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RFID JOURNAL

www.rfidjournal.com January/February 2016

WHY COMPANIES ARE USING RFID TO GO Green

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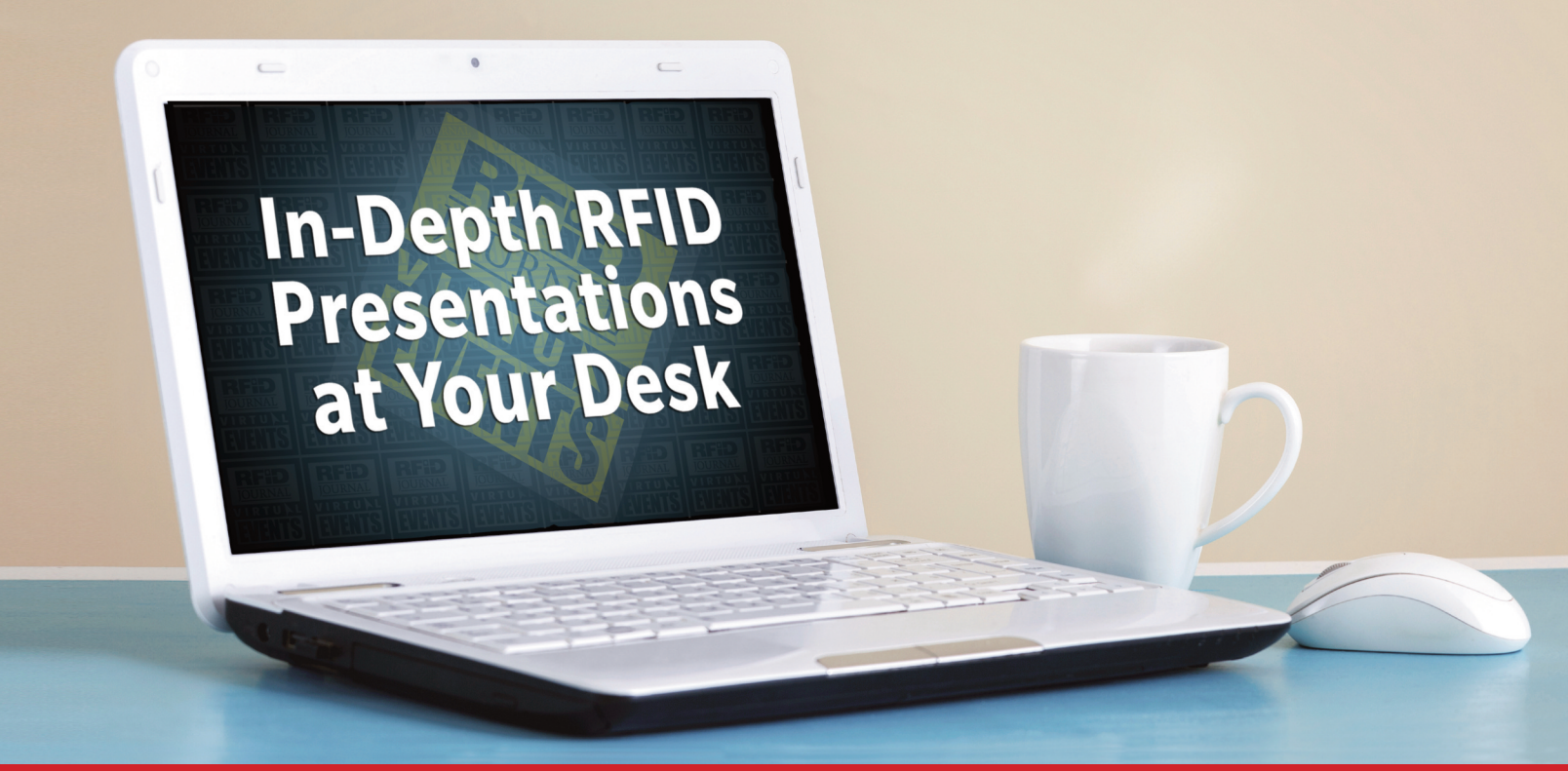

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JUNE 2	RFID IN HARSH ENVIRONMENTS	VE
JUNE 21	RFID IN RETAIL AND APPAREL	VE
JULY 19	RFID IN AVIATION/AEROSPACE	VE
AUG. 16	ENABLING THE INTERNET OF THINGS	VE
SEP. 13	RFID FOR WAREHOUSE AND INVENTORY MANAGEMENT	VE
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Alan McIntosh: Senior Director of Sales, amcintosh@rfidjournal.com | (212) 584-9400 ext. 4

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RFID JOURNAL

Vol. 13, No. 1 | January/February 2016

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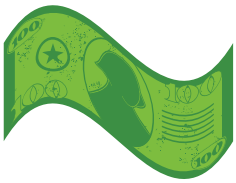

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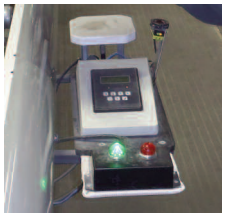

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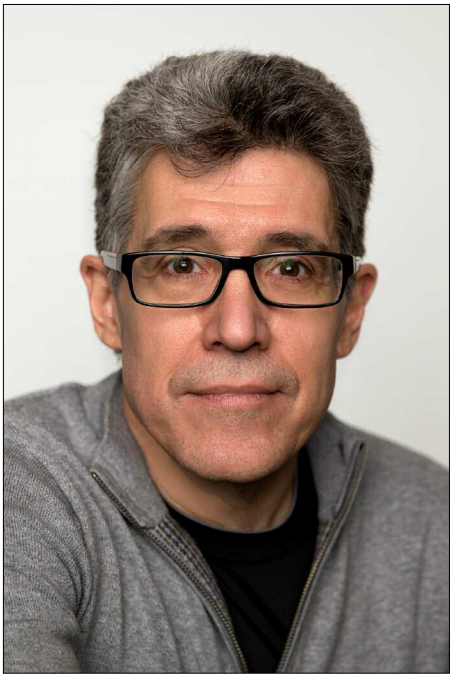

It used to be that people focused on saving the environment were derided as "tree huggers." Today, many companies realize that green (as in environmentally sound and sustainable) is the new green (as in greenbacks, or money). Radio frequency identification is helping companies cut energy and fuel costs, reduce the use of paper, manage hazardous waste and much more. And while all this is good for the environment, it is also good for the bottom line, as we report in this issue's cover story, Sustainability and Profit Go Hand in Hand.

Some green and economic benefits grow out of deployments designed to solve specific business problems. Most retailers, for example, first deploy RFID to improve inventory and shipping accuracy. That, in turn, reduces the need to make extra deliveries to stores from distribution centers or other stores. Fewer deliveries saves time and money, and reduces fuel consumption. Fossil fuels burned for air, marine, rail and road transportation account for roughly 27 percent of greenhouse gas emissions in the United States, according to the U.S. Environmental Protection Agency.

And some bottom-line savings come from green initiatives. Cities and municipalities worldwide are using RFID to reduce the amount of trash that must be incinerated or buried in landfills and to encourage recycling. The automated systems also save labor, reduce fuel costs due to more efficient truck routes, and eliminate lost revenue from missed pickups and misplaced invoices.

Sawmill companies and wood products manufacturers are employing RFID to optimize forest production, improve the quality of wood products and minimize environmental damage. Furniture makers are adopting RFID to improve operations and customer service (see Automating Craftsmanship).

American Woodmark, for example, has deployed RFID at seven facilities, as well as at two U.S. and two international suppliers. The company tracks cabinet doors and drawer fronts at key points in the manufacturing process. The solution has enabled American Woodmark to manage inventory in real time, reduce errors and achieve a return on investment.

Two Israeli bed manufacturers are tracking components to ensure a complete set is included with each delivery order. That's a use case the executive editor of this magazine, Andrea Linne, can appreciate. She ordered a bed last summer from Crate and Barrel in New York. The retailer had to visit her home three times to install the new bed, because the delivery person kept showing up without the correct parts. As a result, Crate and Barrel waived the delivery fee and issued a 10 percent credit, so the multiple trips wasted energy and hurt profits.

Increasingly, it's hard to separate green and profitability goals. Companies that use RFID to monitor the temperature of produce, for example, decrease electricity costs associated with cooling and storage, increase sales because their products stay fresher longer and reduce waste, a cornerstone of sustainability.

RFID isn't a cure-all, of course. But it seems that going green with RFID is a good business decision.

Mark Roberti, Founder and Editor, RFID Journal

PHOTO: SASA STAJIC

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Find New Business Opportunities

RFID providers now have a source where they can 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.

RFID Journal Virtual Events

These live interactive programs offer a convenient way to learn why and how companies are using RFID to improve the way they do business. Presenters will answer your questions. If you miss an event, check our archive for on-demand viewing.

Harsh Environments, June 2
Retail and Apparel, June 21
Aerospace and Aviation, July 19

RFID Connect

Find products that can help you deploy RFID successfully, such as Venture Research's SlimTrack Portal, which has an integrated ultrahigh-frequency RFID reader and antennas for close proximity reading. The portal has a compact footprint for easy installation in tight spaces.

SlimTrack Portal installed at a doorway; inset shows reverse side with digital display.

PHOTOS: VENTURE RESEARCH (BOTTOM LEFT) | ARJOWIGGINS CREATIVE PAPERS. (TOP)

Top 10 Search Terms

1	NFC	6	Retail
2	Levis	7	RTLS
3	Decathlon	8	Beacons
4	Construction	9	Intel
5	Laundry	10	Zara

Most-Read Stories in January

- Rebecca Minkoff Adds RFID to More Stores, Boosts Sales
- Macy's Launches Pick to the Last Unit Program for Omnichannel Sales
- G-Star RAW Store Finds Many Uses for RFID
- Belgian Clothing Retailer JBC Using RFID at 144 Stores
- Columbia's Dental College Finds RFID Instrumental

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:

- How can I get SAE AS5678 tag approval?
- How much do RFID stickers cost?
- Are there any examples of companies using RFID to track concrete in construction projects?
- How can I monitor parts entering and exiting a vehicle?
- What are the best RFID tags for tracking human attendance?

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.

DON'T MISS THESE...

Premium Online Stories

Tracking Lifting and Rigging Equipment
Kennedy Wire Rope and Sling enlists RFID to improve customer service for a client with global business.

Landscaping Company Keeps Tabs on Tools
Environmental Management adopted an RFID asset-tracking solution to eliminate losses and monitor inventory.

Manufacturer Uses RFID to Put a New Face on Cabinet-Making
American Woodmark tags and tracks doors to improve inventory accuracy, production and customer service.

HEALTH

Wearable RF Sensors Could Reduce Hospital Falls

Australian researchers have developed a solution that alerts health-care providers if at-risk patients are in danger of taking a tumble.

Each year, roughly 1 million patients, many of them elderly, fall while in U.S. hospitals. Roughly 30 percent of hospital falls result in injury, and 10 percent result in serious injury, such as a head trauma or fracture. Falls increase the length of hospital stays and the costs patients and hospitals incur. As people live longer, preventing falls is gaining urgency among health-care providers worldwide.

But reducing falls is not easy, because many occur when patients are alone, often in restrooms and around beds, and they tend to happen at night, when hospital staff levels are lowest. Now, researchers at the University of Adelaide's Auto-ID Lab, in South Australia, believe they may have an answer—a low-power, lightweight RF sensor that can alert health-care providers when a high-risk patient is up and about.

The system consists of a Wearable Wireless Sensing and Identification device based on the WISP platform (developed by Intel Research) with an onboard triaxial accelerometer. The unit measures 20 millimeters by 20 millimeters (0.8 inch by 0.8 inch) and 2 millimeters (0.08 inch) thick, and has an antenna for communicating with a passive ultra-high-frequency RFID reader. It weighs roughly 2 grams (0.07 ounces), doesn't require a battery and will cost approximately $3 when manufactured in bulk.

The sensor device can fit in a pocket of a patient's garment.

Energy harvested from the UHF reader operates a 16-bit microcontroller and the accelerometer in the WISP unit. The microcontroller can perform a variety of computing tasks, including sampling sensors and reporting the sensor data back to the RFID reader. The devices can be read from roughly 13 feet (4 meters). Reader antennas can be placed above the bed and hospital-room doorway and in the restroom to monitor activity.

Data from the RFID reader—including accelerometer readings, location information, direction of motion, velocity and time—are sent via the hospital's local area network to a server running patient-monitoring software. Readers can also pick up traditional passive UHF tags on walking aids and staff members.

An inference engine in the software analyzes the data received and classifies the event as either high risk or not high risk. High-risk events are then analyzed by an expert system based on rules to make a decision regarding the final response. If, for example, a high-risk patient is leaving her room without a walker or a nurse, the system will trigger an alarm for someone to intervene and try to prevent a fall.

A prototype of the system was tested on 26 volunteer patients, 71 years of age or older, at Queen Elizabeth Hospital in Adelaide. "The system's performance was not as high as we would like because our sensor placement needs to change from the chest area to the shoulder," says Damith Ranasinghe, leader of the study. "We are currently waiting on ethics approval to test a new wearable antenna design for placement on the patient's shoulder.

"We have a patent filed for our fall-prevention approach, and we hope we can commercialize our technology," Ranasinghe adds. "It really makes sense if you are already doing patient tracking with RFID. Right now, our goal is to run a multicenter randomized control trial at two hospitals in Australia."

Ranasinghe and his colleagues have received $1.6 million (AUD) from the National Health and Medical Research Council to run a trial to demonstrate the efficacy of their approach. If successful, in a few years we could see a sharp drop in hospital falls. —*Mark Roberti*

PHOTO: UNIVERSITY OF ADELAIDE'S AUTO-ID LAB

ECOLOGY

Tracking Rats With RFID

Rats damage crops, foul human food, eat through wiring causing electrical outages and fires in buildings, gnaw through wiring harnesses in motor vehicles, consume the eggs of endangered birds and reptiles, and spread infection. All told, the cost to the U S. economy is estimated at $19 billion annually. And with 75 percent of the world's human population expected to live in urban environments by the year 2050, the impact of rats is expected to get worse.

An RFID reader, scale and camera identify individual animals.

Yet, little is known about rat behavior, because rats are hard to track. GPS devices and other radio transmitters used on animals to understand feeding and social and migratory behavior don't work on rats, because the rodents often spend a lot time in buildings, pipes and below-ground areas where signals cannot be received.

Two researchers at Hofstra University, in Hempstead, N.Y., are working to change that by RFID-tagging New York City rats. Ronald J. Sarno, an associate professor of biology, and Michael H. Parsons, a chemical ecologist, tagged 13 rats (nine males and four females) with Trovan ID-100US Universal Series implantable transponders. The low-frequency devices are roughly the size of a grain of rice and have a read range of approximately 7 inches. Sarno and Parsons used soiled rat bedding to attract the rats to an RFID reader with an antenna, a camera trap and a scale, to record their presence and weight.

Seven of eight rats that were caught and released within 10 meters (33 feet) of the reader returned to the reader at least once (the RFID tag dislodged from the other animal). All told, the rats visited the reader 397 times. No animals captured and released 20 meters to 50 meters from the antenna returned to the antenna. The researchers found that some rats were active throughout the day, rather than nocturnal as popularly portrayed, and they tended to stay in one area as long as food and harborage was available.

The goal of the research, Parsons says, was "to overcome the barriers holding back urban rat research by handling wild rats in a manner that was safe for the researchers [and rats], and by using remote sensing to identify individual animals and gain insights into their private lives." The researchers plan to continue their studies into the behavior and ecology of rats, and believe they may have opened a new avenue for others.

When we have a better understanding of rats' behavior, Sarno says, "the pest-control professionals will be able to control [rats] more effectively, and the urban environment will ultimately be safer." —*M.R.*

PHOTO: RONALD J. SARNO AND MICHAEL H. PARSONS

Rat Race

Estimated number of rats and humans worldwide:

Up to 7 billion each

Estimated number of rats in India:

2.5 billion

Estimated number of rats in China:

2 billion

Estimated number of rats in the United States:

1.25 billion

Estimated number of rats in the Galapagos Islands:

180 million

Estimated number of rats in the United Kingdom:

150 million

—Rich Handley

ILLUSTRATION: ISTOCKPHOTO/IMAGEZOO

ADOPTION

Readers' RFID Interests Revealed

Statistics from the RFID Journal website in 2015 suggest interest in RFID is growing, as some visitors want to expand their RFID projects and others want to learn how to deploy the technology.

Year to year, the RFID Journal audience metrics have been remarkably stable, even as individual readers come and go. Our readership, for example, has always been approximately 50 percent from the United States and 50 percent from other regions of the world. This may change a few percentage points each year, but it has been essentially consistent since RFID Journal was founded in 2002. While the United States has always ranked No. 1, the next eight places were unchanged from 2014 to 2015 (see "RFID Journal Readers by Country" below). Japan, however, overtook Brazil for the 10th spot. This could be due to the severe recession and political issues in Brazil.

"What is RFID?" dropped seven spots, indicating, perhaps, that people have become more familiar with the technology.

RFID Journal has continued to see steady growth. In 2015, rfidjournal.com had 874,789 unique visitors. That's an increase of roughly 7 percent from 2014. Moreover, this does not include visitors to RFID Journal Brazil, RFID Journal Español, IOT Journal or our event websites. Users logged on for 1,292,221 sessions (up 5 percent from 2014), and we served up more than 2.65 million pages (a 6 percent increase), according to Google Analytics.

When we look at the searches people are conducting on the RFID Journal website, we also see some consistency from one year to the next. Many search terms moved up or down one rank from the previous year. But there are several notable exceptions. "What is RFID?" dropped seven spots, indicating, perhaps, that people have become more familiar with the technology. "Read distance" also dropped several places and "history" disappeared from the top 20.

The term "supply chain" jumped nine spots, to become the most-searched term in 2015. This could indicate that readers are becoming more aware of the benefits their companies could achieve with RFID beyond improving internal operations. Two new additions to the most-searched terms—"beacons" and "sensors"—show that companies are eager to

RFID Journal Readers by Country

Rank	2015	2014
1	United States	United States
2	India	India
3	United Kingdom	United Kingdom
4	Canada	Canada
5	Germany	Germany
6	Australia	Australia
7	France	France
8	Singapore	Singapore
9	Malaysia	Malaysia
10	Japan	Brazil

Top Searches on RFID Journal's Website

Rank	2015 Search Terms	2014 Search Terms
1	Supply chain	Library
2	Library	Read distance
3	NFC	Walmart
4	Walmart	What is RFID?
5	RTLS	NFC
6	Beacon	RTLS
7	EPC	Security
8	Security	EPC
9	Read distance	Internet of Things
10	Retail	Supply chain
11	What is RFID?	Cost
12	Airbus	Warehouse
13	Construction	Construction
14	Warehouse	Food
15	Laundry	Airbus
16	Jewelry	American Apparel
17	Asset tracking	Zara
18	Automotive	Active RFID
19	Internet of Things	History
20	Sensors	Disney

use Bluetooth beacons to connect with people's mobile phones and sensors to monitor the conditions of assets.

One of the most striking changes was the drop of "Internet of Things" from ninth to 19th place. That could be due to the fact that RFID Journal now publishes a separate IOT Journal, or it could mean that IoT technologies have fallen into the chasm. Other notable additions to the top 20 search terms are "jewelry," "asset tracking" and "automotive." It's also interesting to note that there are fewer searches for company names, such as Airbus and American Apparel, suggesting that readers are more aware of what other firms are doing and now want to achieve similar benefits.

When we look at the most-searched terms and the "Top 20 Articles From 2015" table, it appears that interest in laundry and library applications is growing steadily.

Most of the top 20 articles viewed by readers from Jan. 1 to Dec. 31, 2015, were news stories. Some were from our Ask the Experts section, which publishes answers to questions submitted via the website. Readers often ask: Which RFID vendors offer which products, and which are the best? (See the second most-read story of 2015.) This supports the conclusion of our branding survey, which found even the most knowledgeable retailers don't know most of the RFID providers focused on retail (see "Survey Hints at Brand Awareness Problems for RFID Vendors"). That's likely the case in other industries as well.

One of the most striking changes was the drop of "Internet of Things" from ninth to 19th place. That could be due to the fact that RFID Journal now publishes a separate IOT Journal, or it could mean that IoT technologies have fallen into the chasm.

A few of the top stories were from our Editor's Note section, and a handful were from the Getting Started area of the website. It's interesting to note that only three of the top 20 articles viewed were published in 2015. Some date as far back as 2004. This could be due to a popular website posting a link to an earlier article or interest resurging in a topic we covered years ago.

Visitors to RFID Journal have a broad range of interests—from basics about the technology to innovations in the field. It seems whether people are new to RFID or have experience with it, they read RFID Journal primarily as a research site where they can find a wealth of information on applications similar to the one they are considering—and get ideas for projects that could improve the way they do business. *—Mark Roberti*

Top 20 Articles From 2015

Linen Loss Drops By 90% at Los Angeles Luxury Hotel
News, Aug. 27, 2013

What Are the Leading RFID Companies?
Ask the Experts, May 13, 2013

What Is the Read Range of a Passive RFID Tag?
Ask the Experts, Aug. 14, 2013

Has RFID Been Integrated With GPS?
Ask the Experts, Sept. 17, 2013

RFID Scores Well at TopGolf's Newest Entertainment Complex
News, Jan. 3, 2012

An iPhone With NFC—at Last!
Editor's Note, Sept. 15, 2014

Companies Deliver New Apps for Bluetooth Beacons
News, Oct. 7, 2013

MagicBands Bring Convenience, New Services to Walt Disney World
News, June 16, 2014

Improving Food Safety and Quality In China
News, Sept. 30, 2013

Michelin Embeds RFID Tags in Tires
News, Jan. 16, 2003

How to Implement RFID Successfully
Expert View, Aug. 9, 2010

The Importance of Standardization
Editor's Note, May 17, 2004

What Do I Need to Know When Buying an RFID Developer's Kit?
Ask the Experts, Sept. 12, 2013

Zebra's Sled Reader Enables UHF RFID Tag Reads Via Smartphone
News, Apr. 22, 2015

RFID-Reading Drone Tracks Structural Steel Products in Storage Yard
News, Sept. 26, 2014

AMA Issues Ethics Code for RFID Chip Implants
News, July 17, 2007

Panasonic Adds Bluetooth Beacons to Electronic Shelf Labels
News, Feb. 4, 2015

Stanley Black & Decker to Shutter Its AeroScout Industrial Division
News, Aug. 18, 2015

A Summary of RFID Standards
Getting Started, Jan. 16, 2005

RFID System Components and Costs
Getting Started, Jan. 16, 2005

ILLUSTRATIONS: ISTOCKPHOTO/IMAGEZOO

MARKETING

Survey Hints at Brand Awareness Problems for RFID Vendors

Responses to an RFID Journal survey indicate that even the retailers who are most educated about RFID are unfamiliar with many solution providers.

In January, RFID Journal sent out a survey to retailers and companies that manufacture apparel, sporting goods, jewelry and accessories to learn what they know about the RFID providers focused primarily on the retail sector. We listed 40 RFID tag, reader and software companies.

The survey was unscientific: We sent questionnaires to people in our database, and received nearly 50 responses. Those who responded do not necessarily reflect the global pool of retailers and manufacturers, but they are among the most knowledgeable when it comes to RFID. So while the sample size is small, it provides a snapshot of what retailers and manufacturers know about RFID solution providers. The

survey suggests that most RFID providers have a lot of work to do to build brand awareness.

Who are these respondents? The vast majority—83 percent—said they have been researching RFID for more than four years. Another 13 percent said they have been researching the technology for three to four years, and 4 percent said they have been investigating the technology for less than a year.

Moreover, 21 percent said they have deployed an RFID solution in some stores, and 17 percent have deployed the technology in all their stores. Another 8 percent said they had finished a pilot and were planning a rollout, and 8 percent said they were currently running or would soon run a pilot. Roughly 30 percent said they had not yet launched a pilot and were still researching solutions. No respondents said they did not plan to implement an RFID solution.

The best-known providers were, in alphabetical order: Alien Technology, Avery Dennison, Checkpoint Systems, Impinj, Tyco Retail Solutions and Zebra Technologies.

We asked these retailers and manufacturers which RFID solution providers they were familiar with. The best-known providers were, in alphabetical order: Alien Technology, Avery Dennison, Checkpoint Systems, Impinj, Tyco Retail Solutions and Zebra Technologies. These companies were known by 70 percent to 86 percent of the respondents (though some respondents were confused about the products and services they offer).

That's the good news. The bad news is that the other 34 RFID providers on the list were known by less than half the respondents. Ten companies were known to just 5 percent of the respondents, and three were not known by any respondents.

Yet, overall, brand awareness is very important to these retailers and manufacturers:

- 96 percent of respondents said it is very important or somewhat important to consider an RFID company's brand when making an investment decision; only 4 percent said brand is not important
- 83 percent of respondents said they determine the reputation of a company's brand by reading about the company on RFID websites
- 71 percent said seeing companies exhibit at events is important
- 38 percent said seeing a solution provider's ads influences their view of the company's brand; no respondents said having a high ranking in Google's search results is important.

When asked how they find appropriate solution providers, 71 percent of respondents said they rely on RFID Journal's website, compared with 12 percent that go to other RFID sites (no surprise, since they are our readers). Roughly 60 percent said they attend RFID industry events to find solution providers. Only 8 percent said they use social media.

WHO RESPONDED

Roughly 63 percent of respondents were from the United States, 17 percent from Latin America, 17 percent from Europe and 4 percent from the Asia-Pacific region. This generally reflects the overall makeup of RFID Journal's readership. Half the respondents were apparel retailers. Seventeen percent were apparel manufacturers. Thirteen percent were from department stores, and 20 percent from other types of retailing (luxury goods, sporting goods and so on).

The respondents were generally from larger chains. Fifty-four percent said their companies have revenue of more than $1 billion. A quarter had revenues of $100 million to $1 billion. Four percent had revenues of $50 million to $100 million, and 16 percent had revenue of less than $50 million.

Two-thirds of the respondents said they are part of an RFID team that makes purchasing decisions. Four percent said they have some influence over the decision on which RFID products their company buys. Three percent said they did not play any roll in the purchasing process.

Overall, this survey suggests that a few RFID providers are well known among the companies that have been researching RFID for three years or more, but many vendors are not well known among even this educated group. It's virtually certain that all RFID companies are less well known—or completely unknown—to retailers that have just begun to research RFID solutions. —*M.R.*

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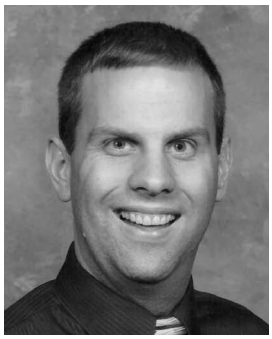
RFID helps companies preserve the environment and boost the bottom line.

BY MINDA ZETLIN

AT DETROIT DIESEL, there's an area employees call the "green corner." The Daimler Trucks North America affiliate, which builds engines, axles and transmissions for long-haul trucks and other heavy-duty vehicles, has won so many awards for its environmental achievements it had to put up a special shelf to hold them all—including the RFID Journal Green Award, which the company won in 2015 for using RFID to reduce paper waste.

Detroit Diesel builds engines to customer specifications, so each requires a "build book" to provide workers with assembly instructions and checklists. Last year, Detroit replaced paper build books—each a 40- to 60-page document—with Omni-ID's RFID visual tags, which display instructions.



"There's tree green and then there's cash green. At the end of the day, you have to make a profit."

ROBERT HYDEN, DETROIT DIESEL

Before adopting the RFID solution, when customers requested changes after an engine was in production, the new instructions had to be printed, and then operators would tear out the relevant pages and staple in new ones. With the factory pumping out approximately 410 engines daily, the build books consumed roughly 5 million pages annually.

Today, the company can quickly update any changes in the software, and then download the information to the tags. Workers can also use the Wi-Fi-enabled RFID tags to call for needed parts, reducing production delays. "We not only are able to save millions of pages of paper and ink, we can update to build information in real time," says Robert Hyden, a Detroit Diesel systems engineer who served as project leader on the RFID implementation. And because the paper books took manual labor to distribute, "there's a payback in manpower as well," he says (see Visualize This—Detroit Diesel Goes Green With RFID).

"There's tree green and then there's cash green," Hyden says. "At the end of the day, you have to make a profit. On the other hand, you want to be a good corporate citizen. We take into account both profitability and environmental impact when we do a new project." Most of the time, the two objectives are aligned. "I don't think, the way things are going, that you can separate those two," he says.

It's a viewpoint smart business leaders in myriad industries are adopting. "Many companies are actively integrating sustainability principles into their businesses, and they are doing so by pursuing goals that go far beyond earlier concern for reputation management—for example, saving energy, developing green products, and retaining and motivating employees," wrote the authors of a McKinsey & Co. report released in 2011.

In 2015, the firm went back to take a closer look at exactly how becoming greener is boosting the bottom line for the companies it surveyed. "We found that companies that built sustainability into their operations saw immediate benefits, which gave them the momentum to do even more," the new report noted. Though these benefits included avoiding public relations or regulatory risks, many found the same programs that made them greener also saved them money by reducing the use of resources such as fossil fuels and water, and lessened the risk of a business disruption should those resources become scarce.

Like Detroit Diesel, other companies are turning to RFID to marry their profit and sustainability objectives. They are not just claiming to be good corporate citizens—a common PR practice called "greenwashing" that, ultimately, is bad for business. Increasingly, consumers are paying more attention to the environmental impacts of products and manufacturers. Credibility issues can hurt entire industries, exposing them to scrutiny and criticism, and engender mistrust in companies that make false claims. In some cases, companies can be fined for deceptive marketing.

"There are all kinds of examples where practices that conserve resources save money or help a company make more money," says Leslie Downey, principal of RFID Revolution, a Washington, D.C., firm that provides RFID online education and market strategy consulting. "Generally, operating a business more sustainably almost always results in cost savings," she says. "I don't think there are too many situations where [those two goals] are at odds. Ultimately, businesses pay more when air and water are polluted."

In retail, for example, "RFID helps reduce out-of-stocks," Downey says. "When that happens, the company can save money by not having to expedite orders. It can increase sales because customers find what they're looking for. Customers save money and reduce emissions by avoiding extra trips to find things that are out of stock."

Another example is trash. Cities and towns worldwide are using RFID-enabled waste-collection solutions to track how much garbage

The RFID Tag Endgame

While radio frequency identification is beginning to facilitate green initiatives, forward-thinking environmentalists, recyclers and government regulators have long wondered: What's going to happen when RFID tags are used to track everything—from apparel, consumer electronics and pharmaceuticals to cardboard boxes, steel drums and shipping pallets? When glass, paper, plastic and other materials are recycled, will the RFID tags they contain contaminate recycling streams or pollute landfills?

The European Commission asked RAND Europe to examine these issues. The 2012 study, "Smart Trash," considered both the benefits of using RFID for product life-cycle management and recycling—and the environmental impact of the actual tags, which can be difficult to recycle. Emphasizing that the relationship between RFID and waste is "still in its infancy," the authors concluded: "The nature and applications of RFID tags continue to evolve. While it is important to provide regulatory certainty to encourage beneficial developments, it is equally important not to inhibit or foreclose beneficial progress by legislating too soon, or by adopting inflexible rules tied too closely to specific technologies or use cases." The study found that RFID tags' impact on landfill or waste incineration facilities would likely be negligible, but that the potential effects on recycling merited more thought.

The study found that RFID tags' impact on landfill or waste incineration facilities would likely be negligible, but that the potential effects on recycling merited more thought.

In the United States, the Institute of Scrap Recycling Industries—an association that represents more than 1,600 companies, including manufacturers and processors of electronics, glass, metals, paper, plastics, rubber and textiles—has been monitoring the RFID-recycling issue since 2008. Initial fears regarding the effects of RFID-tagging were premature, says Scott Horne, ISRI's VP of government relations. Early predictions of the widespread use of RFID tags on grocery-store merchandise, for example, have not yet been borne out, he adds.

"I have not had a huge outcry from any sector of our industry in the last year or two," Horne says. Those dealing with steel and other metals are less likely to be affected, he says, but plastic and paper recyclers still have some concerns.

"Currently, the tags are not a big issue," says Janette Micelli, a spokeswoman for Waste Management, the largest operator of garbage collection, recycling and landfill facilities in the United States. But, she adds, if the tags become more concentrated, they could cause problems and might have to be recycled separately.

RFID tag manufacturers are aware of the issues regarding the recyclability of their products. "So far, our customers have not raised any concerns," says Christian Achenbach, Smartrac's corporate communications manager. "From an environmental point of view, RFID tags generally become significant when they are applied at the item level," he says. When that happens, he adds, Smartrac is "very keen to cooperate with institutions and RFID industry partners to support the development of new environmental standards."

Some tag manufacturers are working to lessen the impact of their tags on the environment. Avery Dennison, for example, has "taken steps to reduce the plastic content of our tags by about 75 percent," says Leah Johnson, senior manager for global marketing. This, combined with an improved antenna-cutting process and a reduction in size of the silicon chips, Johnson says, has significantly lessened the amount of contaminating material each tag could introduce into the waste stream.

Meanwhile, researchers are working to develop more environmentally friendly RFID tags. Some companies have tried printing antennas, but the cost is often just as high as that of metal antennas, or the performance isn't as good. Some have used metallic inks, but the silver in these inks can be expensive, and some countries have banned them from landfills. Researchers at the University of Manchester are working with graphene antennas that may address these issues. *—David Wilson*

PHOTO: ISTOCK PHOTO

"Fuel consumption, emission reduction—literally every measure of sustainability is enhanced when you increase the velocity of freight. RFID tags facilitate increasing that velocity."

CLIFF GLADSTEIN, GLADSTEIN, NEANDROSS & ASSOCIATES

they collect from each household, along with other information. The automated systems help eliminate lost revenues from missed pickups and misplaced invoices and enable more efficient truck routes, which save on labor and fuel. In addition, some cities have switched from a flat monthly fee for garbage pickup to a "pay-as-you-throw" model that records and charges each household every time trash is collected. That's created an incentive for households to reduce their trash output and increase their recycling, which is typically collected free of charge. Cities with such systems are seeing meaningful reductions in the waste they collect, which, in turn, impacts the amount of trash that must be either incinerated or buried in landfills.

Recycling firms are using RFID to improve logistics processes, which also decreases carbon dioxide emissions. In addition, better tracking of assets—from glass bottles to discarded computers and printers—enables the recycled materials to be reused, saving energy while creating new business models (see Finnish Recycling Firm Uses RFID to Create an Efficient and Profitable Business, Brazilian Recycling Plant Uses RFID to Facilitate Reverse Logistics and Extracting New Value From Old Printers).

Here's a closer look at how RFID can help your company make a significant contribution to profit and sustainability.

Reducing Fuel Consumption

Transportation of both people and freight is where RFID is having the biggest sustainability effect and where the technology has the largest potential to reduce the use of fossil fuels, a major contributor to global warming. Fossil fuels burned for air, marine, rail and road transportation account for roughly 27 percent of greenhouse gas emissions in the United States, according to the U.S. Environmental Protection Agency. Globally, the Center for Biological Diversity estimates, 15 percent of carbon dioxide comes from these modes of transportation.

There are many opportunities for RFID to reduce emissions and improve profitability by helping cargo travel from place to place more quickly, says Cliff Gladstein, president of Gladstein, Neandross & Associates, a Santa Monica-based consultancy that advises clients on clean transportation and reduced energy consumption. "Fuel consumption, emission reduction—literally every measure of sustainability is enhanced when you increase the velocity of freight," he says. "RFID tags facilitate increasing that velocity. Knowing where a box is at all times, knowing when that box was unloaded, what stack it was in at the port, where the truck should pick it up, where to send that truck and how fast it's going and whether to divert it because of traffic—RFID contributes to virtually every step of that process."

Since 2005, PierPass, a not-for-profit organization created by marine terminal operators at the ports of Los Angeles and Long Beach, has required every truck entering the ports have a tamperproof RFID tag mounted on the driver-side exterior mirror. At the marine terminal gates, an RFID reader pings the tag and checks the terminal database to verify that the truck associated with that tag is allowed into the terminal. This ensures that only trucks meeting the strict emissions standards adopted by the ports can gain entry.

RFID also is instrumental in Clean Truck programs now in place at ports on the East and West coasts, as well as the Gulf of Mexico. "Diesel particulates are a known human carcinogen and one of the deadliest pollutants in the air," Gladstein says. In response, many communities are providing funds to trucking companies and individual owner-operators to help them replace older trucks with newer, more fuel-efficient models.

If a community is helping to pay for a newer

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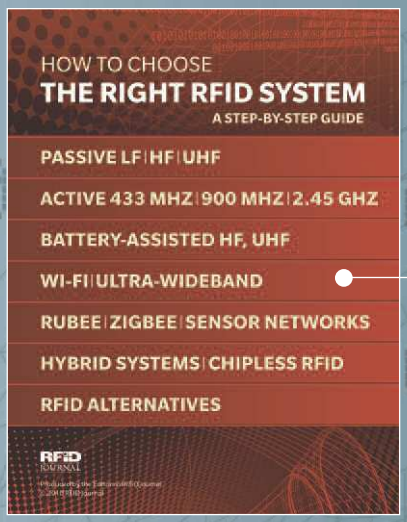

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"Instead of having to blast a tube full of 28 pallets of fruit and wait till all 28 are at the right temperature, RFID tags with sensors tell you that the front third is ready to go."

MICHAEL McCARTNEY, QLM CONSULTING

truck, that community has an interest in knowing the truck is operating within its borders, Gladstein explains, and RFID supplies that information. "A Clean Truck program will demand that the truck spend a certain number of minutes within a geofenced area [a defined boundary tracked by a combination of RFID and GPS] and limit the amount of time it spends outside that area, so RFID tags are critical," he says.

Detroit Diesel is also using RFID for yard management. "As truck trailers come onsite, they're assigned a magnetic RFID tag," Hyden says. "The tugger trucks that deliver them around the plant have RFID readers on top, so we have a real-time map of where everything is." Previously, a company employee had to drive around looking at trailers to find needed parts. "You're easily saving 25 percent on fuel costs annually," he says.

Idling delivery trucks, buses and other motor vehicles in towns and cities worldwide also contribute to air pollution. The idling problem is so bad for the environment and public health that a growing number of U.S. cities and states—including Denver, Hawaii, Las Vegas, Philadelphia and Virginia—have enacted laws against it.

RFID-based toll-collection systems significantly reduce the idling that occurs when a driver waits in line, eliminating gigatons of carbon emissions over time, Downey says. It also facilitates time-of-day tolling—charging discounted or free tolls during off-peak traffic times. That creates an incentive to drive during off-peak hours, which helps ease traffic congestion, reducing emissions even further, she says.

"Another area is automatic vehicle identification [AVI] parking," Downey says. "When you buy a parking pass that's RFID-enabled, you don't need to stop and take a ticket or swipe your card, you just drive on through. That saves a lot of unnecessary queuing by people waiting to get in to work. Employers benefit because employees get to work sooner."

The Lankenau Medical Center installed an AVI system at its Wynnewood, Pa., campus, which eliminates delays caused by congestion and reduces carbon emissions in parking garages. Chapman University in Orange, Calif., deployed an AVI solution that facilitates parking for students and faculty members. Similarly, frequent visitors to the Minneapolis Institute of Art can purchase a "parking debit tag" that is tied to the visitor's account, to expedite entry and exit.

Saving Electricity

Transportation accounts for 27 percent of greenhouse gases in the United States, but it's only the second largest source of these emissions; the largest is electricity use at 31 percent, according to the EPA. Here, too, RFID can contribute to sustainability by helping industries—from perishable foods to IT—reduce electricity use.

"Fruit and vegetables are shipped at field temperatures, typically in the 90s," says Michael McCartney, founder of San Francisco-based QLM Consulting, which focuses on the perishable foods industry. "Once they get to the distribution center, heat has to be taken out."

Each type of produce keeps best at a specific pulp temperature, typically 30 to 36 degrees Fahrenheit for most fruits and vegetables other than citrus. When fruits and vegetables first arrive at the DC, they are often put in long cooling tubes, to cool them down as quickly as possible. Inside these tubes, their temperature may go down quickly, then bounce back up, then sink again. "When the bouncing stops, you can remove the product and get it ready for cold storage and, ultimately, to be put on a truck and sent to a wholesale or retail market," McCartney says.

RFID can shorten produce's stay inside those tubes. Tags with temperature sensors attached to pallets provide accurate information on the items' temperature. "Instead of having to blast a tube full of 28 pallets of fruit and wait

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"Look at employee benefits and product safety. In decades gone by, a lot of companies might not have spent much money on these, but that's changed dramatically as these have become internalized costs."

DAVID Y. SMITH, ORION GBSC CONSULTANTS

till all 28 are at the right temperature, RFID tags with sensors tell you that the front third is ready to go and the back third is ready to go, so you start a cycle that's way more efficient," McCartney explains. A 5-hour cooling process can be reduced to 3½ or 4 hours, he says. That's a 25 percent gain that translates into 6 hours of energy use per day.

Once out of the tubes, produce typically moves to a cold room for longer-term storage and eventual distribution. "You have RFID tags with temperature sensors all up and down the racking system and now you have a completely different idea of what's going on in your cold room," McCartney says. "Hot air rises, so from floor to ceiling you'll have a wide range of temperatures. You may be over-cooling, or you may be cooling inefficiently."

More efficient cooling is only one benefit of using RFID in cold-storage facilities. Because the cooling process is shorter, produce moves through the facility more efficiently and can reach markets faster and fresher. In addition, produce distributors that have been able to track the exact temperature at which items have been stored and transported can have a more accurate idea of how long their products will stay fresh. "You could take all that data and extract the information that your product shelf life is nine days or longer or shorter depending on how the product was handled," McCartney says. "You could use that as a strong selling point throughout the buying retail community."

That same shelf-life information can significantly reduce waste, which also contributes to sustainability. "You have three suppliers delivering strawberries," McCartney says. "One lasts nine days, one last 11 days, and one lasts seven days. Right now, they all look the same. But if you have these metrics, you could put the shortest shelf-life ones at the front of the line and the longer ones later. The reason you have food waste is that you have no information on how long a product is going to last, so you lack the information to meet the demand of the store."

The three biggest produce growers in California's Salinas Valley use this system, as does one of the largest berry growers in the world, McCartney says. He adds that RFID adoption should rise significantly during the next five years, particularly since the Food Safety Modernization Act, which takes effect in January 2017, will require growers to monitor environmental conditions.

Data centers—facilities that typically house servers, routers and storage systems—are also turning to RFID to reduce electricity costs. The equipment not only is sensitive to heat but also generates large amounts of heat, so cooling is essential. All too often, however, data centers are cooled excessively. Wireless monitoring systems that use RFID and sensor technologies to gather environmental information in real time enable companies to better manage energy consumption.

Digital Fortress, a colocation data center in Seattle, deployed an RFID energy-management system to better monitor equipment so it could assure customers their servers are protected. At the same time, the solution enables the company to better manage temperature fluctuations, reducing energy usage and maintenance costs (see Digital Fortress Keeps Cool With RFID). California's Department of General Services equipped 12 of the state's data centers with an RFID-based temperature-control system, to reduce energy consumption (see California Data Centers Expect to Cut Energy Usage By 75 Percent).

Protecting Resources

Sustainability issues include risk management of resources that could become scarce and disrupt operations. Sawmill companies and wood products manufacturers, for example, are employing RFID to optimize forest production and improve the quality of wood products, as well as to minimize environmental damage and enable companies to comply with U.S. and European

rules barring import of illegal or endangered timber products (see RFID in the Forest).

Almacafé, a subsidiary of the National Federation of Coffee Growers of Colombia, RFID-tracks specialty coffee beans throughout its internal supply chain—from the farms to the warehouses, and during processing and bagging for export to roasting and trading facilities. The program rewards the some 25,000 coffee growers who supply the specialty beans, boosting their standard of living and ensuring a ready supply of beans that enables the Federation to better compete in the global market (see RFID Helps Ensure That Special Cup of Joe).

Managing Hazardous Waste

Lufthansa Technik Logistik Services is responsible for logistics services that involve warehousing, transportation and material supply for German airline Lufthansa. Some of the materials essential to keeping a fleet airborne are hazardous substances. The firm developed an RFID item-tracking solution that has yielded economic and green benefits, including: a reduction in labor, inventory, losses due to expired products and costs associated with hauling away hazardous items—and fewer chemicals in the waste stream.

"Sustainability is an important part of the business, and a way to distance ourselves from competitors," says Kathrin Stromann, the RFID project manager at Lufthansa Technik Logistik Services. "RFID is a mainstream part of our business. It is changing a wide range of processes and helping eliminate waste and inefficiency."

Enviro-Energy, a division of Liaison CAN/US Logistics, which specializes in supplying new industrial-size batteries for the telecommunications industry, and in disposing of used ones, is employing RFID to track its battery inventory and comply with customer requests for visibility into the disposal of their batteries. In addition to improving warehouse efficiencies, "we are able to get customers we may not have had in the past," which has contributed to the return on investment, says Alain Perreault, the firm's general manager.

Becoming Green

CEOs who don't believe sustainability can impact the bottom line may change their minds quickly in a world that's increasingly struggling with disruptions caused by climate change and other environmental issues, says David Y. Smith, principal at Orion GBSC Consultants, which advises companies about sustainability issues.

Business leaders must create a forward-looking sustainability strategy. It's only a matter of time until carbon markets, water scarcity and product/packaging recycling costs force U.S. companies to pay attention to their resource consumption, waste production and pollutants, Smith says. "Look at employee benefits and product safety," he adds. "In decades gone by, a lot of companies might not have spent much money on these, but that's changed dramatically as these have become internalized costs."

It's in most organizations' long-term interest to pay attention to sustainability, even without considering cost savings or government incentives, Smith says. Companies should think in terms of what he calls a "triple bottom line." In addition to profitability, "the other two aspects are your company's environmental and social effects," he says.

Smith also reminds companies to think about future generations. Unless we change today's huge level of global consumption, he says, it will worsen the quality of life for the children, grandchildren and great-grandchildren of the people living on Earth today.

"Every time you have to procure or rebuild something because you lost it, or move something unnecessarily, you're using resources, man power and energy and that takes away from the bottom line," says Hyden at Detroit Diesel. "The old idea that everything is disposable and you can buy new each time doesn't work anymore."

American Woodmark RFID-tags cabinet doors and drawer fronts and tracks them at key points in the manufacturing process, including door build, finishing, quality control, stocking and shipping.

AUTOMATING Craftsmanship

RFID helps furniture makers improve production processes, expedite orders and enhance customer service.

BY JENNIFER ZAINO

PHOTO: AMERICAN WOODMARK

Furniture making is a craft, and professionals take pride in their designs, skills and custom products. But like other manufacturers, furniture makers must deal with supply-chain issues, from inventory to demanding customers, all of which can be challenging, even problematic, at times. As business picks up and orders increase, so does the need to better manage processes and operations to succeed in a competitive market.

That's the position American Woodmark, a Virginia-based manufacturer and distributor of kitchen cabinets and vanities, was in when it began exploring RFID in 2009, to better compete in the remodeling and new-home construction markets. Today, American Woodmark has deployed the technology at seven facilities, as well as at two U.S. and two international suppliers. The company RFID-tags cabinet doors and drawer fronts and tracks them at key points in the manufacturing process, including door build, finishing, quality control, stocking and shipping. The RFID solution has enabled American Woodmark to manage inventory in real time, reduce errors, improve customer service—and achieve a return on investment (see Manufacturer Uses RFID to Put a New Face on Cabinet-Making).

Now that American Woodmark has an RFID "backbone," David Johnson, the company's materials technology and projects manager, is thinking about how to employ the technology to further streamline processes. Like other manufacturers, American Woodmark uses programmable logic controllers (PLCs) and command-and-control (CNC) servers to manage networked machines on factory assembly lines and determine their positioning and motion. Integrating RFID with these systems, Johnson says, would enable fixed readers on the production line to identify the RFID-tagged doors and communicate information such as which edge details they are slated to get, to ensure the appropriate tool heads are automatically loaded for each custom job. "No one has to touch anything to put the right tool head that does the edge detailing on the machine," he says. "And when the next stack is read, the system will go and load itself with the right tool head for those doors, too."

Similarly, a production line could be set up to automatically accommodate different door sizes. "The system could just read the tag and know what size door it is working with and what to do with it," Johnson says. He also foresees the day when RFID will help American Woodmark better manage machinery maintenance. If machine parts were identified with RFID temperature tags, for example, they could be read regularly to see if they comply with the specifications in a database.

Johnson says American Woodmark's major competitors have explored the use of RFID for specific applications. They and other custom and office furniture manufacturers "are coming around to RFID," he says, because they understand how the technology can address manufacturing problems by providing visibility into the production process.

Other furniture makers worldwide are RFID-tagging parts and finished products to track work-in-process and shipments (see Poltrona Frau Uses RFID to Track Leather Materials, Custom Door Maker Turns to RFID to Better Manage Business, RFID Helps IKEA Furniture Maker Eliminate Shipping Errors and Walter Knoll Boosts Accuracy for Product Shipment, Returns). And there was "huge interest" among attendees at last spring's LIGNA trade show for the woodworking industry in Germany, says Andrej Ermlich, project management head for Abaco Informationssysteme, an RFID systems integrator and software supplier for the furniture manufacturing sector (see RFID Carves Out a Place in Woodworking Industry).

Still, getting RFID to work well in the furniture-manufacturing sector can be tricky business.

BUILDING A BUSINESS CASE

"We can automate a lot of processes using RFID," says Kevin Knuth, business development manager for Northern Apex, the systems integrator that worked on the American Wood-

> "What if you typed the wrong code or if you pressed the wrong keypad? The last thing you need is a complaint from an angry customer who ordered a left-handle door and got a righty."
>
> MICHAL YANUV MAX, TADBIK

Pandoor Doors uses RFID to set up the computer-controlled cutting machines, which are changed for each order.

mark deployment. "If you can find a way to tag a product at the beginning of a process [as American Woodmark does], you can track it as it goes through sanding and finishing lines, or see if it's been taken off to be reworked automatically." When the product is complete, RFID tags can be read to verify that trucks headed to retailers or distributors have been loaded with the right product. "That opens up a new world to things like advanced shipping notices," he says. "Furniture manufacturers can verify what they loaded on a truck and tell the retailer, 'Here's what you will be receiving,' and it all happens automatically."

An Abaco customer began using RFID three years ago to reduce costs and provide a higher quality of service, Ermlich says. RFID readers are installed on most of the machines to manage CNC programs. "The RFID transponder identifies the part, and the database provides the name or number of the CNC program stored in the machine for drilling, cutting or coating processes," he says. The project also includes using RFID to manage inventory, monitor work-in-process, automate assembly and optimize logistics, from the loading dock to customer sites.

But many furniture makers today are employing RFID to solve specific problems. Pandoor Doors, Israel's largest manufacturer of custom interior doors, adopted RFID to automate manual production processes, so it could fulfill more orders without introducing potential human errors. Pandoor uses RFID to set up the computer-controlled cutting machines, which are changed for each order. "What if you typed the wrong code or if you pressed the wrong keypad? The last thing you need is a complaint from an angry customer who ordered a left-handle door and got a righty," says Michal Yanuv Max, sales and marketing director at Tadbik's RFID division, which provides Pandoor with RFID labels. Pandoor also uses RFID to automate its painting process, she says.

Another European furniture maker is RFID-tagging pallets of finished furniture from warehouse pickup to truck, to prevent delivery

PHOTO: PANDOOR DOORS

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errors—and the unsatisfied customers and additional costs that go along with them, says Erno Berger, account manager at RFID systems integrator Vilant, which worked on the project. "Each outbound gate is equipped with ultrahigh-frequency RFID readers and each pallet is checked as to whether it was loaded to the correct truck, and that no pallets have been left behind from the truck," he says. This is becoming an important use case, he adds, referring to similar projects and inquiries from potential customers.

Two Israeli bed manufacturers, Aminach and Hollandia, replaced their bar-code system with an RFID solution, to ensure a complete set of the correct components is added to a delivery order. That way, an installer doesn't find that a box of screws is missing, and the assembly of a bed or sleep sofa must be delayed.

With the bar-code method, fulfillment employees had to scan each component for a kit and then produce a new bar-code label for the kit, says Uzi Parizat, executive VP at Bos Dimex, an Israeli provider of RFID and supply-chain solutions to the bed manufacturers. "Sometimes, the employees forget or skip one of the kits," he says. Moreover, bar-coded components have to be set in the product carton with the bar codes facing front so they can be easily scanned, and that's challenging when multiple components must be included.

For its customers, Bos Dimex provides Tadbik UHF RFID tags for labeling components that are then picked by fulfillment employees using a handheld reader, according to ordering information entered into an enterprise resource planning system and connected to Bos' proprietary middleware. The tagged items are then placed in a cart for transfer to a station where they are packed in cartons. "All the items and the components are scanned," Parizat says, "and the ERP checks that there is no missing part or wrong part" before the cartons are loaded onto trucks.

"If the processes you want to optimize by using RFID are not defined enough for at least basic assumptions in that direction, an RFID project would not be advisable. You would, on the contrary, increase the amount of chaos..."

ANDREJ ERMLICH, ABACO

SMOOTHING OUT ROUGH EDGES

Furniture makers that want to use RFID to automate processes first need to reach a certain level of organizational maturity, especially regarding matters related to the in-house flow of materials, Ermlich says. "If the processes you want to optimize by using RFID are not defined enough for at least basic assumptions in that direction, an RFID project would not be advisable," he says. "You would, on the contrary, increase the amount of chaos, so to speak."

For some products, specialty tags may be needed, depending on the materials involved, Knuth says. A tag that can be easily read when affixed to a piece of maple may not read at all when used on an item made of medium-density fiberboard laminate, he explains. It's also important to choose the right type of antennas—and know their appropriate placement and power levels—to get installations in furniture manufacturing facilities functioning correctly, he adds.

Johnson says one of American Woodmark's biggest challenges was avoiding extraneous reads in the tag-rich factory floor environment. The company addressed this issue by establishing "keep out" areas to prevent tagged materials outside of the desired flow from passing nearby readers. In places where isolation wasn't possible, the firm installed shielding and enclosures to block extraneous reads.

Solid Comfort, which makes hotel furniture, faced these issues after it implemented an RFID system in 2010 to track items from final assembly to shipment. Things went well during the pilot, says owner Ryan Larkin, but struggles began during the live implementation, with a full warehouse and readers that would constantly read close-by tags. "We couldn't really narrow down the antenna scanning to a specific spot," he says.

Another problem was that completed items—"big bulky furniture made of ¾-inch melamine particleboard," as Larkin describes them—often had to be wheeled through the RFID portal leading from the production area to the shipping area multiple times, because the labels weren't in plain sight. Employees wouldn't realize the tag hadn't been recognized until they were halfway to the truck and heard the system emit the sound that let them know the read wasn't successful.

RETAIL APPAREL ROI CALCULATOR

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› Enter their average number of units on the sales floor and in the back room, as well as their average unit cost, inventory turns and retail margins

› Enter the number of hours that staff members spend receiving goods, conducting cycle counts and replenishing product inventory

› Estimate the reduction in labor costs

THE CALCULATOR ALSO:

› Allows a user to estimate the potential increase in sales

› Enables companies to estimate hardware, software and integration costs, based on their store layout and operations

› Provides a sample case for a fictional company

To download this **free calculator**, simply visit:

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PHOTO: BOS DIMEX

Two Israeli bed manufacturers, Aminach and Hollandia, use RFID to ensure a complete set of the correct components is added to a delivery order, before cartons are loaded on trucks.

"We tried to make it work for a few years, but it got to the point where it was counterproductive for the business," Larkin says. Partner AbeTech came in numerous times to help and each time thought the problem was solved, he notes, but issues continued to crop up. "It could have been the software, equipment or users," he says, "but we just had so many daily obstacles we decided to go back to the bar codes."

Still, Larkin considers himself a big believer in RFID, noting that the problem of random tag reads might not occur today because his plant has been reconfigured to create more separation between the assembly-line offload and warehouse facilities. He's open to trying RFID again, but would test it in a real-world setting first. "I do think we learned a lot," he says. "We learned what doesn't work, so that is a big win."

CREATING CUSTOMER SERVICE

A few years ago, Finnish furniture maker Martela, which manufactures products for offices and public interiors, began attaching passive UHF tags to items after they were delivered to customer sites. As a service to its customers, Martela offers to conduct inventory counts to help organizations comply with government auditing requirements or track assets for internal purposes, and RFID makes the process more efficient. Martela also uses the tags to quickly identify items that need to be replaced and fulfill those orders, as well as track the used pieces as they are either resold or sent out for dismantling and recycling.

Since then, Martela has updated operations and now can RFID-tag items at production sites, according to Berger at Vilant, which developed the solution. "The process is much easier," he says. "There is a lot of model variance—for instance, the same chair might come in several different colors—and now all that information can be integrated and linked to the tag from [Martela's] back-end factory systems right there." There also have been updates to the reporting service, so inventory reports can be automatically generated as PDF files for customers to review online on demand.

American Woodmark's Johnson sees an opportunity to improve customer service using RFID. The company would like to equip field-service personnel with USB RFID readers for their smartphones. The RFID tags would remain embedded inside cabinet doors, invisible to customers. If something went wrong—say, a solid wood center panel split—the customer rep could go to the site, read the tag, record the information in a smartphone application and immediately order a new door. This way, the rep wouldn't have to take measurements onsite and manually input data that could result in potentially ordering the wrong replacement door. "There's nothing more frustrating to customers than getting that door and not having it fit," Johnson says. He's waiting for more RFID chipset builders to accommodate USB RFID readers in a cost-efficient way and is hopeful that will happen this year.

Johnson also envisions harnessing RFID's power in other ways. If, for instance, American Woodmark were to get multiple reorders from customer service reps for doors to replace those with split panels, the company would have an RFID-enabled ePedigree to know when and where those doors were built. "For example," he says, "we measure and record moisture content in our plants. Without RFID, we don't know when or where these doors were built. But now, with RFID, we can see the entire ePedigree for each door, which could supply a born-on date along with dates for each subsequent process step, and correlate data on environmental and equipment status."

Today, RFID provides real-time visibility into the manufacturing floor, Johnson says. But, he adds, "we haven't even scratched the surface of the benefits RFID will provide. It's exciting to think about five years from now, and how we will still be developing applications off the backbone we built over the last several years."

Abaco's Ermlich says his customers have suggested ways to leverage the technology to improve processes. As furniture makers gain more experience working with the technology, he says, they have new insights into how to extend RFID's benefits.

"We haven't even scratched the surface of the benefits RFID will provide. It's exciting to think about five years from now, and how we will still be developing applications off the backbone we built over the last several years."

DAVID JOHNSON, AMERICAN WOODMARK

Making RFID deployments faster, cheaper and more reliable—and solutions more powerful.

BY BOB VIOLINO

IN THIS ISSUE: AEROSPACE · RETAIL · COLD CHAIN

An Active RFID Solution for Aerospace Companies

V-Tag can make it easy and cost-effective to track assets and work-in-process at large facilities.

A V-Tag fixed tag can be attached with Velcro and easily relocated to accommodate any revised factory floor arrangement.

A U.S. AEROSPACE company that makes specialty products for commercial and military aviation manufacturers worldwide, including Boeing and Lockheed Martin, had a problem. The company typically uses fixtures and tooling owned by customers and is required to account for them. Last year, it adopted the RFID V-Tag solution from ID Integration and InfinID Technologies to monitor some 3,000 to 4,000 tools at a 250,000-square-foot manufacturing plant.

V-Tag offers a complete solution that is designed for easy deployment, says Peter Ginkel, ID Integration's VP of marketing and business development. Items are identified with active V-Tag asset tags, which transmit 2.4 GHz signals over a proprietary air-interface protocol. The asset tags communicate with V-Tag fixed tags, which can be attached to ceilings, walls or pillars, and the location of each fixed tag is stored in AssetWorx! software, which is part of the V-Tag solution.

The tags on moving assets create a wireless mesh network that transmits location data to a gateway reader installed within the vicinity. The software displays an asset tag's location on a map of the facility, based on which fixed tags received the asset tag's signal and also on the signal's strength, as received by the fixed tags.

The aerospace company is RFID-tracking the location of jigs and fixtures used in the production of its products, Ginkel says. "Since customer-owned tools are valuable assets, they are subject to auditing by the customers," he explains. At any given time, the tooling can be located in the main storage area, on the shop floor in production, and in calibration or other

PHOTO: ID INTEGRATION

maintenance and rework locations, he says. "Accounting for the tooling makes the auditors happy, saves significant time and insures that the company maintains a high rating by their customer purchasing and financial departments," he adds.

Another company that provides maintenance, repair and operations (MRO) services to aircraft companies is using the V-Tag solution to monitor work-in process. The company needs flexibility to change its workflow for each customer. Factory production floors are frequently reconfigured to facilitate product flow and optimize production, Ginkel says. With V-Tag, fixed tags can be attached with Velcro, and easily relocated to accommodate any revised factory floor arrangement, he says.

While battery-operated tags typically cost more than passive tags, Ginkel says the V-Tag solution is cost-effective because it avoids the time and expense of setting up a passive infrastructure, which includes wiring, cabling and labor, as well as the involvement of plant engineering and safety departments. A V-Tag network can be installed at a large factory in just a few days, he says.

A V-Tag installation typically is priced at one-quarter to one-half of traditional passive tag installations, Ginkel says. "We are finding that budget money is more readily obtainable by nontraditional RFID customers," he says. "A full-blown passive network in a multihundred-thousand-square-foot factory is typically an impressive and intimidating expense. At customers we have worked with, it is unlikely they would have been able to secure the funding to install a passive RFID system."

The V-Tag battery has a three-year life, and InfinID is testing a six-year battery, says Gary Moe, ID Integration's president. "Our customers are fine with replacing batteries when looking at the cost savings and flexibility over a passive solution," he says. "The V-Tag reports back when the battery level is getting low, so

PRODUCT DEVELOPMENTS

PHOTO: ID INTEGRATION

A V-Tag asset tag, such as the one mounted in a case with kitted test instruments, can be moved within a monitored area and its position viewed on a map in the AssetWorx! software.

the customer knows when to replace a battery."

Still, it's often more economical to identify hand tools and other low-value items with passive tags. The AssetWorx! software can also accommodate input from passive RFID tags and bar-code scanners. "A simple passive gateway at the entrance to a tool crib can account for those passive tagged items," Ginkel says.

A cost/benefit analysis can determine whether a passive or active V-Tag solution is most appropriate, Ginkel says. "A factory with traditional assembly lines that constrain products to defined paths may not be optimal for active RFID technology," he says. "But in hybrid applications, the best properties of the different RFID technologies work together."

Paving a Path to Adoption for Retailers

Combining RFID with EAS provides a lower-cost way to trial item-level tracking to improve inventory management.

MANY DEPARTMENT STORE and specialty retailers employ electronic article surveillance (EAS) technology to help combat the theft of goods. Now, they're thinking of using RFID to address another big concern—poor inventory management. But they are wary of the migration path in terms of time and cost, says Uwe Sydon, senior VP of innovation at Checkpoint Systems.

The UNO labels, available in both rectangle and square form factors, are designed to meet packaging and marketing requirements for cosmetics and other products.

In October, Checkpoint introduced its UNO Series of labels, aimed at addressing those issues. "Both RF and RFID technologies are on the same substrate in a single tag," says Umesh Cooduvalli, Checkpoint's senior director for RFID consumables. "This reduces the tag implementation costs of using two different tags—EAS and RFID—and provides for a smooth transition to RFID for retailers." Our EAS customers, he adds, can continue to use their EAS infrastructure for loss prevention and begin to use RFID for inventory management.

Retailers would still need to purchase fixed or handheld readers, depending on their budgets, to interrogate the tags, Cooduvalli says. Any inventory-management software will work fine, he adds,

PHOTO: CHECKPOINT SYSTEMS

"but we prefer and suggest OAT software [OAT-Systems is a division of Checkpoint]."

The UNO Series incorporates Ucode 7 chips from NXP. The Ucode 7 is an ultrahigh-frequency RFID integrated circuit that increases read and write performance. In 2007, Checkpoint attempted the dual-technology approach with Evolve labels. With the UNO series, Cooduvalli says, Checkpoint has leveraged huge advancements in integrated chip technology to improve performance significantly.

The UNO labels are available in both rectangle and square form factors. They are designed to meet packaging and marketing requirements, Cooduvalli says. Some customers are using the product with a clear face sheet (instead of a paper face), so the label is less intrusive on packaging for cosmetics and other products, he says. In the health, beauty and cosmetics categories, each store typically has more than 350 stock-keeping units, he says, and roughly 30 percent of these, including small items, can use the UNO Series. But EAS labels do not work on metal.

Others, such as apparel retailers, use the paper-face sheet labels so they can print price information on the labels. "Some of them also convert them into fully integrated tickets and hangtags," Cooduvalli says.

The UNO Series is designed to support a variety of RFID reader frequencies, by providing greater broadband. This means that regardless of a product's point of manufacture or its destination location, the label will perform reliably, according to the company. "Different regions operate within different frequencies," Cooduvalli says. "Some tags are designed and tuned specifically to either Europe or the United States. But the UNO design is universal and provides optimal performance in both regions."

A health and beauty retailer that has been using Checkpoint's EAS system decided to adopt the UNO labels because "it was cheaper and faster to leverage [the solution] using the infrastructure they already have with hundreds of stores," Cooduvalli says. The retailer reports that accurate inventory visibility has enabled the company to cut its inventory counts and still improve out-of-stock metrics, he says.

PRODUCT DEVELOPMENTS

Mobile App Keeps Cold-Chain Customers Informed

DHL's LifeTrack solution for smartphones and tablets lets users track their shipments in real time and receive immediate alerts.

MONITORING THE CONDITION of temperature-sensitive pharmaceuticals, biomedical supplies and other life-sciences products while they are in transit or storage is essential. It ensures the safety and efficacy of products that can impact patients' health, and enables companies to meet government regulations.

DHL Global Forwarding, the air and ocean freight specialist of the Deutsche Post DHL Group, launched its LifeTrack solution in 2006, to track the location and condition of cargo as it travels through the supply chain. A dedicated DHL team monitors each shipment throughout every stage of transportation, says David Bang, global head of DHL Temperature Management Solutions and CEO of DHL's LifeConEx. "We are able to take direct action when a concern is highlighted," he adds, "including working with our ground personnel as well as partners such as airlines and truckers."

Today, more than 100 companies worldwide use LifeTrack to monitor their shipments, Bang

The LifeTrack Mobile App, which works with iOS and Android devices, provides easy access to real-time information.

PHOTO: DHL GLOBAL FORWARDING

says. The solution includes Web-based software, so companies can log in to a secure, cloud-based site and access real-time information on the status of their shipments. Should a major issue occur, customers get automated e-mail alerts, as well as notices of any interventions and shipment resolutions, he says. "For certain critical decisions, emergency contacts from customers get contacted, too," Bang adds.

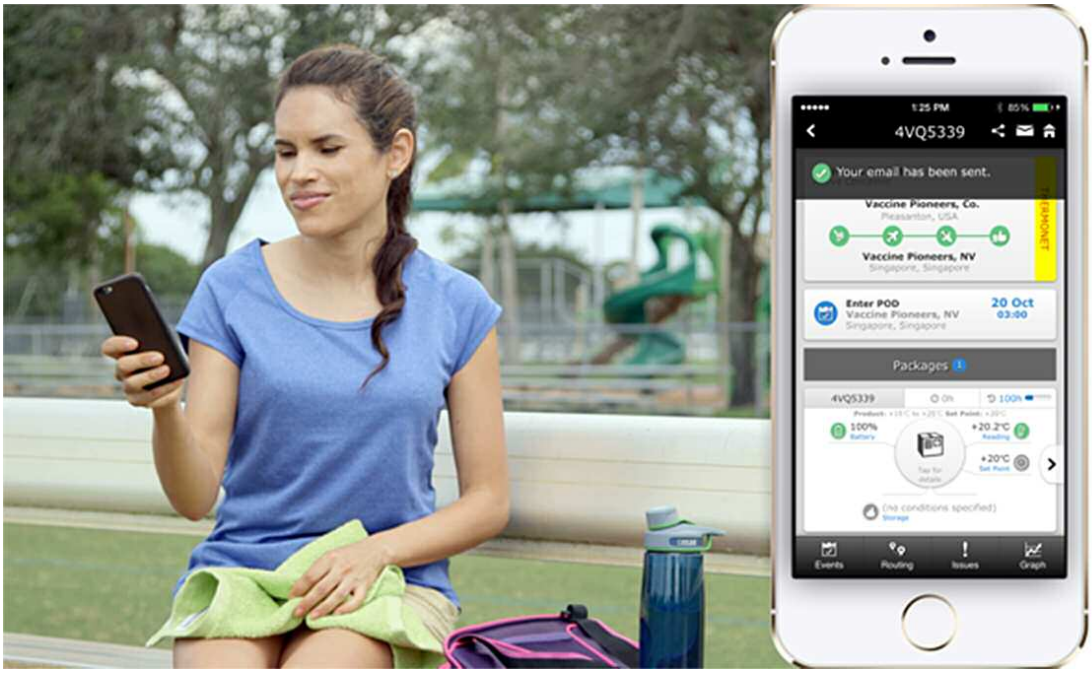
But like many businesspeople, DHL customers are often on the move—and on their mobile devices. So, in December, DHL introduced the LifeTrack Mobile App, which allows iOS and Android smartphone and tablet users to access the same capabilities from their mobile devices.

Customers who didn't have easy access to alerts now receive them immediately on their devices, Bang says. They can select or "favorite" a particular lane—the logistical path from the shipping origin to the final customer destination—and particular product cargo, and track all the logistical events that occur as the cargo moves through the chain. And they can contact DHL's support team 24/7 directly from the app.

The new mobile app is an extension of LifeTrack that customers have been asking for, Bang says. "A major driver for this comes from meeting customer needs," he says. Employees at health-care and pharmaceuticals companies wanted mobile access to provide greater flexibility in their lifestyle and work schedules.

DHL is still gathering data on how many customers are using the app. "However," Bang says, "some early customer feedback has been positive so far." A Swedish customer that is a leader in the area of HIV monitoring, for example, said: "From our company perspective, it is crucial that you get informed when there are issues [occurring], especially when transporting frozen goods." The customer cited the app's "issue-reporting" feature, because it easily distinguishes major from minor issues and provides clear status updates on resolution, Bang says.

Employees at health-care and pharmaceuticals companies wanted mobile access to provide greater flexibility in their lifestyle and work schedules.



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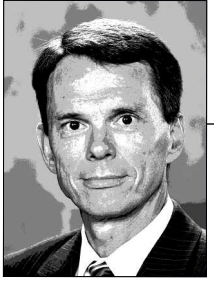

The Truth About High Inventory Accuracy

Process change—not magical thinking—will lead to increased sales.

Fact: Inventory accuracy does not increase sales.

Some retailers will find this statement shocking, and may even say I've been misleading them. But if you read any of my previous columns, you'll see I've never said increasing inventory accuracy results in increased sales. RFID increases inventory accuracy, from an average of 65 percent to more than 95 percent. And high inventory accuracy can lead to increased sales—but only if retailers use the data to improve their operations and processes. This is an important distinction, and it's key to the success of any RFID deployment.

Recently, several retailers have contacted the RFID Lab to report "issues" with their RFID proof-of-concepts (PoCs) or early pilots (which we did not work on). The issue in every case, it seems, was unmet expectations—specifically, the retailer had trialed RFID in one or more stores and, while inventory accuracy increased, sales did not.

A bit of forensics revealed the underlying problem. During each trial, the retailer used RFID to read the tagged items, and in each case, inventory accuracy increased to more than 95 percent. But all the retailers failed to act on this new information. Because of the limited nature of the PoC or pilot, the RFID data was not integrated into existing back-end systems to, for example, automate replenishment. That's typical with limited trials and not a major concern.

Even without integrating RFID data into back-end systems, the retailers could have used the inventory information to ensure items were on the shelves when customers wanted to buy them—but they didn't. One of the retailers had set a pre-PoC expectation to reduce shrink by 4 percent. When we asked what it had done to reduce shrink based on the RFID data, the company indicated it hadn't made any changes—it was hopeful simply having high inventory accuracy would lead to reduced shrink.

These mistakes could easily have been avoided by focusing on inventory accuracy as an enabler, not as an end result. Think of increased sales as money locked in a safe and inventory as the combination to the safe. Just knowing the combination doesn't get you the money; you must properly use the combination to open the safe. For retailers, this means using the RFID data to change store processes and improve store execution to increase sales.

Many retailers that use RFID for item-level tracking have increased sales. They now know what they have and where they have it, and they are acting on that data to improve in-store replenishment. They have also integrated their accurate inventory data into existing back-end systems, so they can reorder products more effectively. And they have complete visibility into products, so they can confidently offer customers an omnichannel shopping experience, increasing online sales and buy-online-pickup-in-store purchases.

High inventory accuracy, powered by RFID, is not some fairy dust that magically creates increased sales. But if used properly, it will lead retailers to the increased-sales promised land.

Bill Hardgrave is dean of Auburn University's Harbert College of Business and founder of the RFID Lab. He will address other RFID adoption and business case issues in this column. Send your questions to hardgrave@auburn.edu. Follow him on twitter at @bhardgrave.

ILLUSTRATION: ISTOCK PHOTO

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.

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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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By Ygal Bendavid and Harold Boeck

Hard vs. Soft Benefits

RFID health-care solutions can improve many operations and processes, but not all the gains will impact a hospital's bottom line.

In previous columns, we've discussed the importance of developing a solid business case to determine how to choose an RFID-enabled real-time location system and which use case to address first. We've also explained how to evaluate the different proposals you'll receive from RFID health-care providers. These proposals typically include the total cost of ownership, and when and how you'll get a return on your investment, based on the benefits you'll receive.

Now, we'd like to discuss the difference between hard and soft benefits. Hard benefits are those that will be converted into cash savings or additional revenues. Soft benefits will make your hospital run more smoothly and more efficiently, but they won't necessarily impact your bottom line. This is an important distinction, because many health-care providers tell potential clients they will see cost savings from soft benefits. Often, they back up this claim with various numbers and calculations. But while it's important to include soft benefits in your business case, you should not factor them into your ROI. Here's why.

Both RFID asset-tracking and replenishment solutions will deliver hard benefits, including a reduction in inventory. Both solutions will also provide soft benefits: They free up nurses' time, which is valuable. Nurses won't have to waste time searching for equipment or counting stock and requisitioning supplies.

Their freed-up time can be spent treating patients. But the few minutes saved every hour aren't likely to be directed into billable patient-care activities.

With improved inventory visibility, RFID providers might suggest you can optimize limited and valuable storage space. But in reality, a storage location won't be converted into a patient room that increases revenue.

Some soft benefits will result in cost savings, but there are too many variables to plug specific numbers into your business case. Real-time data, for example, will enable more informed decision-making, which, in turn, can improve operations. But how do you quantify the cost savings in advance?

Other solutions will deliver cost savings but not on a regular basis. RFID hand-hygiene solutions can increase hand-washing compliance and reduce health-care-associated infections. That can result in shorter patient stays and a faster hospital-bed turnover rate. But a reduction in HAIs from a hand-hygiene solution varies from hospital to hospital—and even within a hospital, from month to month. Similarly, tracking medical supplies can facilitate identifying specific items in the event of a recall. But a hospital will only see a cost savings if such an event occurs.

We do not underestimate the value of soft benefits. In addition to the benefits mentioned above, they can reduce work pressure on nurses, improve patient satisfaction and increase a hospital's reputation. But hospitals that make a distinction between hard and soft benefits will be able to develop a realistic business case that will result in a more accurate ROI—and deploy an RFID solution that meets their goals.

Ygal Bendavid and Harold Boeck are professors in the school of management at the Université du Québec à Montréal, and members of RFID Academia's research board.

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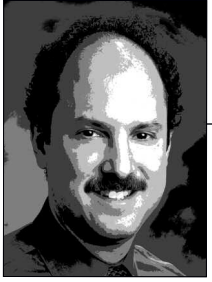


Software Interoperability Certifications

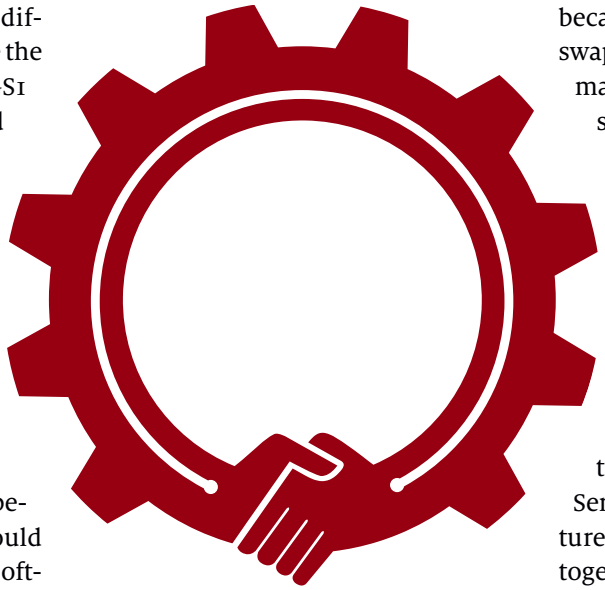
Independent tests would benefit both RFID end users and providers.

In 2006, GS1 began issuing certifications to RFID tag, reader and printer providers whose EPC Gen 2 products passed specific tests verifying their interoperability. This means end users can choose certified hardware from different vendors and have confidence the products will work together. The GS1 website lists more than 50 certified RFID tags, readers and printers.

Last month, GS1 released version 2.0 of the Interoperability Test Methodology for EPC-Compliant Gen 2 UHF RFID Devices, incorporating Gen2v2 enhancements. This led me to reflect on the sad fact that reader-to-software certification has not caught on the way tag-to-reader certification has.

Interoperability certification between readers and software would assure end users that any certified software application they deploy would work with any certified reader. They could choose the application that best meets their business requirements and the reader that is most cost-effective or best fits their site's physical configuration, and be confident they would work together.

GS1's Low-Level Reader Protocol, a standard interface that is the same regardless of vendor, was supposed to make this possible. A few reader and software vendors claim support for LLRP, and GS1 tried to launch an LLRP certification program in 2007. But no



reader or software vendor sought the certification, and the program was abandoned for lack of interest. That means when you want to purchase RFID software—either middleware or a complete software application that interfaces directly to RFID readers—it's not easy to know if it will work with your readers.

The website of a popular RFID software application, for example, says it offers "software that sets up in minutes." Key to this claim is the smooth integration of the software with the customer's chosen readers. The website says its product "is compatible with most fixed RFID readers that run LLRP." But note the word "most"—without adequate testing, the software vendor cannot be sure it will work with any reader that claims LLRP compliance.

Explore the website more carefully, and you'll find it lists only 13 specific readers that have been tested with the software. And only half of those readers use LLRP; the rest use the reader vendor's proprietary software interface.

Short compatibility lists are the norm. Some reader vendors avoid certification because it would enable end users to swap their readers with those from other manufacturers. And it's expensive for software companies to test their products with all the readers on the market.

Software interoperability testing can have benefits higher in the stack, too. GS1, for example, offers a certification test for the Application Level Events interface between RFID middleware and business applications, and for Electronic Product Code Information Services products, to ensure data-capture and traceability applications work together. These certification programs have met with somewhat more success. It's time for ALE, EPCIS and reader-to-software certifications to become standard practice in the industry.

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.

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