

RFID JOURNAL

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MARCH/APRIL 2014

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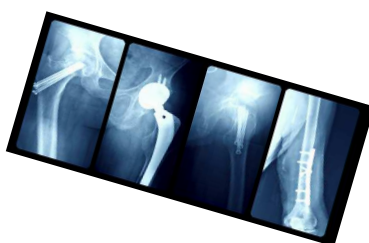
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Find New Business Opportunities

RFID providers now have a source to find companies worldwide that are actively seeking to deploy the technology. [RFID Requests for Proposals](#) is updated regularly, with new RFPs from companies in diverse industries. Each RFP includes detailed information, contacts and submission deadlines.

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Our live, interactive programs, presented by knowledgeable subject-matter experts and thought leaders, bring you up to date on a variety of technological and business issues.

Why Inventory Accuracy Is Retail's "Burning Platform"—and How Item-Level RFID Can Help

Get an in-depth look at how RFID delivers real-world benefits. Apr. 24, 2 pm to 3 pm EDT



Find products that can help you deploy RFID successfully, such as HP RFID Center of Excellence's [automated rotating RFID portal integrated with cloud computing](#). Developed for warehousing in any industry, it quickly and accurately reads items loaded on a pallet.

Most-Read Stories in March

- [E-Thread Provides Discrete Anti-Counterfeiting or Tracking Solutions](#)
- [Borda Technology Markets Active and Passive RFID Health-Care Solution in the U.S.](#)
- [Chinese Company Announces Plans to Invest in Alien Technology](#)
- [Technology Companies Create RAIN to Promote EPC UHF RFID Adoption](#)
- [Pennzoil Powers Up With RFID and Mario Kart to Promote Product](#)

Top 10 Search Terms On RFIDJournal.com

- 1 Walmart
- 2 Rehrig
- 3 Food
- 4 Warehouse
- 5 Library
- 6 Internet of Things
- 7 Logistics
- 8 Security
- 9 NFC
- 10 Airbus



The Inside Scoop

What are end users saying behind the scenes? Why should the RFID community be optimistic about the industry? Who's spreading misinformation? Get insight and perspective at the [RFID JOURNAL Blog](#).



Ideas Exchange

RFID JOURNAL maintains an [Ask the Experts](#) forum, where you can submit questions about RFID technology and its applications. Your questions will be answered by RFID JOURNAL editors or outside experts. Recent questions include:

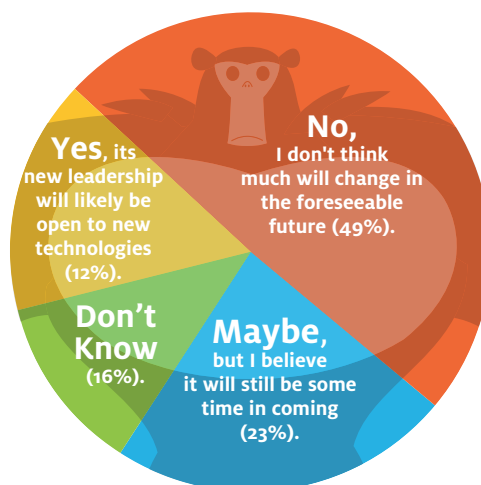
- Where can I get a diploma in RFID?
- How can I use RFID in CNC machining?
- Where can I learn about RFID tracking for train wagons?
- What types of RFID tags are compatible with metal bakeware?
- Are there any passive RFID tags for tracking electronic equipment?

POLL RESULTS

Do you think Microsoft will become the "gorilla" of the RFID software market?

Cast your vote.

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Why Inventory Accuracy is Retail's "Burning Platform"—and How Item-Level RFID Can Help

APR. 24, 2014 • 2:00 PM - 3:00 PM EDT

Poor inventory accuracy in retail is well-documented, but until recently, viable, cost-effective solutions to the problem did not exist. In the meantime, consumer demand for omnichannel shopping experiences and increasing online competition have elevated inventory accuracy from an irritation to a true "burning platform."

Join us to get an up-close, look at how item-level RFID solutions can address this "burning platform".

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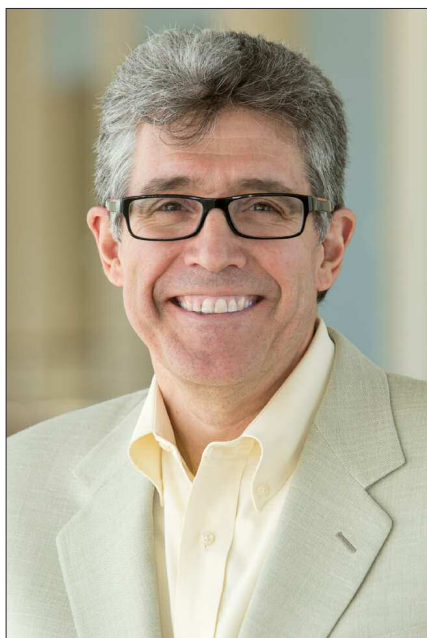
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The Right Approach to RFID

LIKE MARTIN LUTHER KING JR., the great civil rights leader, I have a dream. I have a dream that one day we will dramatically reduce waste and inefficiency across all companies in all sectors. While my dream is not as noble as Dr. King's dream of a world in which the color of your skin is irrelevant, at times it seems as



challenging. But I think we can make great progress if companies take a more strategic approach to radio frequency identification technologies.

Airbus, a pioneer in the use of RFID technologies, has developed a strategy that other companies can emulate. In his keynote address at RFID Journal LIVE! 2014, Carlo Nizam, head of value chain visibility and auto ID at Airbus, said initially the airplane manufacturer used RFID to track tools in a wing assembly plant. Then, managers realized they could also use

it to track shipments from suppliers as well as subassemblies. Next, they discovered they could track the wings and measure how long it took to assemble each wing. After a few years, they had built an active and passive RFID infrastructure capable of delivering real-time visibility and up-to-the-minute reporting on everything going on in the factory. Though it wasn't their intention, they had built the factory of the future.

As our cover story in this issue reveals, taking a strategic approach doesn't mean deploying RFID everywhere all at once. It means thinking about the enterprise's current and future needs, so instead of using RFID to track something here and automate something there,

companies take on projects with a plan to expand the deployment step by step to create a complete infrastructure. (For best practices, see "The Big Picture" on page 14.)

Medical device manufacturers are in the perfect position to consider the big picture. They can adopt RFID to comply with a new U.S. Food and Drug Administration rule to uniquely identify medical devices to facilitate recalls and thwart counterfeiting—and build an infrastructure that improves internal operations and boosts customer satisfaction. Some forward-thinking medical device makers are also developing RFID solutions that promise to improve patient outcome and recovery (see "Managing Medical Devices" on page 22).

RFID vendors are doing their part to provide the tools that will enable companies to take a more strategic approach and deploy an RFID infrastructure. In our Product Development section (page 30), we look at overhead readers designed to track tagged items around the clock. By providing information on the location and movement of goods, companies can get real-time information that will allow them to improve business processes and cut costs. In conjunction with portal and handheld readers, overheads open the possibility of companies building not just factories but stores and warehouses—even hospitals, libraries and schools—of the future.

Companies don't have to dream about solving their business problems and enhancing their competitive edge. They can build an enterprise RFID infrastructure that will support their current and long-term objectives. The only requirement is vision.

Mark Roberti, Founder and Editor

ENVIRONMENT

Green RFID Tags

University of Illinois researchers are developing biodegradable antennas, chips and substrates.

RADIO FREQUENCY identification industry experts predict that this year more than 2 billion passive high-frequency and ultrahigh-frequency tags will be used, and within five years, that number will reach 100 billion. Many people are concerned that the tags will fill the waste stream with metals that don't biodegrade, and tagged cardboard boxes and packaging will hamper recycling.

John Rogers, a professor of materials science at the University of Illinois, may have a solution. He and a team of researchers at the university's Frederick Seitz Materials Research Laboratory have spent the past five years developing electronic devices that are completely biodegradable. The team's initial focus was on sensors and other devices that could be inserted into the human body for monitoring or therapeutic reasons. The goal was to create devices that would break down and be absorbed harmlessly into the body.

A few years ago, Rogers began looking into ways to create a biodegradable RFID tag, because the electronics are less complicated than those of most medical sensors, and the future need was obvious. In March, he presented a paper at the 247th National Meeting & Exposition of the American Chemical Society, detailing his team's latest research, which includes work on printable RFID antennas made of metals that biodegrade and development of a biodegradable substrate on which passive HF and UHF RFID transponders can be mounted.

"Right now, we have biodegradable versions of the components of the tag, except for the chip, and we are pretty close to doing the chip as well," Rogers says.

"We have been working with a conventional foundry to modify some of the processing steps to create a biodegradable RFID chip. We've done some feasibility tests. We're not ready to announce we have successfully done that, but I am quite confident that it can be done."

Replacing the copper antenna with metals that biodegrade, such as tungsten or magnesium, does affect the tag's performance. But Rogers says the hit on performance is modest, and the benefits far outweigh the costs. "The performance of the tag isn't reduced by a factor of 10 or anything like that," he says. "And we can increase the performance by increasing the thickness of the metal. There's no free lunch, but I don't think the reduction in performance will be a barrier to adoption."

Rogers has patented the technology behind the biodegradable tags through the university, and has formed a startup to begin commercializing the technology. He believes his team could have a prototype of a fully functioning, entirely biodegradable tag by year's end, and the technology could be commercially available in two to three years. Several RFID tag companies have expressed interest in collaborating on the development of green tags. Mother Nature is, no doubt, pleased. —Mark Roberti

Designer Has RFID Up Her Sleeve

The Make Fashion event in Canada featured an RFID-enabled jacket with LEDs that lit up when the wearer neared tagged individuals.



THE MAKE FASHION EVENT in Calgary, Canada, was created to pair talented local designers with tech enthusiasts, to explore the convergence of cool clothing and cutting-edge technologies. The second annual fashion gala, held on March 1, featured a unique jacket that had a dancer lighting up—literally—when she got close to her partner.

“For the Make Fashion event in 2013, I created a dress with an accelerometer and LEDs that lit up in response to the dancer’s movements,” says Laura Brett Dempsey, a designer completing her Master of Design in strategic foresight and innovation at OCAD University in Toronto. “This year, I wanted to take it a step further and create an outfit that would respond to the dancer’s partner.”

Make Fashion cofounder Shannon Hoover introduced Dempsey to Benjamin Reed, a product design specialist in the Radio Frequency Identification Application Development Lab

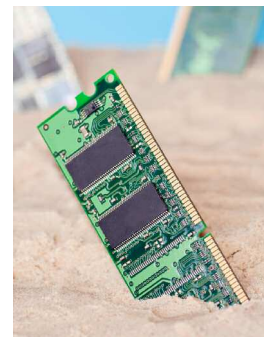
(RADLab) at SAIT Polytechnic in Calgary. Reed had worked on a number of projects with RF technologies. For the fashion event, he considered Bluetooth, Wi-Fi-based real-time location technology and computer vision, but after some experimentation concluded that passive ultrahigh-frequency RFID would be most effective.

“We placed a ThingMagic reader module in the dancer’s jacket, near the small of her back, and wired antennas into each sleeve, as well as the front and back of the jacket,” Reed says. They sewed the LEDs into the garment and outfitted the dance partner with 12 passive UHF Frog 3D tags from Smartrac Technology.

Reed and the RADLab team developed software enabling a small external Linux computer to use the reader’s received signal strength indicator (RSSI), which shows the strength of the signal from the tag to a specific reader antenna, to determine which set of LEDs should light up. “We programmed the computer to trigger the LEDs on a specific side of the jacket to light up when that side was closer to her dance partner,” Reed says. “This is not something anyone would wear at this point, but it could be as the technology gets even smaller.”

The jacket worked flawlessly and drew an enthusiastic response from the roughly 400 fashion show attendees. To further demonstrate RFID’s capability, Reed distributed some 80 tags with color indicators stored in their memory to those at a reception after the show. When the dancer got close to anyone with a green tag, her jacket lit up green; when she neared anyone with a blue tag, it turned blue.

“A huge part of what Make Fashion is all about is the collaboration between technologists and designers,” Dempsey says. “I had a vision, and they made the magic happen.” —M.R.



E-wasted

(in millions of tons)

Electronic waste discarded in U.S. landfills annually:

★ **9.4**

Electronic waste discarded in Chinese landfills annually:

★ **7.3**

Electronic waste discarded in Indian landfills annually:

★ **2.8**

Electronic waste discarded in Japanese landfills annually:

● **2.7**

Electronic waste discarded in German landfills annually:

● **1.9**

Electronic waste discarded in Russian landfills annually:

● **1.5**

—Rich Handley

Source: Solving the E-Waste Problem (StEP) Initiative

RFID IN ENERGY, MINING & CONSTRUCTION

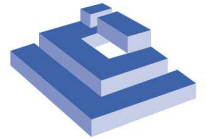


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- › An agenda covering a variety of applications and technologies, including passive ultrahigh-frequency (UHF), passive high-frequency (HF), RuBee LWID, 802.11x, ZigBee, active UHF and many others
- › A unique opportunity to understand how and where RFID can help improve the way your company does business

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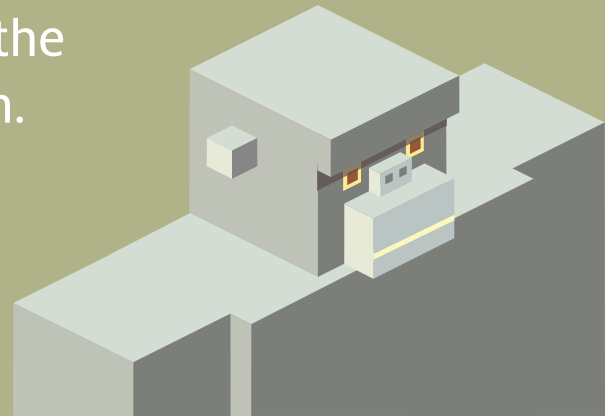
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DEALS

An RFID Partnership Overshadows a Major Acquisition

A complete solution could propel the retail sector toward mass adoption.



ON APRIL 15, Motorola Solutions dropped a bombshell on the radio frequency identification industry. The company announced it is selling its enterprise division, which includes bar codes and RFID solutions, to Zebra Technologies, for \$3.45 billion (see [Zebra Buys Motorola Solutions' Enterprise Business](#)). The move instantly made Zebra the most significant player in the market for passive ultrahigh-frequency RFID technologies. But as big as that news was, it probably will not have as significant an impact as an announcement that got much less attention. At RFID Journal LIVE! in early April, Checkpoint Systems and Mojix announced a global partnership to provide retailers with real-time visibility of store inventory (see [Checkpoint Partners With Mojix to Offer Passive RTLS in Stores](#)).

Before I explain why the Checkpoint-Mojix partnership is a potentially major event in the RFID industry, let me discuss the Zebra acquisition. Motorola entered the RFID market in a big way in 2006, when it purchased Symbol Technologies for \$3.9 billion. At the time, Motorola said it wanted to bolster its enterprise mobility business offerings, part of the company's Networks and Enterprise business unit, through which it offered handheld computers and other rugged mobile devices that enable enterprises to extend network connectivity and computing beyond the office environment. Enterprise mobility was Symbol's core

business (see [Motorola Acquiring Symbol](#)).

Symbol had purchased an RFID startup called Matrix in 2004, for \$230 million. RFID was only a small portion of Symbol's overall revenue at the time Motorola acquired it, but Motorola promoted its passive UHF handheld and fixed readers and quickly established itself as the best-known brand in RFID. Motorola split into two companies in January 2011. The smartphone group became Motorola Mobility and was later purchased by Google (Google is now looking to unload the unit). Motorola incorporated its enterprise business and its radio business, which sells communications systems to first-responders and other government agencies.

While executives in the enterprise group were committed to RFID and believed it would be a huge growth sector, senior executives at the firm apparently grew tired of waiting for RFID to deliver the growth everyone forecast years ago. They decided to sell the unit to Zebra because they wanted to concentrate on their government business. Ironically, Motorola is exiting the RFID business just as adoption is gathering momentum.

For Zebra, the acquisition is a game-changer. Last year, the maker of bar-code label printers and RFID printer-encoders reported \$1 billion in sales revenue. Motorola's enterprise business division, by contrast, reported approximately \$2.5 billion in sales revenue. Zebra employs 2,700 workers world-

wide; it will now add 4,500 employees from Motorola.

The acquisition more than doubles Zebra's size, but more important, it makes Zebra a major player in the passive UHF market. Motorola's handhelds and fixed readers nicely complement Zebra's line of printer-encoders. Zebra should experience significant growth as RFID adoption accelerates globally. But the acquisition doesn't guarantee Zebra will dominate the RFID industry. Nor does it advance the adoption of RFID technology.

For RFID adoption to cross the chasm and achieve mass adoption, there needs to be a company or several companies that provide a complete solution. Zebra will offer hardware and some software acquired with the purchase of Motorola's enterprise division. But it doesn't have a complete solution for any single industry.

The Checkpoint-Mojix partnership is significant because the two companies can go to market with a complete solution for retailers. In 2008, Mojix introduced the first overhead RFID reader system designed to track items in large areas from great distances (see Product Developments on page 30). That year, Checkpoint, a company that provided mainly electronic article surveillance (EAS) technology to reduce shrink in retail stores, purchased OATSystems for an undisclosed sum. OAT was a leading provider of enterprise software that could manage RFID data.

The OAT Foundation Suite was designed to help retailers manage inventory based on the RFID data they collect, and to let them set up and enact business rules based on that information. The suite includes Mobile Asset Tracking and Electronic Proof of Delivery, which can be used in distribution centers to track the receipt or shipment of pallets and cases of goods. The OATSystems product can, for instance, automatically trigger an advance shipping notice—or, in the event a shipment is late, it can trigger alerts informing the retailer of the delivery delays.

Checkpoint has transitioned from a provider of EAS systems to a company that provides RFID-based visibility solutions for retailers. It won a major deal to outfit Kohl's department stores with RFID technology (see [Kohl's Rolls Out RFID for Select Product Categories at Its Stores](#)). Checkpoint has developed its own overhead RFID reader, based on technology acquired from a startup called Wirama, but that reader is designed mainly for theft prevention at exits. By partnering with Mojix, Checkpoint has positioned itself to offer retailers a complete solution: hardware, software and deployment services. This is important because technology buyers generally do not want to buy readers from one company and software from another, and hire yet another firm to put the system together (tags are largely reliable and are readily available from any number of sources).

It's not clear whether the market will embrace the complete Checkpoint-Mojix solution, but if it does, and the partnership leads to a succession of contracts with major retailers, the two companies could emerge as the go-to companies for retail solutions—the “gorilla,” in the parlance of Geoffrey Moore, author of *Crossing the Chasm* and other books on technology adoption. Once a gorilla emerges, the market will quickly reach critical mass, as retailers follow the crowd and deploy the gorilla's solution.

Even if the Checkpoint-Mojix partnership does not have a series of quick wins among retailers, the partnership will put pressure on other hardware and software companies to join forces to offer competing solutions. That's good for retailers, because complete solutions reduce deployment risk.

The whole product is one of the last pieces of the puzzle required to achieve mass adoption of RFID in the retail sector. The Checkpoint-Mojix partnership moves that market a step closer. When one solution emerges as the winner, adoption will take off. —Mark Roberti

Technology buyers generally do not want to buy readers from one company and software from another, and hire yet another firm to put the system together.

ADOPTION

The RFID Barometer

More end users attended RFID Journal LIVE! this year, and many intend to deploy the technology within the next 12 months.

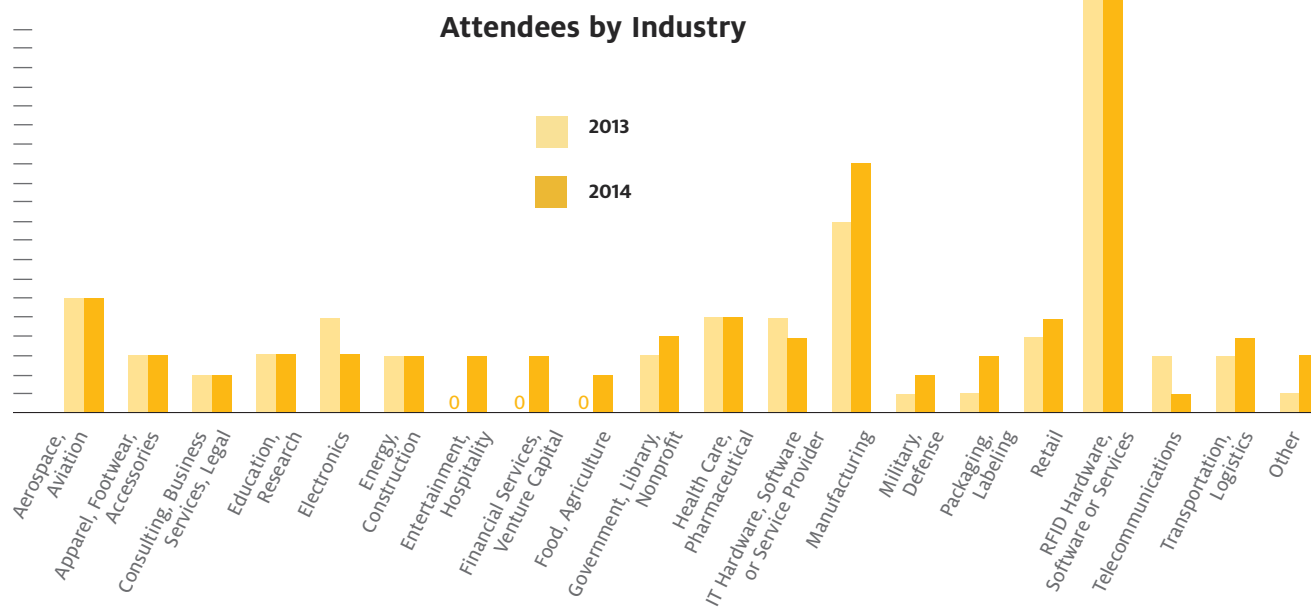
AS THE WORLD'S LARGEST radio frequency identification conference and exhibition, RFID Journal LIVE! has always been a barometer of the state of the industry. Its growth from 300 attendees in year one to 1,600 attendees in year three reflected the early hype around RFID. The relatively stable attendance from 2009 to 2012 reflected the industry's static situation as companies cut investments in new technology after the financial meltdown of 2008. What does this year's event tell us about the state of RFID?

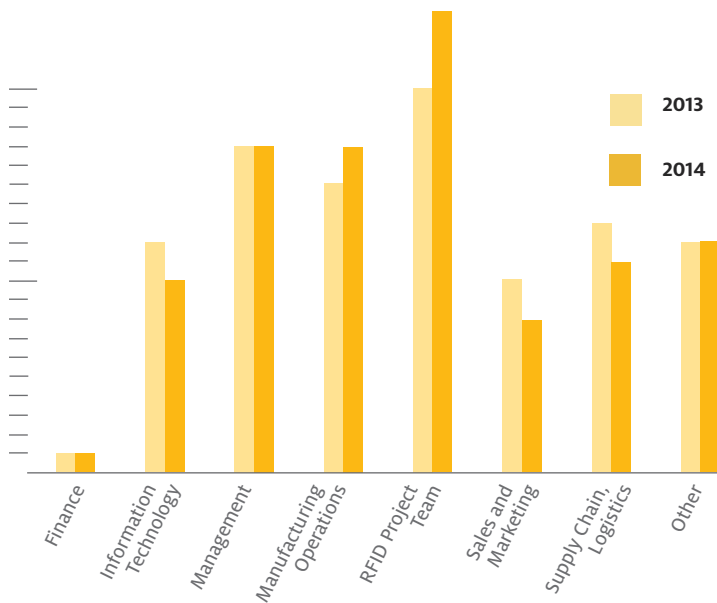
Several trends are clear. For the second year in a row, the number of end users attending the event has risen by more than 10 percent, indicating that more companies believe RFID can help solve their business problems. More end users indicated they planned to invest in RFID within 12

months, and they attended the event to purchase RFID solutions. This supports other RFID JOURNAL data suggesting the investment cycle is shortening. Companies no longer need to conduct endless testing and trials to prove the technology works and can deliver business value.

Attendees came from 53 countries this year, more than ever before, which means adoption is growing worldwide. In particular, there was a large increase in attendees from Latin America—it jumped 4 percent from last year.

These trends will continue to accelerate during the next few years as more people learn that RFID can improve the way they do business. The tables below provide a snapshot of this year's RFID Journal LIVE! event, as well as insights into the RFID industry.



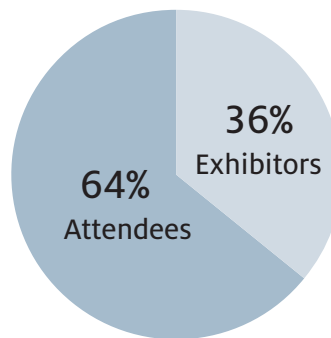


Attendees by Job Function

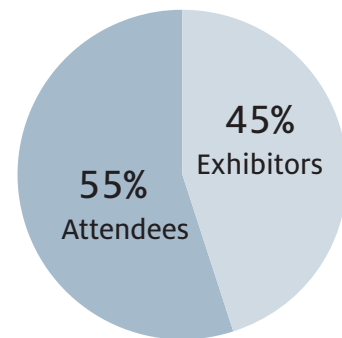
A greater percentage of attendees came from manufacturing and operations this year. There was also a noticeable increase in attendees who said they are part of a dedicated RFID team. This indicates more companies are looking at larger RFID projects that require the support of a group rather than a single individual.

Total Attendance Breakdown

The overall mix of attendees changed significantly this year. A greater portion of total attendance was end users.



2014 LIVE! Event



Historical Average

Attendees by Company Size

	2013	2014
More than 1,000	45%	49%
500-999	7%	7%
100-499	15%	14%
Fewer than 100	33%	30%

There was an increase in attendees from large companies and a corresponding decline in smaller companies.

Plan to Purchase RFID Products or Services Within the Next 12 Months

	2013	2014
Yes	55%	62%
No	15%	14%
Don't Know	30%	24%

The percentage of attendees who said they planned to purchase RFID products within 12 months jumped significantly.

Purchase Authority

	2013	2014
Yes	62%	65%
No	38%	35%

The percentage of those with the authority to purchase RFID products also rose.

THE BIG PICTURE | BY SAMUEL GREENGARD

Companies large and small must take a strategic approach to deploying RFID enterprisewide, so the technology can solve their current problems and support their long-term goals.

YOUR COMPANY IS ABOUT TO DEPLOY a radio frequency identification system to track assets or inventory, manage work-in-process, improve personnel safety or solve another problem that has been plaguing operations and impacting the bottom line. Is it a smart move?

That may seem like an odd question in a publication that believes in RFID's ability to boost efficiencies and reduce costs. But it's for precisely those reasons that every company should consider the question before it deploys an RFID system.

Most companies begin investigating RFID to solve a particular problem. But RFID is an enabling technology that can address many issues. The same system used to track tools could be extended to identify parts in a warehouse. A real-

time location system designed to monitor hand hygiene in a hospital could also track and manage high-value assets. It might require a mix of active and passive technologies, but with up-front planning, all the data can be integrated into a firm's back-end business applications.

Companies that look at RFID as an infrastructure, or platform, on which they can build many applications will reduce costs in the long term. Of course, no company can solve all its problems at once. But companies that take a strategic approach to deploying RFID enterprisewide will be able to roll out new projects that deliver a fast return on investment.

Several organizations, including jet maker Airbus, U.K. retailer Marks & Spencer, and hospital and research center



Oregon Health & Science University, have put in place the structure—both the technology architecture and standardized business practices—that enable them to readily expand the use of RFID into new areas. Based on their experiences, as well as advice from RFID solution providers that have worked on enterprise deployments, here are seven best practices that companies both large and small in any industry should consider as they adopt RFID or add new applications.

Have a Vision

In most cases, an RFID initiative is born when specific stakeholders identify a need for tracking materials or processes and RFID is brought up as a possible way to provide visibility, says John Baker, president of consulting and integration firm Venture Research. When he initially meets with a client, he says, he looks for a shopping list of objectives, but identifies the “lowest hanging fruit” where there’s the “biggest bang for the buck.” At the center of all this is a key concept, he says: “Can we prove the technology and demonstrate to upper management that the initiative is worth investing in over other projects?”

Some companies, however, do have well-thought-out plans for deploying RFID companywide. Airbus, for example, developed a three-phase program to improve business processes and provide real-time automated visibility across its entire value chain of operations, from suppliers to customers, says Carlo Nizam, head of value chain visibility and auto ID. Marks & Spencer (M&S), the largest U.K. clothing retailer, set out to tag and track all clothing to be “the store in which you can always find your size,” says Kim Phillips, head of packaging.

Often, identifying the value of an RFID initiative—how it can simplify, streamline or improve existing workflows—can help galvanize support within the company, says Diana Hage, CEO of software and services firm RFID Global Solution. It paints a picture for an effective end-to-end solution, she adds.

That was the approach taken by Oregon Health & Science University (OHSU), in Portland, Ore. In 2005, a crossfunctional team, with representatives from nursing administration, clinical technology services, IT services, patient transportation and equipment pool services, began explor-

ing ways to better track infusion pumps and other essential equipment across large critical-care units. The team turned to AeroScout to build a more robust network and design a system that would allow nurses to reduce the time wasted looking for equipment, says Dennis Minsent, director of clinical technical services. The group also identified a number of other priorities, including the ability to locate equipment involved in recalls, identify equipment for maintenance, monitor the temperature of refrigerators and freezers that store pharmaceuticals and other items, and locate specialty wheelchairs and stretchers to improve patient flow and speed discharge times.

They prepared a formal presentation for OHSU's upper management and capital com-

Establish a Crossfunctional Team

An enterprise approach to RFID involves multiple departments, so it's important to set up a crossfunctional team early in the game. "The more touch points a project has, the more important it is to have input from across the organization," Hage says.

Initially, M&S established a small crossfunctional team chaired by a project manager, whose sole task was to oversee the implementation and bring together all departments involved in or affected by the project, including retail, purchasing, IT, operations and logistics. The project manager's role is crucial, Phillips says, adding, "You need a champion; without a champion, you can't succeed." As its RFID initiative has grown, so has the team, Phillips says. Today, a crossfunctional steering group, chaired by the director of retail, oversees RFID implementation. Members of the committee include representatives from the retail stores, the financial department, Avery Dennison (the retailer's technology provider) and the executive board.

Deere & Company, the world's largest manufacturer of agricultural and construction equipment, began using RFID in 2005 to track some parts and products. The asset-tracking solution proved beneficial, and by 2007, Deere had deployed roughly a dozen RFID systems in factories and warehouses. The applications included tracking work-in-process to wring inefficiencies out of manufacturing and monitoring outbound logistics operations to prevent defective products from ending up in showrooms (see [RFID Gains Traction at John Deere](#)).

From the start, Deere has taken a crossfunctional team approach. Each new RFID deployment is managed by a five-person core team, whose members play key roles—enterprise architect, factory and warehouse analyst, project manager, channel business analyst and technology architect. "We want to keep the knowledge where it should be—in the organization," said Mark Moran, the company's former manager of tracking systems. The core team works with representatives from the divisions that are considering or implementing RFID.



"We made it clear that we were designing the system to meet everyone's needs then and IN THE FUTURE."

—DENNIS MINSENT, OHSU

mittee that addressed how the facility could build a platform for the future. "We made it clear that we were designing the system to meet everyone's needs then and in the future," Minsent says. The methodical and formal approach paid dividends. The team gained approval and buy-in. It installed the first RFID technology in 2006 and has since built RFID into the mainstream of its business. OHSU has added features, capabilities and applications, including temperature and humidity monitoring, maintenance scheduling, mobile tracking and systems that boost regulatory compliance.

Start Small

Once the crossfunctional team begins to consider the many areas within the company that could benefit from RFID, it's tempting to want to tag and track everything at once. That's not a good idea, because it increases capital outlay and complicates deployment. It's important to prioritize the applications on your list.

M&S for example, is focused on using RFID to improve inventory accuracy and on-shelf availability. But the U.K. retailer has also identified 16 touch points where RFID might be used to collect data and improve processes. "We are looking at some of these other areas," Phillips said last year at RFID Journal LIVE! Europe. "We'd be foolish not to—but you can't do it all at once."

In 2003, M&S, which operates 750 stores in the United Kingdom and more than 350 in 40 other countries, began conducting field trials to prove the technology and business case. In 2004, it began tagging and tracking some clothing items, including men's suits, shirts and ties, at several locations. Gradually, it expanded the deployment to all its U.K. stores and additional types of clothing, such as men's formal and casual trousers, jackets and shirts, as well as ladies' knitwear, coats, formal and casual trousers, and suits. Now, M&S is planning to monitor home goods, such as bedding, accessories and kitchenware.

It's wise to focus on quick wins that demonstrate results within six months, Hage says, and then expand to new and broader applications. "It's critical to have clearly defined processes and boundaries in order to expand or add applications," she says. "It's important to define phases in implementations and celebrate early successes. The goal is to build momentum and interest. It's also very important to develop reference designs prior to deployment and test equipment in a lab before introducing it live."

For the past four years, Hawaiian Legacy Hardwoods (HLH), a Honolulu-based lumber investment and ecotourism firm, has been tagging and tracking koa hardwood trees, as they grow from seedlings at nurseries to trees in forests. While the koa isn't listed as an endangered

species, 90 percent of the native Hawaiian tree has been harvested. HLH has RFID-tagged more than 225,000 trees to monitor their care and eventual harvesting. Its nonprofit division, LegacyTrees.org, plants and monitors koa trees for the purpose of permanent reforestation. A database contains information about each tree, including seed stock, feeding schedules and watering, to ensure a healthy crop.

Each planting season, HLH tags more trees.



"WE ARE LOOKING at some of these other areas. We'd be foolish not to—but you can't do it all at once."

**—KIM PHILLIPS,
MARKS & SPENCER**

Since HLH began using RFID, the organization has gained knowledge and experience—and has developed a plan that will enable it to keep pace with growth and employ RFID throughout its operations. Early on, HLH conducted validation tests, including random double checks, to ensure the system worked with 100 percent accuracy, says CIO William Gilliam. But the company did not envision expanding the operation or adding new applications. "We realized that the original tags and readers couldn't perform certain tasks or weren't the best for the conditions in which they were used," he says. HLH recently revamped its RFID system and is now planning to monitor personnel, equipment and tools.

Standardize Business Practices and Processes


Before any RFID deployment, Hage says, "It's important to conduct an assessment of the

facility and engage in a business process workflow review.” By documenting all the steps within a workflow, she adds, it’s possible to minimize disruptions to existing processes. “Where you can have uniform placements of the technology, you are generally going to have more consistent results and faster deployments.”

In 2007, Airbus found itself neck deep in a

backbone to run all the applications on and the need to build an RFID supply chain that would support everything,” he says. We wanted to take full advantage of the volumes of scale we could leverage as a large enterprise.”

Among other things, the team closely examined workflows, processes, procedures and proof points. The goal, Nizam says, was to understand how to adapt things for full value-chain visibility. “We were focused on creating processes and workflows that could be linked to one another and essentially become part of a reusable approach that involves minimal customization,” he says. “We wanted to avoid injecting costs into other processes and steps.” The big-picture approach—which focused heavily on key areas such as supply-chain logistics, transportation, distribution, production and assembly, tooling management and in-service maintenance—has served as the basis for the company’s industry-leading approach to RFID.

A portrait of Diana Hage, a woman with blonde hair, wearing a light-colored blazer. She is looking directly at the camera with a slight smile.

By documenting all the steps within a workflow, it’s possible to MINIMIZE DISRUPTIONS to existing processes.

**—DIANA HAGE,
RFID GLOBAL SOLUTION**

spate of RFID initiatives, but lacking a uniform approach. The firm recognized a need to pull together a collection of 17 independent RFID initiatives, Nizam says. “We realized there were a lot of interesting things happening with RFID across all different parts of Airbus, but things were highly fragmented,” he says. “Each individual project was looking to establish its own contracts with suppliers, and the lack of standardization in software and hardware was going to lead to higher complexities and costs. There was a clear need for a corporate program and an enterprisewide strategy, and so the Value Chain Visibility program was born.”

Nizam and other officials at Airbus worked for months to introduce a life-cycle approach based on standardized systems. “Once we took a closer look at all the initiatives going on, we discovered that all projects had about 70 percent commonality, so we used it as a starting point for consolidating systems,” he explains. After Nizam and the team pored over all the information, a strategy began to fall into place. “We understood the need to create a converged

Embrace Hardware and Software Standards

Without a long-term plan for deploying RFID across the enterprise, companies can wind up with a mishmash of hardware and software. Venture Research’s Baker believes companies generally benefit by avoiding vendor-specific technology. Consistent standards aid in everything from data collection to reporting, he says. “Standards allow stakeholders to develop reporting that will span local, departmental and organizational boundaries.”

In the past, Baker says, companies had to perform integration on a number of discreet components—readers, antennas, fixtures, RF cabling and middleware for each read point. “All of this can be readily purchased now as a completed sealed solution at substantially less cost than integrating each component,” he says. “This also improves field support and cost of maintenance.”

At Airbus, Nizam says, 17 different initiatives multiplied into hundreds, if not thousands, of different technology issues and decision points. “We realized that the longer we waited to harmonize everything, the more costly and complicated everything would be.”

As a result, the company decided to look at things more proactively and adopt a standards-based approach.

Airbus has established a portfolio of partners that provide RFID hardware, software and support. This ensures a basic level of uniformity across different use cases and scenarios. What's more, the company has embedded this information into its internal IT systems. When updates take place, they populate across the company simultaneously. An added benefit of this approach is that a new facility can come online with an RFID initiative very quickly. Just as organizations have power or Ethernet in a building, RFID becomes a utility that's simply switched on. "Speed and cost are huge drivers," Nizam says.

At OHSU, which is tracking 150 equipment categories, a standardized technical foundation is essential. To achieve consistent and accurate results, Minsent has standardized tags, readers, software and database fields. But, he acknowledges, "What's necessary and needed for a cardiac unit may be very different from what's needed for a general medicine or pediatric unit." Working with an established set of standards enables OHSU to adapt rules, processes and workflow for individual departments, he says.

As an early adopter of RFID, M&S decided it needed to upgrade its system to meet its goals. In 2012, the firm converted its system to EPC Gen 2 standards. "The technology has moved forward and continues to move forward," Phillips says. The firm expects to see more impressive results in terms of return on investment with the newer systems, he says, "because Gen 2 technology is far more cost-effective, more accurate and faster."

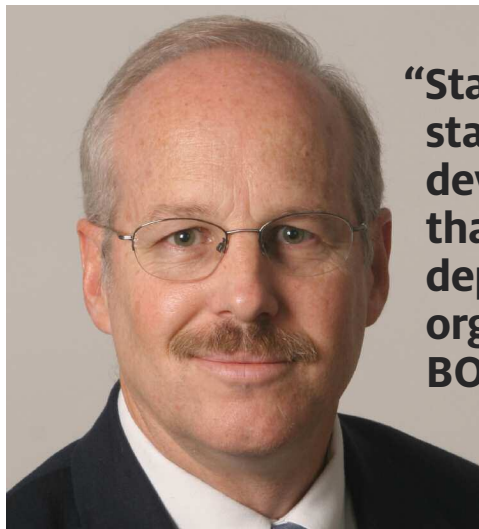
Share Information Across Departments and Divisions

It's no secret that silos are an ongoing problem for businesses, particularly larger organizations. Too often, data, information and knowledge end up squirreled away in departments and systems. Consequently, an enterprise winds up reinventing the proverbial wheel—over and over again. In general, business collaboration tools can help facilitate commu-

nication, but a more focused approach to information sharing is essential to deploy RFID successfully across an enterprise.

Airbus, for example, has constructed a business infrastructure that pushes data, information and knowledge through the organization and to its parent company, Airbus Group (formerly EADS). It includes regular internal conferences and seminars, physical visits and other sessions that extend beyond the 50-person core team. Airbus provides the same basic template to any internal group or department implementing RFID.

In addition, Airbus uses a common project-management system and business-case calculators to develop processes, metrics and business transformation activities. Nizam and his team simply adjust the deltas for these cal-



"Standards allow stakeholders to develop reporting that WILL SPAN local, departmental and organizational BOUNDARIES."

**—JOHN BAKER,
VENTURE RESEARCH**

culators on an as-needed basis per project. This reusable and standard approach helps speed up projects.

The output of all these projects provides the company's "business radar," Nizam says. RFID introduces constant real-time visibility of industrial process performance. By integrating this data with other back-end systems and using dashboards, reports and key performance indicators, he says, "we are able to adopt a continuous improvement system that shows us our real performance. We are able to do things faster, better and with less risk."

Among other things, teams can use all the information gathered by RFID to "visualize fac-

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tories in 2-D and 3-D,” Nizam says. “By knowing where objects are located at any given moment, we can visualize them graphically.” For example, across the organization, management can determine whether containers are in the right place and workflows are taking place as desired. An added benefit: It’s easy to identify what’s working and what isn’t and apply best practices. “It’s the basis of a smart factory and a smart supply chain,” he says.

Address Change Management

RFID initiatives that touch many parts of an organization and significantly alter workflows and processes often require a strong change management component. Resistance and opposition are predictable pieces of the puzzle, Hage says. “RFID project managers constantly underestimate the level of pushback they are going to experience,” she says. Management must make a solid case for change and alert employees as soon as possible. (For tips to ensure a smooth transition as you deploy or expand an RFID system, see [Best Practices: RFID Change Management](#).)

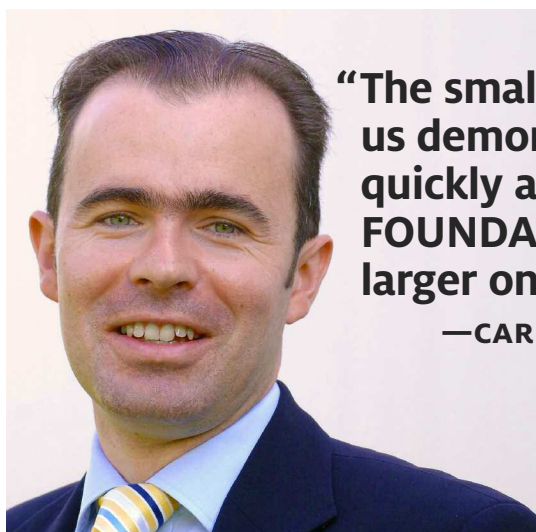
An effective change management strategy for Airbus has been to fuel relatively small projects in order to complement and build momentum for larger ones. “Many of the big projects are becoming mission critical, but we could never have started with them without proof points,” Nizam says. “The small projects help us demonstrate results quickly and build a foundation for the larger ones.”

In addition, Airbus tests and validates systems across numerous iterations and conditions in its industrial showroom and innovation center in Toulouse, France. This enables project managers to appraise how the change process is unfolding so they can adjust and adapt the systems—and work with groups to manage expectations—as needed.

Phillips says M&S builds support for initiatives by focusing on two key areas: achieving consensus and support among executives and project leaders, and training and educating for management and staff. “Through engagement and top-quality training, we have won hearts and minds of our store colleagues and man-

agement teams,” he explains. This approach “has persuaded everyone that RFID is helping to deliver improvements for customers and for themselves. The evidence is demonstrated in extremely high compliance levels in stores.”

Clearly, taking a strategic approach to deploying RFID enterprisewide brings visibility and benefits to all areas of a company’s operations. It also results in faster, reliable and cost-effective rollouts. Building a seamless and integrated RFID infrastructure allows a com-

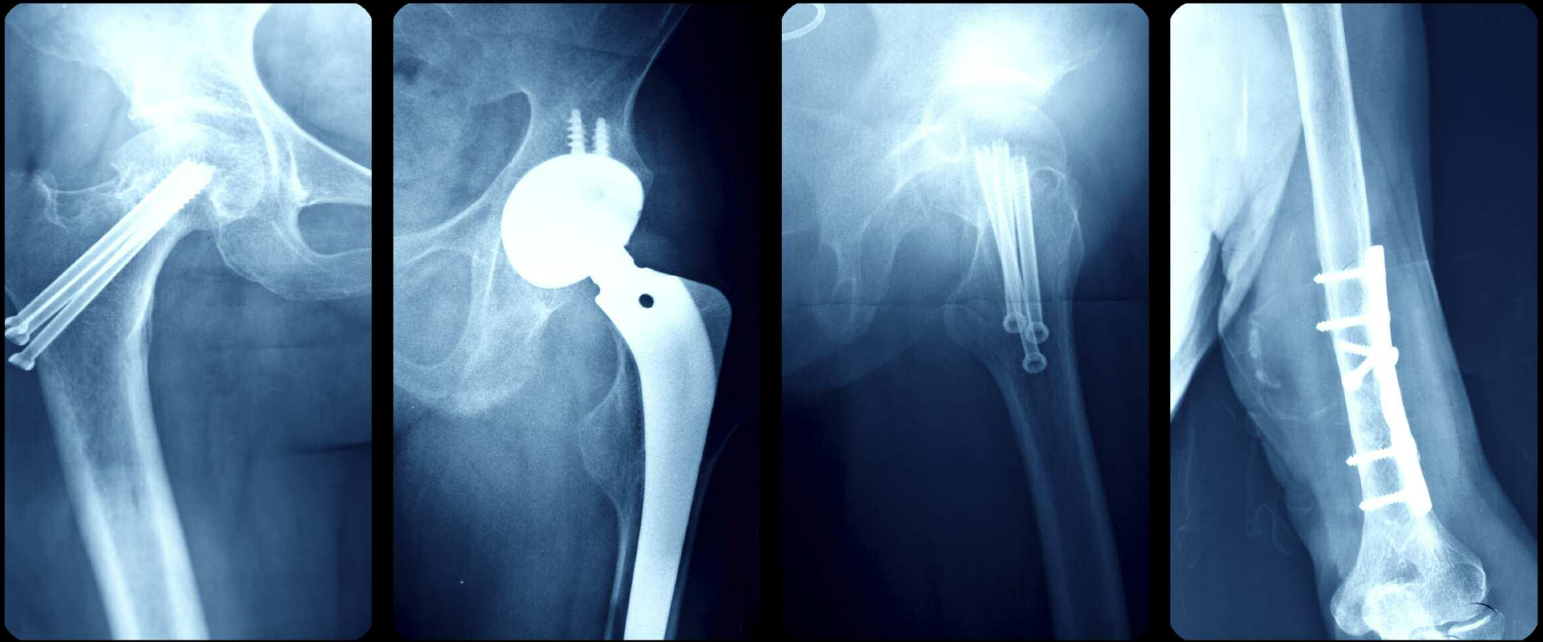


“The small projects help us demonstrate results quickly and BUILD A FOUNDATION for the larger ones.”

—CARLO NIZAM, AIRBUS

pany to fulfill its goal, whether that’s integrating disparate business units, providing better customer service, transforming hospital operations to reduce labor and improve patient care, or preserving native trees.

“At the start, we had a challenging job to convince people to implement RFID and get projects off the ground,” Nizam says, “but today, as more projects have been delivered and the results have been demonstrated, the challenge is keeping up with demand.” In 2008, Airbus had fewer than five RFID projects under way, mostly small to medium-size initiatives. Today, the number stands at nearly 60. What’s more, Nizam notes, these projects are of much larger scope in both size and geography. “For example, one initiative alone spans five countries and 10 separate manufacturing facilities,” he says. “It has helped us build planes faster and more efficiently—and improve quality.” ■



MANAGING MEDICAL DEVICES

RFID can help manufacturers of surgical implants, instruments and other items meet a new FDA mandate, improve internal operations and boost customer satisfaction.

BY
**JENNIFER
ZAINO**



MILLIONS OF PEOPLE young and old are walking around with a variety of implanted medical devices—from artificial hips and knees to heart valves and pacemakers, spinal screws and rods, breast implants and ear tubes—that are improving their health and well-being. That is, as long as the devices are safe and effective.

In September, the U.S. Food and Drug Administration took steps to improve patient safety. The FDA issued a final rule on the Unique Device Identification System, which requires that most medical devices distributed in the United States carry a unique device identifier (UDI). The system is designed to facilitate quick and efficient identification of recalled devices, improve accuracy and specificity of reports about adverse events, and provide a foundation for a global, secure distribution chain to thwart counterfeiting and diversion.

The label and package of each medical device must include a UDI in a plain-text version and in a form that uses automatic identification and data capture (AIDC) technology, such as bar codes or RFID, to convey lot or batch number, expiration date and other production-specific information.

The rule is “technology neutral” on the particular form of AIDC technology to be used, leaving that to the device labeler’s discretion.

In addition to implantable and single-use medical devices, the ruling applies to devices that may be used multiple times, such as surgical instruments and some life-supporting and life-sustaining devices. According to the FDA, a UDI will be required on the device itself if the device is intended to be used more than once and to be reprocessed before each use. In all cases, device manufacturers must submit data to the FDA-administered Global Unique Device Identification Database (GUDID), which will serve as a reference catalog.

“The UDI system will provide all stakeholders—health-care professionals, patients, industry, researchers, health-care community and other government agencies—with a consistent and standardized way to identify devices throughout their distribution and use,” says Jennifer Rodriguez, press officer in the FDA’s Office of Media Affairs. “The data in the GUDID will be foundational to realizing benefit from the UDI system. As UDIs become part of electronic health records, clinical information systems, claims data and registries, the FDA and other stakeholders can use the device identification information in the GUDID to make reliable, meaningful links across these data sources and the clinical information contained in them, within the constraints of patient privacy protection.”

Medical device manufacturers that adopt RFID to meet UDI requirements should expect the effort to involve a large cap-

ital expenditure, including buying tags and building the infrastructure, says Faisal Ghaus, VP of TechNavio, a global technology research firm. But, he adds, there will be a return on that investment. From an operational standpoint, Ghaus says, the implementation of the UDI ruling will help eradicate counterfeit products that account for revenue losses for major companies. It also will allow companies to employ better inventory management across the product's value chain, since expiration dates, manufacturing dates, batches and so on



“In cases of a product failure in large numbers, there would be no need for a total recall of all products. The batch from which the defective products came, and effectively the location from where these products came, can be identified and isolated, thereby minimizing the costs involved as against a total recall.”

—FAISAL GHASU, TECHNAVIO

will be identified almost instantaneously.

“In cases of a product failure in large numbers, there would be no need for a total recall of all products,” Ghaus says. “The batch from which the defective products came, and effectively the location from where these products came, can be identified and isolated, thereby minimizing the costs involved as against a total recall.”

RFID VS. BAR CODES

The FDA ruling mandates different timelines, depending on the device class, including: Sep-

tember 2014, for labels and packages of Class III medical devices (replacement heart valves and silicone gel-filled breast implants, for example); September 2015, for implantable, life-supporting and life-sustaining devices; September 2016, for the labels and packages of Class II medical devices (which range from infusion pumps to surgical needles, suture materials and X-ray machines) and permanent UDI markings for Class III devices intended to be used more than once and reprocessed before each use; and September 2018, for permanent UDI markings on Class II devices, as well as labels and packages of Class I devices (including handheld surgical instruments).

The FDA did not mandate that all permanently implantable medical devices need a UDI mark on them directly, as was originally proposed, says Scott Silverman, chairman and CEO at VeriTeQ. “That would have been premature, because the only applicable technology to meet that standard was RFID,” he says. But, he believes, VeriTeQ’s Q Inside Safety Technology for UDI—which includes an FDA-cleared, passive low-frequency RFID microchip, proprietary handheld reader and database for storing records of the implants—can help some manufacturers of implantable medical devices meet certain requirements of the FDA ruling and achieve other benefits.

The VeriTeQ solution was launched in the European Union and United Kingdom to track permanent breast implants. Issues such as the PIP defective breast implant recall—the implants used unauthorized silicone filler that lead to high rupture rates—will drive the adoption of AIDC regardless of regulatory influence, Silverman says.

Establishment Labs, a manufacturer of medical breast and body-shaping implants, is selling the solution as the Motiva Implant Matrix Ergonomix system. The PIP scandal is “still a front-page story in Europe, so the safety of breast implants and the ability to identify breast implants inside the body is still relevant there,” Silverman says. “We believe it will spread around the world as well. Over the next few months, we believe there will be many

large customers like surgical centers buying Motiva implants.”

VeriTeQ’s Q Inside Safety Technology also can be used in pacemakers and other implantable medical devices. VeriTeQ has partnered with Medical Components, for example, to use the technology in MedComp’s high-speed vascular ports, which go into patients’ bodies to speed up chemotherapy treatments. The RFID chip identifies the port’s serial number and type of port, to help ensure correct medication dosage.

In addition, Silverman says, RFID is a good choice for manufacturers of reprocessable or reusable medical devices that have to meet the FDA’s requirements for direct device marking by September 2016. “Not to be graphic,” he says, “but think of what things look like when they come out of the body, and having to rub your finger along the device to clean it to read the serial number versus just taking a scanner and waving it within six inches of the device.”

Compared with 2-D bar codes, “RFID is more resilient—not affected by dirt or liquids, and you don’t need line of sight,” says Ram I. Alt, product manager of Haldor Advanced Technologies’ ORLocate system, which uses passive high-frequency RFID to track, manage and analyze surgical instruments and sponges individually before, during and after surgical procedures. “And with the Haldor RFID-enabled surgical item management solution, you can scan multiple instruments at once.”

Haldor currently works with hospitals directly and through partners to retrofit surgical instruments with its technology. But Alt says there is a high degree of interest from surgical instrument manufacturers to leverage RFID, “since they need a clear path to be compliant with the ruling.”

“RFID is a great enabling technology to provide instrument-level differentiation,” says Sabina Chadha, executive VP of sales and marketing at Haldor. The technology provides the license plate that a particular instrument was used on a particular patient for a particular case, with applications that include keeping defective instruments from being used or iso-

lating those that are exposed to patients with infectious diseases. This includes wanding the patient to ensure that no sponge or instrument is left behind in the patient’s body cavity. Retained Surgical Items (RSI) events can lead to infections and potentially death, and leave a hospital liable to lawsuits.

Alt adds that ORLocate can be integrated with active real-time location system (RTLS) solutions used in hospitals to track and manage assets, personnel and patients. If, for example, surgical instruments with passive tags are sit-

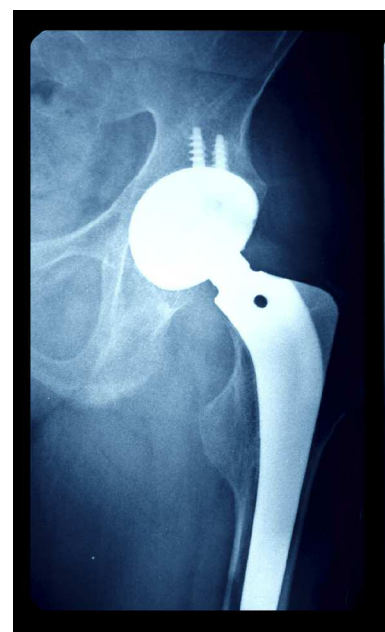
“Not to be graphic, but think of what things look like when they come out of the body, and having to rub your finger along the device to clean it to read the serial number versus just taking a scanner and waving it within six inches of the device.”

—SCOTT SILVERMAN, VERITEQ

ting on carts identified with active RFID tags, you can have complete visibility of mobile assets and high-dollar value items, he says. That, he adds, improves workflow efficiencies, “since if you don’t know where your instruments are you can’t start a procedure on time.”

HID Global also works with hospitals that want to affix one of its standard RFID tags onto their surgical instruments, but its main business in this market is custom-designing tags for particular manufacturers’ surgical tools. Marc Biemann, VP and managing director at HID, believes the greatest success related to using RFID for surgical tools’ identification and tracking comes from “working with the tool manufacturer directly and trying to embed as much as possible in the RFID tag in the tool.”

HID has several large projects under way with manufacturing customers, which it is not



allowed to name, to use its high-frequency or low-frequency passive RFID technology on surgical instruments, such as drills that would be inserted into patients' veins to remove plaque, says Richard Aufreiter, director of product marketing. "The machine that you plug into the tool has a small RFID reader built in to detect what the tool is, if it has been used before, if it was disinfected," he says. "So it makes sure you operate [the tool] according to specifications."

Bar codes are an "easier and cheaper" way

creased productivity and accuracy RFID brings is unbeatable," she says. "It changes completely how inventory is taken."

BEYOND THE MANDATE

As medical device manufacturers plan their approach to compliance with the FDA rule, they are also thinking ahead and considering how RFID could improve their internal operations and boost customer satisfaction. Some companies that have deployed RFID are already achieving such benefits.

Medical device and equipment manufacturer Stryker, for example, is using RFID to ensure the totes it ships to hospitals for use in orthopedic surgical procedures—filled with 40 to 100 sterile orthopedic implantable products—are complete. The RFID system also checks the totes when they are returned to Stryker facilities. "When it comes back, we've got to find out what's missing, because we cannot afford to make the mistake and send it back out [to medical facilities for another procedure] and there's something missing," Paul Pennington, supply-chain optimization manager at Stryker, said at RFID Journal's LIVE! 2013 conference. "We needed something to speed up the process [as] field surgical procedures continue to increase."

The choice, Pennington said, was whether to continue doing things the old way or use RFID to make operations smarter and faster, so item counts were more accurate and billing could be accelerated. Today, Stryker's North American orthopedics division is using more than 600,000 UHF passive RFID tags to track orthopedic implantable products at 38 branches and three national loaner centers. Stryker is now expanding that program throughout its European supply chain. (To learn how Stryker planned and implemented its RFID deployment, see [Managing Medical Devices With RFID](#).)

Wyoming Medical Center, in Casper, Wyo., and New York Hospital, in Queens, N.Y., are both using LogiTag's SmartCabinet to manage their inventory of medical devices and

The choice was whether to continue doing things the old way or use RFID to make operations smarter and faster, so item counts were more accurate and billing could be accelerated.

—PAUL PENNINGTON, STRYKER

for surgical instrument manufacturers to comply with the FDA rule, says Evelyn Ong, business development director for aerospace and health care at Xerafy, which makes RFID tags including ultrahigh-frequency tags for medical instrument tracking. But, she says, Xerafy is working with some instrument manufacturers that are considering how they can make a stronger business case to hospital customers to select tools that embed RFID technology into the design from the start.

"The key benefit is in the OR," Ong says. Hospitals can use bar codes to track an instrument's journey from sterilization to the operating room and back, but "the key is when they have to do inventory counts of instruments in the OR. If you start with 100 instruments, you have to end with 100, no more and no less." And unlike RFID, bar codes and the one-by-one scanning they support don't offer much of an improvement on the manual process most hospitals currently use. "The speed and in-



RFID—A New Tool for Surgeons

Medical-device manufacturers are developing intelligent implants that use radio frequency identification technology to provide real-time information during surgeries and post-operatively, to improve patient outcome and recovery.

One smart device, OrthoSensor's VeraSense Knee System, is being offered by knee replacement vendors Biomet, Stryker and Zimmer. The system features a single-use sensor that is inserted into the knee during a total knee replacement procedure. It uses an RF technology (Medical Device Radiocommunications Service) for real-time streaming communications, giving surgeons a graphical display to help them fit the implant properly, as well as provide identification data such as the product's serial number.

But the future, says Thomas Packert, OrthoSensor's VP of IT, is to have a smart knee that uses RFID to communicate to a device outside the knee post-operatively. The company is working on the VeraSense Implantable Sensor Technology, which will embed microelectronics in permanent knee implants to wirelessly send patient information to doctors so they can monitor balance and alignment.

A similar vision is in place at Intellirod Spine, which is developing a wireless implantable microelectronic lumbar spine fusion sensor that would be clamped onto a rod-based pedicle screw system during surgery, to deliver data about bone growth to spine surgeons. The goal is to provide doctors with an objective read on a surgery's success and information to help them prescribe additional treatments, such as bone growth stimulation, says CEO Ric Navarro. It could also help patients avoid post-operative CT scans and more exploratory surgery, he adds.

During post-surgery office visits, a doctor would use a custom RFID reader to retrieve a measurement of rod strain from the high-frequency RFID chip incorporated in the system; declining rod strain

indicates the fusion is progressing well. The chip also communicates the sensor's serial number for product identification.

While the sensor is easily removable, "the beauty of passive RFID is that it eliminates the need for a battery power source so it is quite safe to leave in the body," Navarro says. "We were initially concerned about the depth of penetration of power and signal through human tissue, but we think we can get that 3- to 4-inch penetration into the body to get the signal out even with a very tiny reader coil [to power the device and send out the signal]," he says. The reader coil has to be

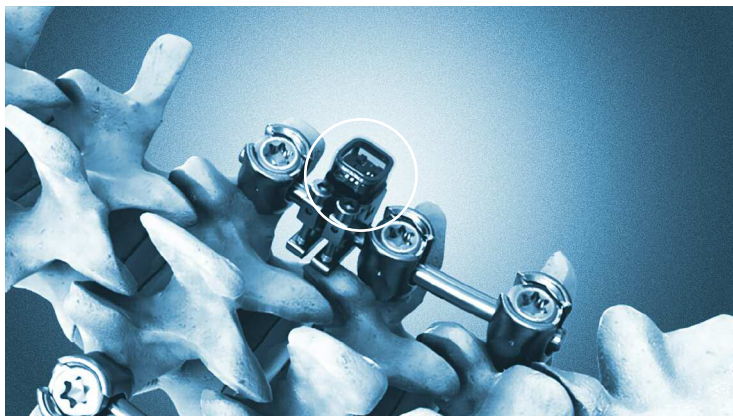
tiny to avoid interfering with muscle tissue or being felt by the patient.

The company plans to begin human clinical trials next year, to secure U.S. Food and Drug Administration approval. If all proceeds apace, it could be available in the United States by 2017, and perhaps a year earlier in Europe. "The point is proving the safety for the permanent implant," Navarro says.

Of course, safety has to be matched with effectiveness. The jury is still out on CardioMEMS' Champion HF

Pressure Measurement System, designed to improve the management of severe chronic cardiovascular diseases by implanting miniature wireless sensors that would use RF to transmit cardiac output, blood pressure and heart rate data. In October, an FDA advisory panel narrowly voted in favor of the device, deeming it safe but ineffective.

Still, the door is wide open for RFID-enabled innovation in the medical-device sector, because of the technology's ability to transmit through flesh and tags to be sized to fit the application. "Health-care applications that require a daily or an hour-by-hour monitoring can employ the technology, which can be used to measure, for example, any shift in an implant, or bone being dislodged through minute factions," says Faisal Ghaus, VP of TechNavio, a global technology research firm. —J.Z.



Intellirod Spine's implantable sensor would use RFID to deliver data about bone growth to spine surgeons post-operatively.

RFID End-User Case-Study DVDs

RFID Journal has created a series of DVDs containing presentations by end users, recorded at various live and online events.

RFID Journal holds several face-to-face conferences every year, as well as a number of online virtual events and webinars. These events feature end users speaking objectively about the business reasons that they deployed an RFID system, the technical hurdles they overcame in doing so and the benefits they now achieve as a result, as well as presentations by academics, vendors and other experts. Many of the sessions were recorded, and we have compiled these recordings into seven DVDs that are available for purchase for only \$99 or free with a one-year premium membership to *RFID Journal*.

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consumables. As products are received at the hospital, employees attach a passive high-frequency RFID tag to each item. The RFID solution automatically creates a digital record of which items are removed, and by whom, from the locked cabinet.

But more benefits could be achieved if the device manufacturer tagged the item package, says Shlomo Matityaho, CEO of LogiTag. It would create a unified platform between the medical device manufacturer and the hospital, based on the real movements of the item, he says. “This will enable the hospital and the vendor to fully move to a consignment model, which we believe is efficient for both sides.”

In Israel, for example, the local branch of a medical device instrument company is working with Herzliya Medical Center and other hospitals to improve efficiencies. The manufacturer applies RFID labels to packages of stents and other medical devices. Hospital employees store the tagged items in the Smart-Cabinet. When an item is needed for a procedure, a hospital staffer swipes his or her RFID-enabled badge to unlock the cabinet and remove the item. The system automatically records what item was removed, and, once that item is used in or on a patient, reports that information, including the procedure performed, to the LogiTag system, to which both vendor and hospital have access.

“This triggers [the distributor] to bill the hospital [for the device] from one end and to replenish the hospital with a new one from the other end,” Matityaho says. It also brings precision to the process, he notes. If an item is removed but no record of its use follows, the vendor can immediately take up the situation with the hospital. Additionally, it offers insight into expiration dates so the vendor can replenish regularly supplied items.

THE PATH TO ADOPTION

The FDA mandate will impact the adoption of RFID. In its recent report, “RFID in Healthcare Industry—Global Market Size, Share, Growth, Analysis and Forecast, 2012-2018,” Trans-

parency Market Research puts the global RFID market for health care at an estimated \$3.4 billion by 2018. “The market is... getting support from the fact that the FDA and many other agencies are exerting pressure to explore RFID and other technology to improve quality of patient care,” it explains.

Other outside pressures could also impact adoption. In light of concerns raised by health issues, such as the PIP recall, there is discussion that insurance may become mandatory for any surgery involving an implant, Tech-

“The market is... getting support from the fact that the FDA and many other agencies are exerting pressure to explore RFID and other technology to improve quality of patient care.”

—TRANSPARENCY MARKET RESEARCH

Navio’s Ghaus says. “In such a case, insurance companies need to ensure that should a claim be made, the claim is being made for the correct implant,” he says. “AIDC becomes extremely important in order to prevent any wrongful claims.”

But, in the end, it may be smart business practices that drive medical device manufacturers to adopt RFID. “The long-term benefits from [RFID deployment] will ensure better safety protocols, better inventory management and easier tracking, all of which will lead to cost savings in the long run,” Ghaus says.

Most of the medical device manufacturers Xerafy works with have a staff member dedicated to the UDI program, Ong says. While bar codes will satisfy regulatory requirements, a handful of companies are looking past that, despite the challenges of source-tagging. “They are more forward-thinking,” she says. “They do see the benefits of RFID, and they are committed to work with us on RFID.” ■



WHAT YOU NEED TO KNOW ABOUT **OVERHEAD** RFID READERS



These devices, which
are mounted on or installed
in ceilings, can track the location
of moving assets or inventory
in large areas.

BY BOB VIOLINO

IN 2008, startup Mojix's STAR (Space Time Array Reader) system was voted best new product at RFID Journal LIVE!, RFID JOURNAL's annual conference and exhibition. The system, which is installed on or in ceilings, was designed to read EPC Gen 2 passive ultrahigh-frequency tags in very large areas (an entire warehouse, for example), from great distances (hundreds of feet) and precisely identify the locations of tagged pallets, cases or items.

In 2012, Mojix introduced its next-generation STAR 3000 system. Since then, several other RFID providers have entered the so-called

“The benefit of an overhead system is that it automatically collects location data to determine travel; a traditional fixed reader is intended to capture data at a specific point and a handheld solution requires human involvement.”

ROBERT ZIELINSKI, CDO TECHNOLOGIES

“overhead” reader arena. Checkpoint Systems, a provider of electronic article surveillance solutions, launched its Overhead EAS Solution in 2011, and a new version, Overhead 2.0, in 2013. Sekura, which develops security solutions for retailers, jumped into the market in 2012 with its Vertic RFID Overhead System. Impinj, a provider of handheld readers, announced its overhead solution, the Speedway xArray system, in 2013 (the xArray won the award for best new product at last year’s RFID Journal LIVE!).

Given the wide variety of fixed and handheld RFID readers available—and the myriad solutions developed to use these devices—when and why should a company consider an overhead reader? Are these readers designed for specific industries or applications? What unique features do they offer? How about cost? These are just a few of the questions companies that have deployed—or are planning to deploy—RFID have been asking.

Let’s examine these issues, but first, a couple of basics. All the overhead readers are designed to read passive EPC Gen 2 tags. Each overhead employs a phased array (also called antenna array), which divides a large area into separate read zones.

“Arrays are dynamic antenna systems using multiple radiating antenna elements that coordinate to create RF fields with a unique size, shape and direction,” says Tracy Hillstrom, senior product line manager at Impinj, a provider of both handheld and overhead RFID readers.

“The array can be driven to change the read field over time, so it can be very responsive to the application requirements and environment. Most traditional antennas use a single antenna element, so you don’t get the diversity of read fields that are possible with an array.”

“An overhead RFID array is often considered when identifying the number, location and movement of assets within a space is necessary,” says Robert Zielinski, director of com-



Mojix’s STAR 3000 reader system can identify a passive tag from as far as 600 feet away.

mercial marketing at CDO Technologies, a systems integrator, in Dayton, Ohio. “The benefit of an overhead system is that it automatically collects location data to determine travel; a traditional fixed reader is intended to capture data at a specific point and a handheld solution requires human involvement.”

Some overheads include software or a cloud-based server to manage the data. For specific product features, see the vendor table on opposite page.



WHEN AND WHY? ASSET MANAGEMENT

Companies should consider an overhead solution when they need to track assets in large warehouses, yards or production areas in real time, says Shawn Manesh, senior VP of operations at Mojix. The STAR 3000 reader system can identify a passive tag from as far as 600 feet away, he says, making it suitable for asset tracking in physical areas of up to one million square feet. It is especially designed for industries with high-value goods, time-sensitive de-

livery or high cost of delivery errors, he adds.

Global oil and gas company BP is using Mojix's STAR solution to locate goods as they enter a warehouse and to identify their location (see [RFID, GPS Bring Visibility to Construction of BP Oil Platform](#).) Daimler is testing the Mojix solution to track cars within its factory (see [Daimler Sees Potential Benefits of Using RFID to Track Quality-Control](#)). And Rewe supermarkets is rolling out Mojix's STAR technology at its distribution centers to track the movements of returnable transport items

Some Leading Providers of Overhead Readers

Company	Product	Industries Served and Applications	Technology	Data Management
Checkpoint Systems checkpointsystems.com	Overhead 2.0	Apparel retail; electronic article surveillance system for theft prevention at stores with wide entrances and high ceilings	Small console unit contains an RFID reader and array antenna; can be installed in tight spaces at doorways. Uses Checkpoint's Wirama Radar for location and directionality, to reduce stray reads and false alarms. Dual tag combines an RFID inlay with an EAS tag, reducing tag costs.	Oat Foundation Suite inventory-management software from company's OatSystems division
Impinj impinj.com	Speedway xArray	Health care, manufacturing and retail; asset management	Unit includes an Impinj Speedway Revolution 420 reader and an antenna array. Plugs into a Power-over-Ethernet connection, to keep installation costs down. Radiates a linear beam pattern in vertical and horizontal paths to read tags in any orientation within a 750- to 1,500-square-foot area.	Impinj works closely with resellers and software developers, to deliver data management capabilities appropriate for a customer's solution.
Mojix mojix.com	Mojix STAR 3000	Apparel retail, automotive manufacturing, and oil and gas; asset management	System consists of a Mojix STAR 3000 receiver and up to 512 eNodes (exciters, each with 4 to 16 antennas); multiple systems can be networked together to increase coverage of large areas with high density of tagged assets. A master controller processes tag reads into standard Application Layer Events (ALE) data for use by enterprise systems or cloud-based server.	Cloud-based hosted server eliminates need to acquire software; specific applications for automotive, industrial manufacturing, logistics, oil and gas, and retail industries; software for smartphones
Sekura sekura-global.com	Vertic RFID Overhead System	Retail; inventory management and theft prevention	System consists of an overhead reader and antenna, with built-in audio and visual alerts. Each master unit can drive three slave units, each covering a 6-foot-wide doorway area.	Scout RFID inventory-management software

“A handheld is like a flashlight in the dark, whereas installing overhead RFID readers is like turning on the lights.”

TRACY HILLSTROM, IMPINJ



Hospitals are interested in Impinj's Speedway xArray system.

(see [Rewe Supermarkets Expand Rollout of Mojix RFID Systems](#)).

Hospitals are also considering overhead solutions to track and manage valuable assets, Impinj's Hillstrom says. Many hospitals spend hundreds of thousands of dollars per year in rental fees for equipment, but workers can't find what they need when they need it, she adds. While some hospitals are beginning to look to Wi-Fi-based real-time location systems as a solution to this problem, that technology falls short when a hospital wants to continuously track documents, charts, medicines and other small, low-cost items that can't accept a bulky, active tag, she says.

With an overhead reader, hospitals can deploy an expanded traceability program that is fully automated, Hillstrom says. “Just imagine what a hospital could do in the area of safety if it knew that a particular medication had entered a patient room,” she says. “With the ability to check that the medication had actually

been prescribed, without human intervention, compliance issues can be avoided. We have seen a great deal of interest in the xArray from health-care providers looking for a more cost-effective real-time location system capability.”

WHEN AND WHY? INVENTORY MANAGEMENT AND THEFT PREVENTION

Increasingly, apparel retailers are using a combination of fixed and handheld RFID readers to improve inventory management. Retailer American Apparel has deployed an overhead monitoring solution using Impinj's product, and Impinj is working with solutions partners



Checkpoint's Overhead reader is designed for stores with wide entrances and high ceilings.

on overhead solutions based on xArray technology. “We have seen a great deal of interest in xArray from retailers seeking greater inventory visibility for omnichannel purposes,” Hillstrom says. “However, we are not at liberty to disclose [customer] information.”





Sekura's Vertic RFID Overhead System is designed for theft prevention.

reader provides enhanced aesthetics because it can be flush-mounted to the ceiling or concealed within the ceiling, Sherman says.

The reader sends information about tagged items that have been read at the point of exit to the OAT Foundation Suite, which manages RFID inventory information in-store, Sherman says. "It enables retailers to know when, how many and what items were stolen," he says. "The information from the point of exit can be used to update the status of stolen items and to remove those items from inventory."

Some retailers also want to extend the benefits of RFID technology to loss prevention, leveraging the same tag, says Alan Sherman, senior director of global marketing at Checkpoint Systems. Checkpoint's Overhead is designed for implementation in stores with wide entrances and high ceilings that need protection at the exit door, such as specialty retail and department stores in malls. The overhead

By knowing what was stolen, Sherman says, retailers can restock or reorder goods to maintain shelf availability. And by being immediately alerted to the theft of items, he adds, retailers can potentially prevent significant financial losses. Checkpoint says retail customers in the United States and Europe are using the system.

Sekura's Vertic RFID Overhead System is

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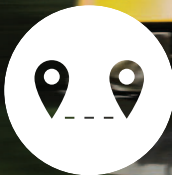


Pushing Performance

High Speed



High Read-Range



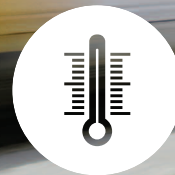
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also designed for theft prevention at exit doorways. It comes with Scout RFID software, an end-to-end inventory-management system with fraud- and theft-prevention capability, says Chris Naphthine, RFID product manager. The Vertic system has been deployed by Wilkinson, a retail hardware store group in the United Kingdom, he says.

Professional thieves account for the majority of retail theft, Naphthine says. “They know their way around every security system,” he says. “They know how to dodge the cameras and how to respond when approached, because it’s their livelihood.”

Scout RFID software linked to overhead readers and closed-circuit TV cameras strategically positioned at doorways near the readers can capture images of thieves as they walk out of a store with tagged items, Naphthine says. “Scout software collects these images and tells you what items the thief is stealing and when it happened, on one page in real time,” he says. “The user can search by product code or product group to ascertain what is occurring over a defined period. Typically, thieves only need to be seen once to be able to prevent them when they return, as Scout provides undeniable proof. Facial recognition can be an integral part of the system functionality, and we are working toward this becoming a standard option.”

A GROWING MARKET

While the overhead reader market is relatively small today, RFID providers and systems integrators believe these devices will play an important role in RFID solutions. As overhead technology matures and workflow processes progress, more vendors are likely to enter the market, CDO’s Zielinski says. “But not until sales volume nears critical mass,” he adds. “At this point, applications are very niche and projects are not enterprise considerations. Therefore, sales opportunities are limited and prices are still relatively high.”

Overhead reader costs vary greatly by manufacturer, Impinj’s Hillstrom says, from several thousand dollars to more than \$10,000 each. Potential buyers, Zielinski says, should

account for not just hardware prices, which manufacturers often quote, but also the cost of mounting and integration.

“The cost to a retailer for covering a sales floor with xArray compares favorably with what they pay for store lighting—just the fixtures,” Hillstrom says. “Because xArray runs off of PoE [Power over Ethernet], cost with installation is much less expensive.”

As the number of tagged items continues to grow, the variety of data-collection use cases and corresponding number of read points will continue to grow as well, Hillstrom says. “So, there will continue to be a need for handheld, fixed and overhead readers,” she says.

Handheld readers, for example, are ideal for specific workflows typically related to inventory management, such as cycle counting, Hillstrom says. “A handheld is like a flashlight in the dark, whereas installing overhead RFID readers is like turning on the lights,” she adds. “Once the lights are on, there is so much you can do. And it works even when employees have their hands full with more important duties, like helping customers, patients and clients.

“Overhead readers that cover large areas support a much richer and broader set of applications,” Hillstrom adds. “We expect that as businesses rely more heavily on RFID systems, they will desire seamless and fully automated data collection, which will naturally favor installations of overhead readers.”

Mojix’s Manesh agrees. “Handhelds and gate readers will not be replaced by overhead solutions, but instead will operate together in an enterprise, as each RFID solution meets a different customer need,” he says. “As RFID migrates to larger installations and enterprisewide with a majority of assets tagged, the need to automate RFID reads and provide visibility throughout facilities will require a mixture of products.” ■

EDITOR’S NOTE: At press time, Checkpoint Systems and Mojix announced a high-value apparel store was testing a new overhead real-time location solution developed for the retail industry (see [Checkpoint Partners With Mojix to Offer Passive RTLS in Stores](#)).



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Uncomplicating the Supply Chain

RFID can provide visibility into manufacturing and commercial operations—if all partners work together.

By Ian Robertson



IT'S COMPLICATED is the name of a popular romantic comedy starring Meryl Streep. It also describes the way most products are manufactured today. Often, the manufacturer must buy raw materials from suppliers in distant

regions of the world, convert them to finished goods, ship them to points of consumption using third-party logistics providers and, if necessary, collect returns for reprocessing or disposal. Manufacturing, in other words, involves a complex series of supply chain links.

Other industries also rely on complex supply chains. In the oil and gas sector, for example, assets used in the field for exploration and production are often owned by a service company that rents them to the firm managing the operation. The management firm may not be the company that owns the well. And yet another company may be responsible for transporting the assets.

When there's a break in one link of the supply chain—say, raw materials are held up in customs or finished goods don't reach a distribution center on schedule due to a snowstorm—it affects all the other links. RFID can provide visibility into each link, so supply-chain partners can make informed decisions that minimize potential problems and improve efficiencies. Manufacturers, for instance, can shift production to another line, and logistics providers can divert goods to a different warehouse.

This works when you have a holistic view of the supply chain. But that involves getting all supply-chain partners to join together. Unfortunately, that's complicated, too. Outsourcers, for example, operate in a fiercely

competitive environment and are reluctant to invest in RFID, even if it adds just a few cents to their unit cost.

Then, there are the practical issues that must be addressed. The cost of RFID tagging occurs once in a supply chain, but significant benefits may accrue for all players down the line. How can that cost be shared equitably? Gathering all supply-chain event data into a single repository could provide all players with a holistic view of supply-chain performance. Who will set up and manage the repository, and how will it be funded?

At times, these issues seem insurmountable, but supply-chain partners that have tackled them and adopted RFID are achieving benefits. Companies in the oil and gas industry, for example, are beginning to tag and track assets so all supply-chain partners can determine where an asset is, when it got there, what rental fee to charge, when the asset should be taken out of service and so on.

The key to supply-chain management is understanding how each link can benefit from using RFID, and how RFID-enabling one part of a process can deliver real benefits in another. We'll examine all these issues in upcoming columns. ■

Ian Robertson is CEO and president of Supply Chain RFID Consulting, a Texas-based firm providing services to companies that want to understand how to use and implement RFID internally and with partners. Send your supply-chain questions to ian.robertson@s-c-r-c.com.



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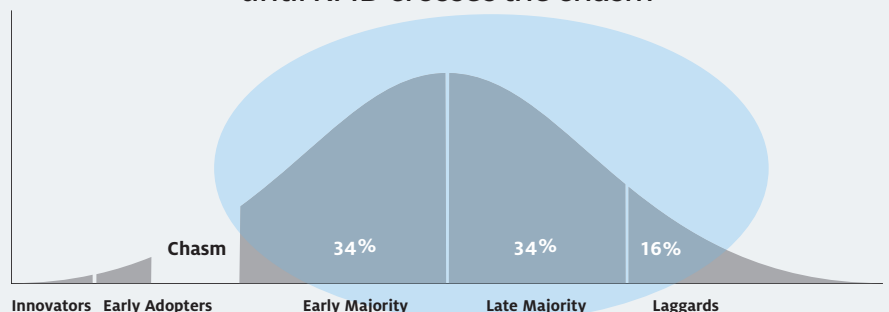


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Sharing Tag Space

Gen2v2 lets supply-chain partners manage their own information.

By Ken Traub



A PASSIVE EPC GEN 2 ultra-high-frequency RFID tag has user memory that can function as a miniature database, accumulating useful information about the object to which the tag is affixed. Consider, for example, an RFID-tagged

aircraft part. The part manufacturer can write the date of manufacture on the tag. The airframe manufacturer can store information regarding how the part was installed and inspected. And over time, the airline can add specifics about maintenance and repair operations.

Some Gen 2 tags have large user memories—up to 64 kilobytes—and can accommodate all this data. But complications arise when supply-chain partners want to put their own data into the same memory. For the data to coexist, all parties' software must coordinate use of this shared memory. This is difficult because the part manufacturer doesn't know which airline will use the part, and supply-chain partners likely use different software.

Gen2v2 solves this problem by allowing the user memory to be divided into "files." The new protocol gives tag manufacturers the freedom to implement the file feature in different ways. Some manufacturers hard-code tags with specific file settings. Others let the first end user configure the amount of memory needed for its file, using Gen2v2 commands issued by an RFID reader controlled by a software application; the next end user can then allocate its file from the remaining memory, and so on.

Each file can be accessed as though it were a separate memory bank. So now the part manufacturer can have one file, the airframe

manufacturer another and the airline a third, and each company's software can read and write its own file without disturbing the content of the other files.

Gen2v2 also allows each file to have its own security settings, with separate passwords to control access. So the part manufacturer can set its file so all parties can read the expiration date but only the part manufacturer can write or alter that data.

Similarly, the airframe manufacturer and the airline can set their files with different permissions, based on need.

This means supply-chain partners do not have to worry about their data conflicting with any data previously written to the part. Each partner can use its own software to read or write a file, without any coordination with the others.

To take advantage of this feature, end users must have RFID readers equipped with upgraded firmware capable of issuing the Gen2v2 "file open" command, to select the file to use when interrogating the tag. The middleware or other software controlling the reader also may require upgrading. In addition, the software should be configured to store a Gen2v2 "file ID" value with each file, so each party can identify its own file. ■

Ken Traub is the founder of Ken Traub Consulting, a Mass.-based firm providing services to companies that rely on advanced software technology to run their businesses. Send your software questions to swsavvy@kentraub.com.



Apparel Retailers Finally Get RFID

Omnichannel has created a sense of urgency and is spurring adoption.

By Bill Hardgrave



IN MY FIRST COLUMN for *RFID Journal*, in the Sept./Oct. 2012 issue, I addressed the state of radio frequency identification adoption among U.S. apparel retailers (see [Tracking Your Competitors](#)). At that time, studies had shown that RFID could improve inventory accuracy from an industry average of 60 percent or less to more than 95 percent. Yet, the apparel retail industry was still in the early stages of adoption.

As is typically the case with any new technology, a few brave specialty and department store retailers pushed the envelope and served as early adopters. The benefits these retailers—including American Apparel, Bloomingdale's, Macy's and Walmart—achieved have been well documented. RFID solution providers responded with better, cheaper and faster hardware and with new software to handle RFID data. Still, most retailers continued to sit on the sidelines waiting for “the right time.”

To be fair, some extenuating circumstances, such as the Great Recession and the threat of lawsuits from so-called patent trolls, no doubt contributed to slower-than-anticipated adoption the past several years. But I believe one of the main reasons for the relatively slow pace of adoption has been a lack of urgency.

Today, it is hard to find a retailer that is not aware of RFID and its ability to improve inventory accuracy. Nevertheless, while retailers acknowledge that widespread adoption will likely occur, they would prefer to make the move to RFID along with everyone else. Most retailers have been content to wait and follow the herd.

Recently, though, the dynamics in retail

have begun to change due to the rapid ascent of the “omnichannel” concept. In short, omnichannel retailing means customers should have a consistent and seamless experience whether they are shopping in a store, on a mobile device, on a home computer or by phone. Nowadays, consumers are in control, demanding product when and where they want it (see [Retail 3.0](#)). And, as I indicated in my [Omnichannel Retailing](#) column, the ability to provide this service begins with operations—in particular, those that deliver real-time, accurate inventory data efficiently and cost-effectively.

Now, retailers get RFID. The vast majority—especially the large retailers—realize they must operate on an omnichannel level to stay competitive. And with omnichannel rising so fast, retailers finally feel an urgency to adopt RFID to achieve the inventory accuracy they need.

The number of retailers expressing interest in getting started with RFID or extending their current RFID initiative has increased significantly since the beginning of 2014. Two out of three of the top U.S. apparel retailers are doing something with RFID, ranging from investigation to full deployment. Omnichannel has provided the motivation, and the herd is on the move. ■

Bill Hardgrave is the dean of Auburn University's Harbert College of Business and the founder of University of Arkansas' RFID Research Center. He will address other RFID adoption and business case issues in this column. Send your questions to hardgrave@auburn.edu.



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How to Choose the Right RFID Technology for Your Application

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