what data needs to be captured; where does it need to go; and how often)
- The existing infrastructure (some harsh industrial environments are not conducive to certain AIDC technologies).
- The motivation for the product tracking and capture of an individual product/component (regulations, partner mandates, customer requirements, etc.)
- Cost (many technology deployment decisions are based on the budget).

Taking all of those factors into account, a hodgepodge of data capture solutions is often found scattered across any given factory floor and warehouse. Even in the aerospace industry, one of the most advanced when it comes to automation, multiple technologies are employed.

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**How Lockheed tracks F-35 parts**

As the lead manufacturer in the development of the F-35 high-performance strike fighter (also known as the Joint Strike Fighter), Lockheed Martin Aeronautics uses a 2D barcode to track traceable parts as they are installed. In addition, Lockheed is building out an RFID network in its Fort Worth, Texas, factory as a way to track part kits, equipment



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Lockheed's senior technical fellow for production operations, is to improve the management of parts and tooling throughout the factory.

"The factory is one mile long and there are thousands of parts per airplane, which are touched by about 1,100 mechanics, meaning things can get misplaced easily. Barcodes and RFID keep the shop organized," Kinard says.

RFID also plays well with the flow-based manufacturing system of the F-35. "When a kit is consumed, a signal is sent back to the warehouse to get the next set ready. So now we have just-in-time delivery of the next kit to the next unit," he says.

RFID is becoming the technology of choice for many manufacturers. "The reason is that it has come down in price," says Mark Hall, industrial identification consultant at Siemens' Industry Automation Division.

Ten years ago, when Wal-Mart mandated all of its suppliers use RFID for tracking inventory and pallets, the cost of the technology coupled with an incompatible infrastructure—which was set up for use with barcodes—was an obstacle to adoption. "The Wal-Mart thing was tough to implement because of the cost through the supply chain, which is why it didn't actually go anywhere," says John Stamos, product marketing manager at Cognex.

Today's RFID tags, as well as the software and connectors to run the technology, have all come down in price. Industry experts put the price of RFID tags at less than 10 cents each (and under 5 cents in large volume). As a result, "in the next five to 10 years, more and more—if not all—plants will use RFID in process management for tracking, controlling gates and providing visibility within the production line," predicts Siemens' Hall.

The appeal of RFID is not just its affordability, but also its ability to track individual processes or products, as each tag represents a unique identifier. In addition, it doesn't require line-of-sight with antenna, and it has read/write capability to erase and reuse, if needed.

"In the automotive world, a unique identifier RFID tag can do everything from telling robots how to paint cars, to what colors to paint them," Hall explains.

And now Siemens has developed an industrial-strength UHF (ultra high frequency, running in the 902-928 MHz range) RFID tag called the RF 600, which can withstand heavy metal areas—traditionally difficult environments for radio transmissions. UHF is lower cost than HF (high frequency) tags, Hall says. "But the most dramatic change is that we can almost hide them in metal. Two years ago, we didn't have this type of technology, so it really does provide a great opportunity for track and trace," he adds.

**The future: imaging and analytics**

Cameras, too, are coming down in cost and creating new opportunities for product tracking. Image-based barcode readers, for example, are beginning to replace laser scanners, which are limited to reading 1D barcodes and also by their inability to read degraded codes. Image-based readers, on the other hand, take pictures of the product and use a series of algorithms

and tooling connected to each work instruction.

The full RFID rollout is still in progress at the Lockheed facility, but RFID technology is currently in use on the assembly of the F-35 wing systems. It will eventually be tracking everything, including the hydraulic and electrical equipment used to build the airplane. The goal, says Don Kinard,

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to search the image and locate the 2D barcode, which holds more data than 1D.

Image-based scanners take on average about 60 images per second or more, making them a good fit for high-speed process control in applications like packaging and work-in-progress traceability. In fact, image readers can boost overall productivity. Integrating image, high processing speeds and fast algorithms increases throughput, reduces scrap, and improves overall efficiency, Cognex's Stamos says.

In addition, coupling the quick image collection with factory floor analytics software creates a new opportunity that points directly to the big data movement—one of the 10 megatrends that will affect material handling and logistics between now and 2025.

**Learn more about The Future of Material Handling.** [Click here now.](#)

"Once you start taking pictures, you begin to think about what else you can do with it," notes Jim Anderson, national product manager at Sick, a supplier of machine vision scanners and sensors. As cameras get faster and there's even more RFID in production, we will see targeted tracking, he says. In the food industry, where the FDA wants farm-to-fork accountability, the addition of cameras in the field could pinpoint a particular day's work at the farm. "Instead of having to recall millions of pounds of beef, you could narrow it down to something more specific," says Anderson.

Now that there is a means to collect rich, visual data, the bigger issue is how to make sense of it all. "Companies have the big data, but they don't know how to make use of it," says the Material Handling Institute's Forger. Most likely, the existing image-based analytics applications will have to evolve to help solve the problem.

Sick has software it calls Package Analytics, which provides real-time performance monitoring of an automated logistics operation. It is capturing and holding all of the scanned data in a searchable, reusable way. Images are compressed over time to reduce the data size, but the archived images are still accessible.

Right now Package Analytics is very focused on high-volume distribution centers, but Anderson envisions the use of the software in an enterprise scenario where one giant database can provide a view into everything that is going on across the corporation.

Similarly, National Instruments' LabView is a graphical programming platform that also acts as a data acquisition tool for multiple subsystems, from sensors and barcodes to vision systems and robots. "It's the glue that holds it all together," says Carlton Heard, National Instruments' product manager for vision. If, say, a vision system is tracking and inspecting parts, and attaching an image to each defective part it flags, it is easier to figure out the source of the problem, he says.

The industry is at a turning point in terms of what can be done with visual data due to increasing camera capabilities, field-programmable gate arrays (FPGAs), plus the addition of processors and network technology that can churn through data and move it into the cloud. Of course, that also means smartphones may be part of the discussion.

A smartphone "could be an add-on for production supervisors," says Tom Heitman, manager of solutions consulting at Peak-Ryzex, a system integrator for supply chain, field service and mobile workforce automation. "You can envision them carrying a tablet or iPad and doing a spot check on things going on in the production area."

At Lockheed Martin, the use of tablets on the factory floor is already in the works. In the next two to three years, the team intends to replace mobile computer terminals with tablets to bring 3D models to the production floor, and solve problems right at the point of need.

“Where we are also heading is the ability to build something and verify it in real time,” says Lockheed’s Kinard. That’s where things such as structured light and 3D digital scanning for on-the-spot verification between the engineered and the as-built structure come into play. “We’re not there yet, but the technology will allow us to do those kind of rapid checks and reduce the cost of those builds,” he says.

Clearly, product tracking hardware and software in its many forms is evolving to allow manufacturers to do so much more. But companies should weigh all of the options carefully when moving forward. Innovation is good, Kinard says, “but it has to be innovation with a purpose. Otherwise it is just a great idea without a home.”

**COMPANIES IN THIS ARTICLE:** SICK Inc., National Instruments

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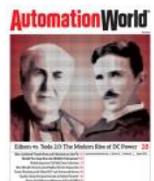
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