#### DEDICATED TO RADIO FREQUENCY IDENTIFICATION AND ITS BUSINESS APPLICATIONS



- VERTICAL FOCUS: NON-APPAREL RETAIL Department And Specialty Stores Tag And Track A Wide Range Of Items PAGE 28
- **PRODUCT DEVELOPMENTS** Passive UHF RFID Sensor Tags PAGE 36
- HEALTH-CARE BEAT The Benefits Of RFID Replenishment Solutions For Medical Supplies PAGE 47



# SMALL FIRMS EMBRACE DELTS

PAGE 18



Our virtual events and webinars are FREE to attend—but space is limited, so register early.

# **2016 VIRTUAL EVENTS AND WEBINARS**

- FEB RFID IN MANUFACTURING
- MAR RFID IN RETAIL AND APPAREL
- JUN RFID IN HARSH ENVIRONMENTS
- JUL RFID IN AVIATION/AEROSPACE
- AUG ENABLING THE INTERNET OF THINGS
- SEP RFID FOR WAREHOUSE AND INVENTORY MANAGEMENT
- OCT RFID IN FOOD INDUSTRY

#### FOR SPONSORSHIP INFORMATION, PLEASE CONTACT

Alan McIntosh: Senior Director of Sales, amcintosh@rfidjournal.com | (212) 584-9400 ext. 4

Matthew Singer: Senior Director of Sales, msinger@rfidjournal.com | (212) 584-9400 ext. 6



To register for these events and to view the most up-to-date calendar, visit:

## www.rfidjournalevents.com





Vol. 12, No. 6

Nov./Dec. 2015

EDITORIAL

Mark Roberti, Editor mroberti@rfidjournal.com

Andrea Linne, Executive Editor/Magazine alinne@rfidjournal.com

Paul Prince, Executive Editor/News pprince@rfidjournal.com

John Hull, Creative Director jhull@rfidjournal.com

Rich Handley, Managing Editor rhandley@rfidjournal.com

Beth Bacheldor, Senior Editor bbacheldor@rfidjournal.com

Claire Swedberg, Senior Editor cswedberg@rfidjournal.com

Edson Perin, Brasil Editor eperin@rfidjournal.com

Sam Greengard, Contributing Writer sam@greengard.com

Bob Violino, Contributing Writer bviolino@optonline.net

Rhea Wessel, Contributing Writer/Europe rwessel@rfidjournal.com

Jennifer Zaino, Contributing Writer jennyzaino@optonline.net

INTERNET OF THINGS JOURNAL

Mary Catherine O'Connor, Editor mc@iotjournal.com

#### **RFID JOURNAL EVENTS**

Kimberly A. Ray, VP of Events kray@rfidjournal.com

Cheryl Johnson Senior Director of Events Management cjohnson@rfidjournal.com

Debbie Hughes Senior Editorial Director of Events dhughes@rfidjournal.com

Deborah Lambert Editorial Coordinator of Events dlambert@rfidjournal.com

SALES

Alan McIntosh, Senior Director of Sales amcintosh@rfidjournal.com

Matt Singer, Senior Director of Sales msinger@rfidjournal.com

SUBSCRIPTIONS subscriptions@rfidjournal.com

ARTICLE REPRINTS customerservice@rfidjournal.com

RFID JOURNAL LLC Editorial office:

PO Box 5874 Hauppauge, NY 11788

Mark Roberti, Chief Executive mroberti@rfidjournal.com

Kathleen Knocker, Director of Finance kknocker@rfidjournal.com

Sonja Valenta, VP of Marketing svalenta@rfidjournal.com

Quedah Locket, Marketing Coordinator qlocket@rfidjournal.com

Lydia Sum, Administrative Assistant Isum@rfidjournal.com

Contents © 2015 RFID Journal LLC

# features

COVER STORY

12 RFID Asset-Tracking for Small Organizations

> Now is a good time for small businesses and nonprofits to use the technology to manage inventory and improve efficiencies. Here are the issues to consider for a successful deployment.

By Jennifer Zaino

VERTICAL FOCUS

20 Riding the Tails of Apparel Retailers Department and specialty retailers now see the value in RFID-tagging and tracking a wide range of items, including cosmetics, electronics, furniture, homeware, office products and sporting goods. By Jennifer Zaino

PRODUCT DEVELOPMENTS

32 Passive UHF RFID Sensor Tags Go Where No Sensors Have Gone Before Now it's easy and economical for companies to monitor the condition of their assets, products, buildings and machinery in any environment. By Bob Violino

#### columns

- **40 Tuned In** Why isn't everyone doing it? By Bill Hardgrave
- **43 Health Beat** RFID replenishment solutions for medical supplies. By Ygal Bendavid and Harold Boeck
- **45 Software Savvy** The right way to encode RFID

tags for consumer products. By Ken Traub

departments

5 Editor's Note A big idea for smaller companies.

- 6 Out in Front RFID blood sensors for the developing world; smart pills for authentication; a harmful pill to swallow.
  - 8 Perspective

Retailers' shifting priorities; divining the true state of RFID adoption in retail; consolidation in the RFID industry continues.



#### contents

# tune in online

#### **Find New Business Opportunities**

RFID providers now have a source where they can find companies worldwide that are actively seeking to deploy the technology. <u>RFID Requests for Proposals</u> is updated regularly, with new RFPs from companies in diverse industries. Each RFP includes detailed information, contacts and submission deadlines.

#### **RFIDJournal 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. RFID in Manufacturing, Feb. 9 RFID in Retail and Apparel, March 1 RFID in Harsh Environments, June 21





Find products that can help you deploy RFID successfully, such as Nedap Retail's <u>ID POS</u>, designed to read items at a point-of-sale station. It has a small, rugged casing that can be mounted under

the cash desk. The antenna reads only items on top of the reader; it ignores items below or next to the antenna, due to the built-in shielding.



**Cast your vote.** Each week, RFID JOURNAL takes the pulse of the RFID community. See what other people are thinking—and make your opinion count.



Most-Read Stories in November

• What Is the Read Range of a Passive

• Intel Unveils RFID System for Retailers

Wi-Fi-based RFID Tags, Software to

Extronics to Market AeroScout

• Lucky Brand Uses RFID-Enabled

Touchscreens to Provide Info,

Assistance to Shoppers

**Top 10 Search Terms** 

On RFIDJournal.com

1

3

4

6

7

8

9

2 Retail

RTLS

5 Library

NFC

Laundry

Cold chain

Security

Internet of Things

Supply chain

• What Are the Leading RFID

**Companies?** 

**RFID Tag?** 

Industrial Sector

#### The Inside Scoop

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



#### Ideas Exchange

RFID JOURNAL maintains an <u>Ask the Experts</u> 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 would I transfer data from a fixed RFID reader to a remote server?

- What determines the lifespan of an RFID tag or label?
- What is the importance of standardization?
- Has RFID been used to track children in an entertainment park environment?
- Are there any examples of RFID being used in the food-processing industry?

## **10TH ANNUAL**

# **RFID JOURNAL AWARDS** SHOWCASING THE BEST OF THE **RFID** INDUSTRY

#### BE RECOGNIZED FOR YOUR ACHIEVEMENTS AT THE 2016 RFID JOURNAL AWARDS.

The 10th annual **RFID Journal Awards** will recognize companies that have distinguished themselves by their successful use of radio frequency identification (RFID).

#### **DEADLINE:**

Submissions for all awards are due no later than midnight on **Jan. 29, 2016**.

#### **2016 CATEGORIES:**

- > Best Internet of Things Deployment
- > Best RFID Implementation
- Best Use of RFID to Enhance a Product or Service
- > Most Innovative Use of RFID
- > Best NFC Deployment
- > RFID Green Award
- > Best New Product
- > Special Achievement

An independent panel of judges will review all entries submitted and choose the winners. Awards will be presented at the 14th annual RFID Journal LIVE! conference and exhibition, being held on May 3-5, 2016, in Orlando, Fla., and will be featured in RFID Journal's digital magazine.

For more information about the RFID Journal Awards, or to submit an entry, please visit www.rfidjournalawards.com or e-mail awards@rfidjournal.com.





## About RFID Journal LIVE! 2016

RFID Journal LIVE! is the world's largest conference and exhibition, and the premier RFID event worldwide. With more than 150 speakers, 50 case studies and 200 leading RFID technology providers, LIVE! 2016 is the only event where you can get everything you need to put RFID to work today. Visit **www.rfidjournalevents.com/live** for more information.



# Learn How RFID Can Help Your Business WITH RFID ESSENTIALS WEB-BASED TRAINING

*RFID Journal's* **RFID ESSENTIALS** is an interactive, Web-based training course developed by top industry experts that puts you, the learner, in the driver's seat. Real-world applications requiring critical thinking help you understand how to use RFID to improve operating results. **RFID Essentials** can help your enterprise accelerate deployment by educating employees early in the planning process.

Professionals in IT, finance, operations and engineering can learn the basics of RFID, how to use the technology in operations—such as supply chain, asset tracking and access control—and how to find a return on investment.

#### IN THIS COURSE, YOU CAN:

- > Learn at your own pace, in lively, visual, interactive exercises
- > Complete all nine modules in about eight hours, or focus on the modules most relevant to your goals
- > Acquire knowledge that you can act on, to help your organization move forward

Find out why Fortune 500 companies, as well as the U.S. Transportation Command, have chosen RFID Essentials to get moving!

Try a 15-minute sample for free! For more information, visit www.rfidjournal.com/essentials.

# A Big Idea for Smaller Companies

WHEN I LAUNCHED RFID JOURNAL out of a spare bedroom in my home, in 2002, it was with a single mission: to help companies learn to use radio frequency identification technologies to track and manage literally everything. That mission was not limited by industry, geographic region or company size. I knew RFID could help

> just about all entities needing to identify, locate and

better manage their stuff. For most of the past decade and a half, the interest in RFID has come from large firms that need to

track numerous parts bins, jigs, tools, returnable transport items and other assets. But during the past year or two, that's begun to change. I've been getting frequent inquiries from smaller organizations that want to improve the way they track and manage items.

One reason small firms are considering RFID is they are hearing about success-

ful large deployments, such as those by Kohl's, Macy's, Target and other major retailers. News stories about using RFID to manage apparel and footwear and improve inventory accuracy shows RFID works. Another reason is small companies are always under competitive pressure, and they don't have large numbers of employees to locate and count assets.

As our cover story in this issue shows, the "stuff" small businesses and even nonprofits want to track ranges from watches in a repair shop to beds, computers and lawnmowers at a long-term care facility and files in a law firm (see RFID Asset-Tracking for Small Organizations). The story examines what it takes for small com-

panies to make the most of RFID and the solutions available in the marketplace today.

Dress for Success Worldwide, for example, is a nonprofit that provides women with professional attire and support to help them achieve economic independence. The South Central PA affiliate wanted to improve inventory management at its three locations and in its mobile unit. The organization deployed an RFID solution to improve efficiencies and better serve clients. Now, when donated items are received, they are tagged and the information is entered in a database so inventory can be shared among the nonprofit's sites.

Specialty retailers are also paying attention to those major retailer deployments. Sporting goods and health-and-beauty shops, for example, are adopting RFID to manage seasonal items and reduce theft (see Riding the Tails of Apparel Retailers). At the same time, department stores are expanding their RFID-tagging initiatives to home goods and other nonapparel items.

Thirteen years ago, I didn't think retailers would need to rely on RFID to lure shoppers to their stores (see Are Brick-and-Mortar Retailers Going the Way of Dinosaurs? Not So Fast!). And I didn't imagine the new world of omnichannel retailing that would compel companies to improve inventory accuracy in order to deliver an anytime, anywhere shopping experience to consumers (see Perspective). But it's gratifying to see that large and small firms alike now see the benefits of RFID-tracking their stuff-and that lower costs and improved technologies have made that possible.

Mark Roberti, Founder and Editor

# RFID Blood Sensors for the Developing World

A scientist for a nonprofit and a researcher at MIT have created a low-cost device that could free up health workers to care for patients.

DELIVERING HEALTH CARE to millions of people in the developing world, where resources are severely limited, is a challenge. Most hospitals and clinics are overcrowded and understaffed. Medical records are largely paper-based and easily lost. And blood tests required to diagnose anemia and other medical conditions are expensive and time-consuming, and the results are prone to misinterpretation.

Christina Swanson is senior scientist at Diagnostics For

and flows through microfluidic channels more quickly. Bhattacharyya developed a unique RFID transponder with a probe. When fluid flows through the assay into the probe, the impedance of the antenna changes, reducing the RF signal from the tag. By measuring how quickly the tag signal changes, the device can determine the number of red blood cells in the blood.

"These sensors can free up the worker using the test,"

All, a company whose mission is to make low-cost, efficient and transportable diagnostic devices available to resource-constrained populations. She knew the paper-based assays used to measure protein levels in blood hold great promise for widespread testing, but they also drawbacks-the have main one being they require a health-care worker to closely monitor reaction times and visually interpret the test results. Swanson realized that if the assay could be



Rahul Bhattacharyya and Christina Swanson with the prototype device.

Swanson says. "We can also link the ID of the RFID tag to a person and transmit that information to the doctor treating that patient. The blood test results are more accurate because there is no interpretation by a health-care worker."

The prototype device has proven the concept is viable, Bhattacharyya says. Lab tests show the results can automatically differentiate blood samples with red blood cell levels ranging from 20 percent to 50 percent, which is good enough

linked to an RFID transponder, the device could report the test results automatically, freeing up workers to greatly increase the number of people they could test in a given day.

Swanson contacted the Auto-ID Lab at the Massachusetts Institute of Technology, which has been working on passive ultrahigh-frequency RFID solutions for 15 years. There, she teamed up with Rahul Bhattacharyya, a research scientist who has been working on a variety of low-cost passive UHF RFID sensors, to develop an RFID-based anemia test.

Anemic blood has more plasma and fewer red blood cells than healthy blood. When tested with a paper-based assay Swanson designed, the anemic blood separates faster to discriminate between blood samples of anemic and nonanemic patients. The next step is to determine which tests are most needed in the developing world, and to develop assays that can test for more than a single blood component and report the results via RFID.

"What's most exciting about this work is that you can print most of the components, including the RFID antenna," Swanson says. "That will enable us to create very low-cost devices that can be stored at room temperature. They are paper so they are lightweight and won't cost much to ship. We think they can have a big impact on health care in areas where there are very limited resources." —*Mark Roberti* 

#### ANTICOUNTERFEITING

# Smart Pills for Authentication

Tiny RFID transponders embedded in individual pills could help reduce counterfeiting of high-price drugs.

L. Richard Carley, Carnegie Mellon

LIFESAVING PRESCRIPTION drugs can cost \$1,000 per pill, which makes them an extremely attractive target for counterfeiters. So are drugs such as Adderall (for treating attention deficit hyperactivity disorder), Cialis (for erectile dysfunction) and Tamiflu (for influenza). Researchers at Carnegie Mellon University may have a solution—a miniscule RFID transponder with an encrypted identifier



The measure are been with th

The researchers began with the idea of creating transponders that were no bigger than the chip itself (the antenna would reside on the chip). A team member who is an expert in hardware security proposed adding encryption to ensure tag data could be communicated securely. The team then decided a useful application would be embedding transponders in pharmaceutical pills to address the multibillion-dollar problem of counterfeiting.

The big challenge with little transponders is getting power to the chip. A small antenna can't harvest much energy from the reader, but the researchers found a novel solution to the problem. "We are using specialized MEMS [microelectromechanical systems] post-processing to greatly improve the antenna efficiency," says L. Richard Carley, ST Microelectronics Professor in Carnegie Mellon's department of electrical and computer engineering. "In addition, we expect to operate at a frequency above 40 GHz to improve the antenna power transfer efficiency."

The pills would be authenticated before being swallowed. The transponder is encased

in glass and is small enough to pass safely through the digestive tract. "We implemented security in much the same way as security for Web browsing is implemented—using the Advanced Encryption Standard," Carley says. "These medicines would not simply have a product code on the bottle each pill would literally have a key and a complete AES engine built into the RFID

tag, which is inserted into the pill."

The team is exploring simple schemes in which the RFID tag is powered up, the reader connects to a validating server, and the server provides a "challenge question." The tag uses its stored 128- or 256-bit key to generate an answer, and the server determines if that key was used in a pill made by that manufacturer. If so, the server would also provide information on the pill's fabrication date, lot number and so on.

"Since the challenge questions themselves would be randomly generated," Carley says, "a counterfeiter monitoring the communication between the tag and reader would not be able to create a device that would pass the authenticating server's test."

The researchers have received support from the university's Disruptive Health Technology Institute. They are developing a prototype chip with an antenna. "We expect to have test results from the prototype chips by next summer, if everything goes well," Carley says. If the results are good, pharmaceutical firms could be embedding the tags into their most expensive pills a few years after that. -M.R.



## A Harmful Pill to Swallow

Value of worldwide counterfeit drug market annually:

#### \$75 billion

Value of fake drugs confiscated by Chinese authorities in 2013:

## \$362 million

Number of illicit online pharmacies suspended by Interpol from 2010 to 2014:

## 57,000

Number of people who die annually due to fake malaria drugs:

## 200,000

Percentage of counterfeit medicines in the industrialized world:

#### less than 1%

Percentage of counterfeit medicines in developing countries:

10% to 30%

—Rich Handley

# perspective THE STORY BEHIND THE NEWS

#### RETAIL

# Retailers' Shifting Priorities

Changing customer behavior is forcing companies to address operational issues related to omnichannel retailing.



WARREN BUFFET famously said: "When the tide goes out, you can see who's been swimming naked." His point was that when there is an economic downturn, you can suddenly see the weaknesses in many businesses, which had been hidden by the growing economy. Similarly, shifting customer-purchasing behaviors are exposing some of the weaknesses in retail operations—not to Wall Street, necessarily, but to retailers themselves.

A company called Retail Systems Research (RSR) surveys retailers annually. It categorizes them as "winners" (companies outperforming others in the market) and "others" (laggards and companies between laggards and winners), and asks: "What are the top business challenges retailers face?" In 2012, 72 retailers, two-thirds based in the United States and 44 percent with sales of more than \$1 billion, responded as follows:

- Need for more consistent store execution/employee productivity (68% of "winners" and 33% of "others")
- Need to improve customer service while holding the line on

payroll costs (47% and 39%, respectively)

- Store managers lack information they need on the selling floor too much time spent in the back room (37% and 17%)
- Lost sales due to store out-of-stocks (32% and 11%)
- Customer dissatisfaction caused by lack of integration between the store and other selling channels (26% and 22%)

For this year's survey, conducted in October, RSR surveyed 91 retailers, 89 percent of them headquartered in the United States. Roughly one-quarter are focused on apparel retail, and another 31 percent are general merchandise retailers. The remaining 44 percent sell fast-moving consumer goods, food and health-care products (15 percent); hard goods, home décor or home-improvement products; automotive equipment (19 percent) or other goods (10 percent).

Asked about the top business challenges they face, here is how they responded:

- How we fulfill [orders] has changed due to cross-channel shopping (55% of "winners" and 47% of "others")
- Consumer demand has grown more unpredictable (52% and 43%, respectively)
- Pressure from competitors to achieve same-day fulfillment to consumers (48% and 52%)
- Competitive pressures drive us to create shorter customer orderto-delivery cycles (48% and 57%)
- Long supply chains and new product introduction cycles hamper responsiveness (48% and 40%)
- Uncertainty about variable supply-chain costs (29% and 27%)
- Digital channel growth outpaces store growth, putting new pressures on supply chain (19% and 35%)

Three years ago, most of the issues retailers faced related to store execution and internal problems (need to improve customer service, for example). Today, retailers feel challenged to meet the changing ways consumers shop and to compete with online retailers, which generally fulfill orders accurately and reliably. More people are buying online, and when they don't like an item, they either ship it back or return it to stores. That's created a reverse-logistics problem for retailers, which have to handle the large volume of returns. In addition, roughly 40 percent of retailers surveyed this year said their stores were not designed for current or projected volumes of omnichannel order fulfillment.

Retailers were asked which customer order-fulfillment processes are "very valuable." The responses show how important omnichannel retailing has become:

- In-store inventory pick for consumer in-store pickup (68% of "winners" and 41% of "others")
- Drop ship from vendor direct to store (68% and 47%, respectively)

• Ship to store from "direct" DC for consumer in-store pickup (65% and 47%)

- Same-day ship (61% and 51%)
- Direct to consumer fulfillment from our DC (61% and 51%)
- In-store reservation of inventory for consumer in-store purchase (58% and 41%)
- Same-day delivery (58% and 41%)
- Online visibility into in-store inventory (55% and 56%)
- In-store purchase of online inventory for shipment direct to consumer (52% and 49%)
- Store-to-store transfer for in-store pickup (48% and 34%)
- Drop ship from vendor direct to consumer (48% and 44%)
- Ship from store direct to consumer (45% and 42%) Most of these responses relate to omnichannel retailing.

All require a high level of inventory accuracy. It's no surprise, then, that respondents said enterprisewide inventory visibility would create the most value for retailers (65 percent



# A Staggering To-Do List

of winners agreed, as did 43 percent of others). Real-time updates to inventory transactional systems was seen as next most important (61 percent and 53 percent, respectively), followed by predictive analytics (58 percent and 32 percent).

Pressure from competitors has made retailers acutely aware of their lack of inventory visibility. In the 2015 survey, 74 percent of winners and 75 percent of others said they have inaccurate store inventory data. Roughly two-thirds of winners and three-fourths of others said they have too much inventory in stores, and slightly more than half of both groups said they have too many out-of-stocks in stores.

Retailers said they are moving toward real-time transactional systems and boosting returns management. Thirtyone percent said they are investing in enterprisewide inventory visibility and another 35 percent said they have budgeted for it (see "A Staggering To-Do List").

Yet, it's not clear what kind of inventory visibility they are investing in, because just 25 percent of the retailers said they are rolling out "auto-ID tagging" (that is, RFID tagging) and only 24 percent said they have budgeted for it. It seems retailers would like to deploy software at the enterprise level without fixing their inventory-accuracy problem. But dashboards or other systems that show inventory across stores and distribution centers will not solve the problem. Studies conducted by the RFID Lab at Auburn University show that inventory accuracy in most stores is only 65 percent.

Similarly, aggregating erroneous data isn't going to improve omnichannel execution. Thirty-one percent of respondents said they are rolling out distributed order management and 32 percent are rolling out sourcing algorithms for locating the optimal inventory for customer-order fulfillment. But how do you improve these operations if your inventory accuracy is poor?

It appears many retailers still don't understand that the only way to get accurate inventory is through RFID. Studies from the RFID Lab prove that item-level tagging can boost inventory accuracy to more than 95 percent.

While the RSR survey is not comprehensive, it does suggest that RFID adoption may not be as robust as some other surveys suggest (see "Divining the True State of RFID Adoption in Retail"). But it's likely retailers will learn they will never be able to meet customer demand via multiple channels without RFID-tagging items to improve their inventory accuracy, and then implementing these other systems. Expect RFID to rise on the priority list in the coming years. *—Mark Roberti* 

# Divining the True State of RFID Adoption in Retail

IN MARCH 2015, GSI US, the organization that developed the Electronic Product Code standards for passive ultrahigh-frequency radio frequency identification, issued a press release stating its 2014 GSI Standards Usage Survey revealed that 57 percent of U.S. retailers "are currently implementing RFID, and another 19.3 percent planned to implement RFID within the next 12 months." The release also said an additional 10.5 percent planned to implement RFID within 13 to 24 months. This means by the end of 2016, some 87 percent of all U.S. retailers are likely to have deployed an RFID system.

In October, Retail Systems Research (RSR) published its 2015 benchmark report "Retail Supply Chain Execution: New Requirements To Meet New Demand." The report focuses largely on retailers' opinions about supply-chain execution issues, such as the need to replenish closer to the point of demand and to change the way respondents fulfill orders based on cross-channel demand. But one chart indicates 25 percent of respondents have "implemented or are rolling out" item-level auto-ID tagging and another 24 percent have "budgeted or are evaluating" that technology.

In September, at RFID Journal's RFID in Retail and Apparel event, Bill Hardgrave said: "In 2015, about 50 percent of the top 100 retailers in the U.S. are using RFID in some respect." He based this on the retailers that have worked with the RFID Lab at Auburn University, which he heads, and on publicly available information. Of that 50 percent, he estimated half were conducting a proof of concept or pilot and another 46 percent were phasing in their deployment. Just 3 percent of the top 100 retailers are fully deployed, he said.

Taken together, this would suggest that retail is very close to reaching the tipping point at which the entire industry—or at least all retailers focused on apparel—will deploy RFID systems. But RFID Journal is skeptical. Our data—based on retailers signing up for RFID Journal newsletters, participating in our online retail seminars and attending our face-to-face retail events—suggests that, yes, the large retailers are getting serious about taking advantage of RFID. But we do not see nearly as much activity among the small and midsize chains.

As RFID Journal reported in March, the GSI survey focused

mainly on Global Trade Identification Numbers, electronic data interchange advance shipping and notices. The survey questions related to RFID use were sent only to the 177 respondents who indicated a familiarity with RFID. Most were apparel and footwear retailers and accounted for just 22 percent of all respondents. So the survey results indicate 87 percent of those already actively researching RFID solutions will deploy RFID by the end of 2016—not 87 percent of all retailers.

The RSR study comprised just 91 qualified retail respondents, roughly 54 percent of which have sales of

more than \$250 million. It's quite possible 25 percent of this group is rolling out an RFID system, but the survey sample is too small to draw any firm conclusions about the state of RFID adoption. Interestingly, the survey does point out the need for inventory visibility and omnichannel fulfillment, which is a big part of what RFID can deliver to retailers (see "Retailers' Shifting Priorities").

What's the real state of RFID adoption in retail, and when will we reach the tipping point? It's difficult to say, for several reasons. We don't know how many midsize and small retail chains are deploying RFID or running pilots. We don't know how many of the pilots will lead to rollouts (not all do, even when the pilot is successful). We don't know how long it will take for those already doing phased deployments to reach full deployment. And we don't know how long it will take for those just conducting pilots to begin phasing in a deployment and then reach full deployment.

RFID Journal believes the tipping point might be farther off than headlines based on recent surveys project. One reason is that the level of commitment to RFID projects varies among retailers. Some are aggressively deploying the technology. Others seem to be conducting proof of concepts or pilots merely to avoid falling too far behind competitors. Other projects seem to be a higher priority.

Another reason is that for the industry to reach a tipping

point, more items must be tagged at the source. The GS1 survey found that 78 percent of the retailers who were sent questions related to RFID indicated at least some of the goods they receive is tagged. More specifically, 20.4 percent reported 41 percent to 60 percent of their received goods are tagged, 18.6 percent said a total of 61 percent to 80 percent of their merchandise is tagged, and 8 percent said all goods are tagged. Conversely, 15 percent reported no tagged goods, and 7 percent said they didn't know. Those numbers are encouraging, but the responses are only from retailers that indicated

a familiarity with RFID. We suspect if the entire retail market were surveyed, the responses would be lower.

While we're not likely to see the tipping point within the next six months, RFID adoption is picking up in the retail apparel and nonapparel sectors (see Riding the Tails of Apparel Retailers). Each year, more retailers are realizing RFID is the answer to their inventory accuracy problem and is critical to their being able to carry out omnichannel selling. And as Hardgrave says in his Tuned In column, adapting to an omnichannel world is essential for survival. We encourage all retailers to begin exploring RFID as a solution to their inventory accuracy and store and supplychain execution issues, because if they wait until the industry reaches the tipping point, it will be too late. -M.R.





#### MERGERS

# Consolidation in the RFID Industry Continues

During the past three years, the RFID industry has undergone a steady wave of consolidation, with larger, more established companies often acquiring smaller RFIDfocused firms. In some cases, the acquisitions were aimed at building out complete product portfolios. Motorola Solutions, for example, began the recent spate of acquisitions when it purchased Psion, a maker of handheld RFID and bar-code readers, in June 2012. This gave Motorola, which had earlier acquired Symbol Technologies, a strong position in the market for handheld RFID and bar-code readers.

Honeywell, its chief competition in the bar-code industry,

responded by buying Intermec for \$600 million in 2012. Honeywell had earlier acquired the bar-code equipment maker Metrologic and added LXE, a maker of rugged RFID devices, in 2011. Grabbing Intermec gave Honeywell the size and strength to compete with Motorola in the auto-ID industry. Motorola subsequently split apart and sold its enterprise division, which included its RFID and bar-code equipment, to Zebra Technologies.

Some acquisitions were designed to add RFID capabilities to existing portfolios. Stanley Healthcare Solutions, for example, purchased AeroScout so it could offer AeroScout's Wi-Fi-based real-time location system to existing hospital customers. And in August 2013, Cardinal Health, the pharmaceutical distributor, purchased WaveMark's passive highfrequency tracking system, used to monitor inventories of implantable devices, drugs and other hospital consumables (bandages, gauze and so on). Cardinal offers IT and supplychain services to hospitals, so this was a way to bring RFID into its product mix.

RFID companies focused on the retail space have been making acquisitions to expand their product portfolio or their reach into new markets. The SML Group, a Hong Kongbased apparel branding company, purchased CGP Labels in 2012, to provide RFID labels for clothing. A year later, the company acquired Xterprise, which provided software to American Apparel and other retailers. These moves positioned SML as a company that could offer apparel manufacturers and retailers a complete solution.

In January 2015, Tyco Retail Solutions purchased Creative Systems, a European-based RFID solution provider that implemented one of the earliest item-level deployments, at a bookstore in Portugal (see <u>Portuguese Book Megastore</u> <u>Deploys Item-Level RFID System</u>). The move mainly enabled Tyco to compete more effectively in Europe.

A month later, the ITL Group, an international retail

apparel label solutions company owned by SA Bias Industries, announced it had acquired a majority shareholding in Canadian RFID software firm Overheer Systems, which also focused on the retail market. ITL said the acquisition was central to its larger strategy of offering retailers an end-to-end RFID solution. The company integrated Overheer Systems' cloud-based, item-level RFID application, Reflect RFID, into its existing LabelVantage IT online platform, which retailers can use to optimize their global supply chain.

Then, in April, r-pac International acquired Truecount's software. The apparel branding firm, which competes with SML, announced plans to create a new division, r-pac Retail Services. Its goal is to be a one-stop, single resource for retailers and the retail supply chain.

Retailers and apparel manufacturers should benefit from the ability to get all the RFID hardware, software and services they need from a single supplier. But previous acquisitions have often led to good companies being swallowed up and never heard from again, so it remains to be seen whether these acquisitions will turn out to be good for end users—and, in the case of public companies, shareholders as well. -M.R.

# **Major RFID Acquisitions Since 2012**

Stamey Realtricate Solutions Acquires wi-Fi-Dased RTLS	SATO Acquires Magenan Technology (Nov. 2013)		
Company AeroScout (June 2012)			
	Thinfilm Acquires Kovio (Jan. 2014)		
Notorola to Broaden Handheld Reader Portfolio With Psion			
Acquisition (June 2012)	Zebra Buys Motorola Solutions' Enterprise Business (Apr. 2014)		
SML Group Buys CGP Labels (July 2012)	Fujitsu Buys GlobeRanger, Bringing the Electronics Company		
	into the U.S. RFID Market (May 2014)		
Honeywell to Buy Intermec (Dec. 2012)			
	ORBCOMM Acquires InSync Software (Jan. 2015)		
ODIN, Acquired by Quake Global, Releases iPad-based			
Solution (Jan. 2013)	Tyco Retail Solutions Acquires Creativesystems (Jan. 2015)		
SML Group Buys Software Company Xterprise (June 2013)	ITL Acquires Majority Ownership of Overheer, Plans To Offer		
	Complete RFID Solution (Feb. 2015)		
Cardinal Health Aims to Bring Visibility to All Medical			
Products (Aug. 2013)	R-Pac International Acquires Truecount Software (Apr. 2015)		



WIN

**iPAD MINI!** 

# MAY 2016 3-5 2016 ORANGE COUNTY CONVENTION CENTER ORLANDO, FLA.



CELLOTAPE

Fil

CWART<sup>DD</sup>

Enable the inter

14<sup>TH</sup> ANNUAL CONFERENCE AND EXHIBITION

You'll find tags, readers and software designed specifically for Retail Manufacturing Energy Health care/Pharma Aerospace/Defense and many other industries

**REGISTER NOW TO SAVE UP TO \$500!** SAVE AN EXTRA 10% WITH CODE **SAAC**.

The RFID Journal LIVE! Exhibit Hall Is THE Place to See the Newest RFID and IoT Technology Innovations in Action



www.rfidjournalevents.com/live



# THE INDUSTRY'S LARGEST CONFERENCE PROGRAM HELPING COMPANIES TO TRACK AND MANAGE EVERYTHING IN THEIR BUSINESS



**REGISTER NOW TO SAVE UP TO \$500!** SAVE AN EXTRA 10% WITH CODE **SAAC**.



# MAY 2016 ORANGE COUNTY CONVENTION CENTER ORLANDO, FLA.



14<sup>TH</sup> ANNUAL CONFERENCE AND EXHIBITION

postconference workshops 50+ end-user case studies

RFID Institute certification training

f

co-located events: INTERNET OF THINGS CONFERENCE and IEEE RFID 2016

and so much more!

**#RFIDLIVE** 

in

www.rfidjournalevents.com/live



# RFID Asset Tracking for Small Organizations

Now is a good time for small businesses and nonprofits to use the technology to manage inventory and improve efficiencies. Here are the issues to consider for a successful deployment.

## **BY JENNIFER ZAINO**

RECENTLY, PEOPLE WHO WORK FOR SMALL COMPANIES and nonprofits have been asking RFID Journal: Can I use RFID to track my assets? Those assets range from office equipment to art in a gallery and files in a dentist's office. These potential users have read about large enterprises using RFID to cut costs and improve operations and want to know if they, too, can use the technology to manage their inventory and improve efficiencies. Some even ask: Can I buy some tags and a handheld reader and do it myself?

To find out, RFID Journal spoke with RFID providers and small organizations that are using the technology to track their assets. They



Dress for Success South Central PA is RFID-tagging and tracking items at the organization's three locations and in its mobile unit, to improve efficiencies and facilitate sharing among the organization's boutiques.



all say now is a good time for small companies to consider RFID for asset tracking, because costs have come down and the technology has improved. Most small businesses can use EPC Gen 2 passive ultrahigh-frequency RFID tags and portable reading devices.

Experts are quick to warn there are no shortcuts. Like any company deploying RFID, a small organization needs to develop a business case and examine processes. And many companies will need to hire outside help, at least to integrate the RFID data with their business applications and databases.

But despite the challenges, small companies that have deployed RFID asset-tracking solutions tout the benefits. Stoll & Co., for example, a small repair shop in Dayton, Ohio, is using a passive UHF RFID solution to manage the roughly 12,000 watches it handles monthly (see <u>Small Repair Business Streamlines</u> <u>Processes</u>). The solution, developed with systems integrator CDO Technologies, has improved productivity and customer service, says owner Ron Stoll. While Stoll says he can't recall how much money he has spent on RFID, he feels it doesn't matter: "Today, I couldn't imagine running our business without those little RFID chips." He suggests other small businesses contemplating an RFID deployment should not "look at what it costs to do these projects. Look at how much it can save you or how much more efficient it can make your business, and how it can allow your business to grow."

## ESTABLISH A BUSINESS CASE

Small businesses may have fewer assets to track than large companies do, but they also have fewer employees to do the job. "No one has time to really look for items," says Robert Zielinski, CDO Technologies' director of commercial marketing. RFID can speed up the process of collecting data about tagged items for inventory purposes, he says. It also can help save unnecessary spending on buying new equipment to replace inventory that is considered lost but may actually be on site somewhere.

Take, for example, the Ohio Department of Veterans Services, which operates two longterm care facilities for honorably discharged vets. To provide information for annual state audits, the organization needs to track some 4,000 assets, including beds, computers and lawnmowers, says Bob Day, fiscal officer and payroll administrator. It had been tracking these assets using bar codes and then manually recording the information in a database. Every year, an auditor and a facility staff member would walk the floors and grounds, trying to locate items on the list and then verify the information. "It was very cumbersome and laborintensive," Day says, with errors occurring annually, mostly because they were unable to find assets listed in the inventory database.

"We did some research into RFID a few years ago, but it was cost-prohibitive at the time," Day says. Since then, technology costs have declined, and the organization reconsidered ΡA

an RFID asset-tracking solution. CDO Technologies proposed a passive UHF RFID system, and Day calculated that an investment of less than \$100,000 would deliver a return.

The deployment, which went live earlier this year, will deliver long-term savings in the reduction of labor hours of existing staff and the elimination of at least one position, Day says. Now, in addition to conducting a full-fledged inventory annually, the Ohio Department of Veterans Service can check asset status quarterly, as well as randomly, and easily update any changes to ensure audit lists are accurate.

A few years ago, Ruth Koup, founder of Dress for Success South Central PA, also explored using RFID to manage inventory. The organization is a nonprofit affiliate of Dress for Success Worldwide, which provides women with professional attire and support to help them achieve economic independence. Koup wanted to track items at the organization's three locations and in its mobile unit, which together span six counties. "Each year on our annual audits, inventory was our biggest nemesis," she says. It took hours to reconcile common variances that happened when, for example, a volunteer manually recorded that a client had received a sweater when the item was listed in the inventory database as a jacket.

At the time, Dress for Success South Central PA depended on an in-kind model for access to RFID hardware and services, and the project fell apart when it encountered complications integrating RFID data with existing systems. But Koup's vision for using RFID didn't falter. Auditors recommended a bar-code solution to replace manual processes, but that wouldn't have helped locate items that had been moved around, such as items inadvertently misplaced by volunteers, and it would have required too much labor. So Koup spent the next couple of years working with IntermixIT, an IT consultancy in Harrisburg, Pa., to upgrade the organization's computer system so it could support a future RFID effort.

In 2013, Koup was ready to try RFID again, but this time she wanted to purchase hardware and services rather than depend on the in-kind model. "So the pitch to the board [to get RFID



funding] was that reconciliation for one audit To learn about RFID, students could cost \$45,000 in labor/volunteer hours, and if we had that to invest in RFID we could save time and money, meet auditing expectations and be more efficient, including being better at sharing inventory across locations," she says. The organization's York boutique, for instance, might receive a donation of 30 size 22 suits, and its Harrisburg site might not get any. With RFID, each site could tag items when they were received, and that information could be immediately available in the database for other locations to view and use to coordinate a share.

The pitch was also tied in to the launch of Tied to Success, which provides similar services as those for Dress for Success but for men transitioning from poverty or unemployment to employment. "It was a great opportunity because it was a smaller-volume program," Koup says, "and the boutique is right at the Harrisburg corporate office in a separate suite."

at Sinclair Community College decided to track gym equipment. They researched tags that worked under a variety of conditions, including on metal, submerged in water and on a scoreboard mounted on the gym wall.



The RFID initiative was approved and deployed in 2014. The organization worked with systems integrator Advanced Mobile Group, which provided planning, implementation and support services. It used the Avery Dennison UHF RFID tags left over from the first effort and Motorola Solutions handheld readers. Information about each donated item, such as size and color, is linked to its unique identification number and stored in a back-end database. When an item is given to a client, an employee or volunteer uses a handheld to read the item so it can be deleted from the database. The results? "In the 2014 audit, auditors for the men's program raved about how accurate it was and what a great solution it was," Koup says.

The organization's seven-person IT team could have taken on the asset-tracking project on its own, but "we would never be at the point where we are now as quickly."

#### -BOB DAY, OHIO DEPARTMENT OF VETERANS SERVICES

During the past year and a half, the organization has worked to fully RFID-enable its women's program. December 2015 will mark the first full audit based on the inventorymanagement solution. "We're crossing our fingers that it goes just as well [as the men's program audit]," Koup says, adding she has every expectation that it will.

Meanwhile, Dress for Success South Central PA is expanding the RFID solution, installing fixed readers at all boutique sites between the back rooms and store floors. Koup expects that automatically tracking the flow of items will add to the return on investment. "Nothing bothers me more," she says, "than to have to go out and solicit or purchase items, and a month later I find a whole slew of what I needed in the first place but couldn't locate at the time."

## CONSIDER YOUR RESOURCES

Small companies with small budgets may be hesitant to hire a systems integrator to develop and deploy an RFID solution. But most small companies are also short-staffed and don't have personnel who can invest the time into researching RFID technology and getting up to speed. It's important to consider your resources before deciding how to proceed.

"Tagging and tracking a few assets might seem simple, but there are always issues that occur in any implementation," says Steve Halliday, president of High Tech Aid and pres-

> ident of RAIN RFID. "The location of tags and readers can be a big issue from a physical point of view. Another area that can be an issue is the software that collects the RFID data and then interfaces with the user's back-end applications.

> "Even though a small system typically costs less than \$100,000—in some cases it has been around \$50,000—we have found that many businesses have problems with the cost of the application and yet expect it to be fully integrated into

their own system," Halliday says. "While some companies set out to implement RFID on their own, most need help from someone with experience. We still hear stories of companies that implemented RFID but saw no value from the implementation. In most cases, a good systems integrator can make sure the project expectations are set correctly and ensure the project is implemented properly and that it does provide the expected returns."

Day says the Ohio Department of Veterans Services' seven-person IT team could have taken on the asset-tracking project on its own, but "we would never be at the point where we are now as quickly." He relied on CDO to keep it from unnecessary spending that could easily have occurred if they'd tried to "reinvent the wheel." The organization followed CDO's tag recommendations—one tag for plastic devices,



# See the complete table of contents at www.rfidjournal.com/howtochoose

#### HOW TO CHOOSE THE RIGHT RFID SYSTEM ASTEP-BESTER GUDE PASSIVE LFI HFI UHF ACTIVE 433 MHZ 1900 MHZ 12,45 GHZ BATTERY-ASSISTED HF, UHF WI-FI ULTRA-WIDEBAND RUBEE IZIGBEE I SENSOR NETWORKS HYBRID SYSTEMSI CHIPLESS RFID

RFZD

**RFID ALTERNATIVES** 

# How to Choose the Right RFID Technology for Your Application

Choosing the proper radio frequency identification system for your application can be a difficult task. The editors of RFID Journal provide a guide to choosing the right system for your needs, and explain the pros and cons of different RFID solutions for different applications.

Save yourself hundreds of hours of research time with this new guide for just \$295, **or only \$195 with a new membership to RFID Journal.** 

www.rfidjournal.com/howtochoose



on-metal tags for metal equipment and tags that can withstand harsh environments for outdoor assets. CDO also developed software to interface with the RFID data collected with Alien Technology handheld readers and delivered to internal databases.

But the IT team will likely take on the next step of leveraging the RFID data in conjunction with its maintenance partner for a preventative maintenance program, Day says. "We can convert the data to Excel and generate reports around the age of each asset on a continual basis," he says, "so we can track when mainte-

"RFID still isn't generally about just buying some tags and pulling a reader out of the box for plug-andplay operations."

#### -APRIL CARPENTER, SINCLAIR COMMUNITY COLLEGE

nance is due or even when particular assets need to be replaced."

Suits to Careers, the umbrella organization that includes Dress for Success and Tied to Success, doesn't have any in-house IT staff, so it relied heavily on outside help to ensure its RFID project began—and continues—in the right direction, Koup says. Currently, for example, IntermixIT and Advanced Mobile Group are working together to fix some glitches in synching RFID data from the York location to the corporate database.

Koup is also depending on Advanced Mobile Group to take the RFID solution to the next step. "Right now, it is more of an inventory system, but we also are trying to scale this into what could be something like a point-of-sale system," she says. Clients don't pay for the items they receive, of course, but "we'd have a receipt to tell us everything that is going out the door and that is merged into our database more easily than we are doing it right now," she adds.

Koup believes the RFID model Suits to Careers has developed could, at some point, be offered as a hardware-software-in-a-box solution that other nonprofits could adopt. "They can have the fruits of our labor," she says. In fact, she adds, "142 Dress for Success affiliate locations in 20 different counties will eventually require an inventory control and PoS system as they grow to be the size we are now, serving 2,000 women and 200 men annually."

Even tech-savvy organizations sometimes need outside help. "RFID still isn't generally about just buying some tags and pulling a reader out of the box for plug-and-play operations," says April Carpenter, associate professor of management at Dayton's Sinclair

> Community College. Carpenter worked with students in the Supply Chain Management and RFID Certification Program, Paul Murphy, director of business services, Tim Borchers, manager of mail and logistics, and Travis Beetley, facilities manager, to develop an RFID solution to manage high-value items.

> The college wanted to track items that students in various pro-

grams—automotive, culinary, dental hygiene, nursing and unmanned aerial systems—take from shelves. In addition, it wanted to track facilities equipment that is often moved to other locations to be calibrated or cleaned. Borchers called a tag vendor and wasn't sure how to respond when the salesperson asked him which of its 3,000 different types of RFID tags he wanted to use.

To learn about RFID asset tracking, the Sinclair team decided to first track gym equipment, which doesn't change location much but offered a good testing ground for researching tags that worked under a variety of conditions, including on metal, submerged in water and on a scoreboard mounted on the gym wall. There's a lot of work involved in figuring out what to tag first, what type of tag to use to get the best read rates, where to put the tag on the assets, even the best place for someone using a handheld passive UHF reader in an area where assets are located to get the best read results, Carpenter says.

Contracting with a systems integrator to do all that up-front tryout work might have cost



# Get the latest RFID news from the most trusted source



The leading early adopters turn to RFID Journal to learn where the business benefits are and how to achieve them. In addition, all members get these exclusive benefits:



- ▶ *RFID Journal* digital magazine, published 6 times per year, which delivers the latest RFID products, innovations and news
- Access to members-only content on the RFID Journal website, including the industry's most extensive database of case studies, features and special reports
- > Timely e-mail newsletters with industry-specific news
- Discounts on RFID Journal events, training and educational seminars

## **Read What Our Members Say**

RFID Journal is the single source for knowing what is happening and discussing what potentially may happen next with RFID. RFID Journal stands alone. **—S. Fabes, Associate, Booz Allen Hamilton** 

A great publication focusing on the needs of the user. *—T. Coyle, Senior VP, Mark IV* 

Get all these great benefits for just \$149 per year THAT'S A SAVINGS OF \$40 OFF THE RETAIL PRICE OF \$189 – USE PROMO CODE DIGIT

DON'T MISS THE NEXT ISSUE—BECOME A MEMBER TODAY!

Join today: Call (631) 249-4960 or visit us online at www.rfidjournal.com/join

the school \$10,000 to \$20,000, Carpenter says. The college relied on CDO to develop the software to connect the data from RFID reads into other databases and provide guidance during the planning phase. "But they let our students do a lot of the grunt work themselves, which saved Sinclair a lot of money," she says.

The solution delivered a significant return on investment, Carpenter says. "With bar-code tags, it would probably take an hour or an hour and a half to match equipment IDs with a spreadsheet," she explains. "My students got to the point where they could walk into the gym with an Alien Technology handheld reader,

Salespeople use RFID to track the sample lines they show to retail clients. "We can say what is in the bag... and when it comes back in, we can check that we gave out these 300 pieces and got back these 300 pieces."

-ARI EBRAHIMOFF, B.I.G. JEWELRY

stand at the door, and within about one minute and twenty seconds get a count on all the tags. That's a huge time savings."

CDO will be writing software to link Sinclair's asset-management system to other databases the college maintains for asset lifecycle management, Carpenter says. But the college's IT staff will take it from there. "We have internal people who know enough about it that once we get the software integrations done, we can go to town," she says.

Plans for tracking more assets will be reviewed and considered for the next fiscal-year budget, Carpenter says. "We will have a new group of capstone students in January who can expand on the project started last spring by the other students," she says.

The services of programmers or systems integrators may be required when deployments move up the ladder, Zielinski says—perhaps, for example, tracking assets in real time using fixed readers. "A lot of that data may be being collected over a wireless network," he says. "Is the network beefy enough to handle that?"

## TOOLS FOR DO-IT-YOURSELFERS

B.I.G. Jewelry—whose business includes dropshipping jewelry orders for a couple of dozen online sites—is using U Grok It's UHF RFID solution to track sample lines salespeople take to

> their showings at retail clients. "We can now use RFID to say what is in the bag they are taking, and when it comes back in, we can check that we gave out these 300 pieces and got back these 300 pieces," says Ari Ebrahimoff, B.I.G. Jewelry's managing director. "And if something is missing we can identify it very quickly."

> The U Grok It solution is a handheld UHF reader that attaches to an Android or iOS smartphone or tablet to let users write to RFID tags and then read and search for those tags within a 6- to 25-foot range. The

company provides sources for buying RFID tags. The Discover Grok application can handle functions such as taking inventory and locating specific items, says Laura Sankey, VP of sales and marketing. "People just want to pick something up, press a button and start finding their stuff," she says. More than 300 organizations—in industries ranging from livestock to cannabis operations, health care, transportation, trash services, rental shops, retail stores and server management—are in some stage of testing or implementing U Grok It, she adds.

The Association Law Firm, in Orlando, Fla., which has roughly 25 employees, generates hundreds of thousands of collection, enforcement and other litigation and legal guidance files related to its representation of condos, homeowners' associations and timeshares. In March, the firm began using U Grok It to track



and manage all that material. It purchased 10,000 tags, and it took file clerk Ralph Eachus approximately a month to tag all existing files.

It was a pretty simple matter, Eachus says, requiring a seamless import of the file information the firm maintains in a database client and associated brief number, for example—to the Discover Grok app. Then, to identify each file, he found the file's corresponding entry in the Discover Grok app, pushed a button on the device to write a unique number to a tag, scanned the tag number into the system and attached the tag to the file.

Eachus discovered he needed to put some

space between each file and tag and the thousands of other tags near the device, to avoid confusing the system about which tag to associate with the file. There also were a few software glitches at first, which he worked out with the U Grok It team. Since a June update, he says, "It's been smooth sailing."

The law firm now has processes in place so any new files are tagged as soon as they are created. Whenever an employee needs a file, he or she can use the U Grok It device

with one of the firm's smartphones to scan for it in the immediate vicinity. "You're not going to turn it on and find a file across the office or in someone's briefcase in the hallway," Eachus says, "but for what we needed this is great, especially with it being very cost-effective."

Small contractor businesses—such as landscapers, restoration providers, and companies that provide equipment rentals and home medical device services—need to track assets as they move from warehouses to vehicles and job sites and back. To provide real-time inventory management, Invisi-Tag developed an RFID starter kit that includes a portable reader, an Android tablet, an enterprise inventory and checklist app, an enterprise cloud-reporting account, and 15 metal and 15 nonmetal tags. The company says it has more than 200 customers currently on the platform in different verticals.

"The contractor loads equipment and assets onto a vehicle, and our reader detects hundreds of pieces instantly and relays that information to the Invisi-Tag app on their mobile device," says Aminur Rahman, Invisi-Tag's senior engineer of electrical engineering. "If the item is detected, it turns green on the software's checklist, or it remains red if it's missing or they're leaving it behind." The outof-the-box solution, at \$3,000 to \$5,000, costs a fraction of what it costs to implement a custom RFID solution, he says. Its short-learning curve is another advantage, he says. Invisi-Tag helps users create a database of tags and trains customers' employees to use the app and apply the tags for the best read rates.

An employee can use a U Grok It device with one of the firm's smartphones to locate files in the immediate vicinity. "For what we needed, this is great, espeically with it being very cost-effective."

-RALPH EACHUS, THE ASSOCIATION LAW FIRM

"The statistic is that contractors lose up to 10 percent to 15 percent of equipment every year," Rahman says. "We help contractors bring that 10 to 15 percent back to their bottom line."

### BEYOND ASSET TRACKING

While a number of small organizations are excited about deploying RFID for asset tracking, CDO's Zielinski advises them to think about how they can use the RFID data and the visibility it provides to change their business. "Ultimately," he says, "their limitations may be in their processes, not the technology."

Systems integrators can help small companies get beyond the mindset of doing what they always have done or know how to do. That way, he adds, they can benefit from the businessimpactful intelligence RFID data provides.





# Riding the Tails Apparel Retailers

Department and specialty retailers now see the value in RFID-tagging and tracking a wide range of items, including cosmetics, electronics, furniture, homeware, office products and sporting goods.

**BY JENNIFER ZAINO** 

nyone following the radio frequency identification industry is likely aware that major retailers in Europe, North America and South America are embracing the technology to track and manage apparel and footwear, to improve inventory accuracy and provide customers with an omnichannel anytime, anywhere shopping

experience. "Apparel is a proven use case" for ultrahigh-frequency RFID, says Bill Hardgrave, dean of Auburn University's Harbert College of Business, founder of the RFID Research Center and retail columnist for RFID Journal magazine (see Tuned In). "We've done apparel long enough to know where the benefits are, and it's a relatively easy product to tag it's RF-friendly and not onerous to figure out where to put the tag."

> Less well known is the fact that department and specialty retailers are turning to RFID to manage nonapparel items—from cosmetics to furniture and sporting goods—and the benefits in these categories could prove more substantial. Hardgrave cites cosmetics, for example, as a very high-shrink item, much more so than many products in the apparel category. In fact, black mascara is the biggest headache, says a VP of loss prevention at a



"Some leading department stores want to get to 100 percent of their store inventory being tagged in the next few years."

#### **MELANIE NUCE, GS1 US**

major drugstore chain, who has discussed Checkpoint Systems' merchandise availability solutions with Su Doyle, head of that vendor's RFID industry programs. "It's a top 10 hightheft item in stores—small, easy to conceal and easy to resell on the gray market," Doyle says.

Some retailers have conducted pilots to track health and beauty items, as well as ink

cartridges and other office supplies. And more are considering it, Hardgrave says. "We have talked about some of those categories with retailers, and we will see retailers outside of what you may think of as apparel doing some interesting things with RFID," he says. "And once one or two larger retailers go, others will take notice and follow."

In another sector, sporting goods retailers that first began using RFID to manage seasonal items such as ski jackets and bathing suits-in which the need to keep the right assortment of products in stock for winter, spring, summer or fall activities is critical-are extending that mindset to sports equipment, because seasonality also drives inventory, Doyle says. Mammoth Outdoor Sports, in California, uses RFID technology to merge its Internet and retail store inventories, and to get a daily report showing which products are at its warehouse and stores or at exhibitions. Decathlon, a French sporting goods manufacturer and retailer with 700 stores in 18 countries, has also jumped on the RFID bandwagon.

Department stores that have had success RFID-tracking select apparel items now want to extend their deployments to more apparel categories—and to other merchandise. "Some leading department stores want to get to 100 percent of their store inventory being tagged in the next few years," says Melanie Nuce, VP of apparel and general merchandise at global supply-chain standards organization GS1 US.

Target, for example, announced earlier this year that it is adopting a companywide RFID item-level tagging program, to improve its inventory accuracy and enhance its ability to keep stores well stocked. The retailer has begun RFID-tagging select productsspecifically, men's basics and women's denim and swimwear-at stores in the Minneapolis area, according to a Target spokesperson. Beginning in the first quarter of 2016, Target plans to take the technology chainwide and expand it to include all women's ready-to-wear apparel, kids and baby apparel, and athletic wear-and soft home goods such as towels, linens and pillows. (The company has plans for additional category rollouts but doesn't have details to share yet.) "We're starting with these areas because guests love our style offerings, and because they are popular order pickup items [buy-online-pickup-in-store]," the spokesperson says.

U.K. retailer Marks & Spencer announced in May that it is expanding its use of RFID technology at most of its stores, from 80 percent of its general merchandise toward a goal of tagging 100 percent of goods within the next two years. The retailer sells everything from clothing to food, home goods and furniture. By next spring, M&S plans to tag the remainder of its homeware merchandise—including kitchenware, children's books and stuffed toys—and by the end of 2016, it aims to tag most beauty and cosmetics products.

#### THE RETAIL BUSINESS CASE

As in apparel retail, improving inventory accuracy is the foundation for many retail deployments (see Perspective on page 8). Building on that, and depending on the category, RFID can help solve other business problems. Shrink, for example, is a multibillion dollar problem for retailers globally. For some retailers and malls, the technology is helping to enhance the shopping experience (see "Are Brick-and-Mortar Retailers Going the Way of Dinosaurs? Not So Fast!" on page 32).

Cosmetics is a high-profit but hard-toinventory item for department stores, Doyle says. Checkpoint, she adds, is involved in active pilots to track beauty products with RFID for retailers in North America and Europe, though it's too early to name the stores or cosmetics companies.

The data collected from RFID-tagged cosmetics items can expose theft patterns when, for example, these products leave stores without being paid for, perhaps during a particular employee's work shift. With this



"Studies show that if someone comes in to a store to pick up an order, he or she is 40 percent to 45 percent more likely to buy other items as well."

#### SU DOYLE, CHECKPOINT SYSTEMS

information, retailers can take action to prevent loss. In addition, cosmetics are the kind of products that demand a store have what the consumer wants when she or he wants it. A shopper may be persuaded to buy her favorite style of jeans in a lighter or darker color, but the store is likely to miss a sale if it doesn't have her go-to lipstick or eye shadow.

In a drugstore or specialty health-andbeauty retail shop, many different lipsticks and other small cosmetics items are often displayed on pegboards, and it's easy for a stockperson to mistakenly load specific color slots with identically packaged items of similar colors. Store associates may assume a popular lipstick is well represented on the sales floor when it's actually running low. "The consumer comes in, thinks the store doesn't have their shade of red, and it becomes a lost sale," Hardgrave says. Tag these items, Doyle says, and the retailer "has a way to keep complex cosmetic SKUs in stock in densely packed merchandising displays." It also enables sales associates to help customers quickly find the exact item they want among so many look-alike containers, each with a wide variety of colors and shades.

For Target and many other retailers, RFID is key to providing an omnichannel shopping experience. Without the inventory accuracy RFID data can provide, retailers build in a buffer, Hardgrave says. They might, for example, have a business rule that says: If inventory at the store shows fewer than three items in stock, show it online as out of stock.

"They don't want to send you to the store and, when you get there, for it not to be there," Hardgrave says. "They conceal their inventory from the consumer." In the process, the retailer puts itself in the position of losing the sale

# Are Brick-and-Mortar Retailers Going the Way of Dinosaurs? Not So Fast!

AMERICANS PLAN TO DO almost half of their holiday shopping online this year, according to the National Retail Federation's Holiday Consumer Spending Survey, conducted in October. As brick-and-mortar retailers vie for consumers' attention, they are turning to RFID technologies to enhance the shopping experience.

Video game retailer GameStop, for example, has been trialing a Bluetooth Low Energy (BLE) beacon-based system at 36 stores in Austin, Texas, to engage real-world customers. Shoppers can hold their smartphones up to beacons to learn more about the products on display in a particular area, receive promotional discounts, read reviews and ratings, and view video game trailers. GameStop's long-term goal is to set up a technology-based engagement system throughout all stores, says Charlie Larkin, senior director of technology innovation. It may incorporate Near-Field Communication and other technologies, he says, so consumers can access data by tapping their smartphones near passive NFC RFID tags.

Last September, U.S. retail real-estate developer Simon began deploying a BLE beacon system at nearly 240 malls and shopping centers, to help merchants connect with their customers based on real-time data regarding each shopper's location at those sites. According to Business Insider's BI Intelligence research and information service, beacons are expected to directly influence more than \$4 billion worth of U.S. retail sales this year, and in 2016 the number will climb tenfold.

Appliance, car, furniture and other retailers that display big-ticket items in showrooms are also considering or deploying NFC and BLE beacon technology, to provide customers with the information they could access if they were shopping online. Before making a big purchase, consumers want to know: What other colors or materials does the product come in, and how do they look? Has the item been favorably reviewed by other buyers? What are the retailer's shipping, return and warranty policies?

Made.com, which began as an online furniture retailer, now has three showrooms in the United Kingdom. To remain relevant in the age of

e-commerce and to differentiate itself from traditional furniture retailers, Made.com is using CloudTags technology at all three stores, says Rebecca Ruddle, head of showrooms.

CloudTags' solution includes NFC RFID tags to attach to showroom items, BLE beacons and location-aware tablets for shoppers. "We prepackage everything to make it an exceptionally easy experience," says CloudTags CEO James Yancey. "Unless shoppers are completely loyal to a store and go there all the time, they mostly don't want to download their apps, and often they don't have enough technical knowledge to turn BLE or NFC on."

When a customer uses a retailer-provided tablet to tap on or near an item's NFC tag or comes within a couple of inches of it, content about the product—name, cost, available colors and so on—is sent from the retailer's system to the device. "The beacons are great so we know where the customer is standing and for how long, and we can show supportive messages about what they are interacting with," Yancey says. If, for instance, they remain in front of a sofa in a furniture showroom for 60 seconds, a window on the tablet can pop up showing top customer reviews about the item from the retailer's website, or an offer for 15 percent off shipping.

Made.com reports that the technology has had a considerable impact on sales—the average order value of customers who use the tablets is roughly 25 percent greater than those who don't. That's due largely to "the lovely e-mail they get after using the tablet showing items they tagged in the store that they can buy with two clicks on our website," Ruddle says. Customers can remain anonymous while exploring, or share their name and e-mail address with the retailer. The e-mails, Ruddle explains, help shoppers who were focused on the main purchase at the time—a sofa, for instance—recall that they also liked the rug that was paired with it in the showroom setting. The e-mail keeps them from forgetting those nice add-ons that increase order value, she says.

The CloudTag solution also frees up sales associates to help shoppers

to a competitor. "That's why we will see retailers—and the electronics sector is a great business case for this—forced to use RFID to really provide the omnichannel experience the consumer demands," he says.

"The use of buy-online-and-pickup-instores is huge," Hardgrave says, noting that electronics is one area in which it's really hitting home. Consumers want to research these products, especially higher-priced items, on the Web, buy them online, and still have the instant gratification of going to the store and getting them right away.

Retailers of all types of items are eager to raise their game against the mighty Amazon, which can deliver items in a day or even less. In addition, Doyle says, "studies show that if someone comes in to a store to pick up an order, he or she is 40 percent to 45 percent more likely to buy other items as well."



who aren't using the tablets. But, Ruddle says, shoppers like to use the tablets. When Made.com first trialed the solution at its Notting Hill, London, showroom, roughly a year and a half ago, approximately 15 percent of customers used the tablets. Today, customer usage at the showrooms is 42 percent.

If a customer buys a product online 15 to 30 days after opening a follow-up e-mail, most CloudTag clients give full or partial credit for the website purchase to the associate who helped the customer, Yancey says. That helps address a salesperson's worst nightmare—the in-store customer who says he or she isn't ready to make a decision after an associate spends a lot of time trying to close a deal. Getting this all to work well is "not as simple as just throwing beacons and tablets in the store," he points out. "You've got to figure out some way that everyone feels they are winning."

There are other business benefits, Ruddle says. By capturing cus-

tomers' e-mail addresses on the tablets, Made.com can attribute online sales to each showroom. And, she says, during her quarterly review of items on display in each showroom, it's very easy to make decisions about what to move in and out of the showrooms. "We get a top 10 list of each showroom's items and postcards that people tap, and we can refer to that to make informed decisions of each item we have on display," she explains.

Made.com is readying a trial with the tablets and beacons that could further impact revenue. It enables shoppers to view a sofa, chair or other item they're considering in a real-life buyer's home on their tablet. The application uses the company's Made Unboxed social platform, which enables customers to post pictures of their interiors featuring Made.com products and view others' designs for inspiration. "We'll see what the engagement rate is," Ruddle says, "and whether we can leverage this to really transform the experiences customers have in retail spaces." -J.Z.

#### **OVERCOMING RFID OBSTACLES**

Cost is no longer a significant concern when it comes to RFID-tagging items. Retailers are tagging socks, undergarments and other relatively low-margin items, Hardgrave points out, so cost shouldn't be prohibitive on products with healthy price points, such as electronics and sporting goods. "Cost only comes in when there's not a benefit," he says, and clearly there is a benefit with RFID.

But tagging pots and pans and other nonapparel items presents some challenges. M&S, for example, worked closely with Avery Dennison Retail Branding and Information Solutions to design EPC Gen 2 RFID tags in different sizes and shapes to accommodate a wide range of merchandise, including items containing non-RF-friendly metal or liquids. They developed to tag formats and 70 tag variations, and



Retailers are tagging socks, undergarments and other relatively low-margin items, so cost shouldn't be prohibitive on products with healthy price points, such as electronics and sporting goods.

#### **BILL HARDGRAVE, AUBURN UNIVERSITY**

accounted for cosmetics and other manufacturers' aesthetic requirements in the designs.

Checkpoint also has been working to address some of the unique tagging challenges for hard goods, Doyle says. Both its Slim and Whisper RFID labels for cosmetics categories come in very small form factors so they can be placed on tiny cases without obscuring the packaging and can be read at very short distances (as likely would be necessary for scanning products on pegboards). The Slim label can also be strategically placed over the edges of a box to make the box tamperproof.

It's critical to consider "what makes the tag readable and the product merchandisable," GSI's Nuce says. Tag placement can also be a concern when it comes to jewelry, as metal content makes it difficult to put a tag right up against the item but merchandising requirements typically dictate avoiding any type of trim (RFID tag, price tag or label of any sort) that would detract from product aesthetics. "The functional challenge with any technology deployment is how to satisfy all users," she says.

As retailers expand RFID into new product categories, they'll have to convince another tier of suppliers to tag items at the source. Target, for example, will work closely with its vendor partners as it rolls out RFID usage across categories, the spokesperson says. "We're asking that RFID tags be applied to items at the vendor/product manufacturer level," he says. "Most apparel vendors today order a tag to attach to products; with RFID, they will simply order an RFID-enabled tag."

Hardgrave doesn't think that will present too many concerns, though suppliers will likely want to know what reimbursements they might expect for incurring additional costs or what benefit they'll get. "Will the retailer share information with them to help them be a better partner, which results in better sales?" he says. "Those are universal conversations regardless of whether you are doing T-shirts or big-screen TVs."

Retailers also have a wide choice of RFID readers, including handhelds, fixed overhead and portal readers, and robotic systems. Today, brick-and-mortar stores are doing a lot of remodeling to provide customers with an engaging physical experience—something online retailers can't do, Doyle says. They want to make their environments more welcome and their stores more modern. "And if you're going to make a store look more modern, you might as well modernize the infrastructure to match," she says. "It's interesting how much store design is driving some of the investment in sensor technologies like RFID today."

So what's in store for department and specialty retailers? Some nonapparel retailers are piloting and deploying RFID, and GSI US expects adoption to continue next year, Nuce says. Hardgrave goes even further: "I expect some announcements of nonapparel categories from some retailers and a few nonapparel retailers."



# RETAIL APPAREL ROI CALCULATOR

ESTIMATE WHAT RFID CAN DO FOR YOUR BOTTOM LINE

Learn how to assess your potential return on investment (ROI) from employing RFID to track apparel, footwear and accessories in stores. This interactive spreadsheet comes with supporting notes that explain the assumptions in the calculator.

#### THE CALCULATOR ENABLES RETAIL FIRMS TO:

- > 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: www.rfidjournal.com/store/fashion-retail-roi-calculator



# Passive UHF RFID Sensor Tags Go Where No Sensors Have Gone Before

BY BOB VIOLINO

# Now it's easy and economical for companies to monitor the condition of their assets, products, buildings and machinery in any environment.

WANT TO KNOW the temperature of machine parts *before* they overheat and cause damage? Monitor water-intolerant assets without opening the container to check each one? Detect strain in concrete? Save water while increasing plant growth in greenhouses and crops in fields? Automate the time-consuming process of tracking tire pressure on aircraft?

Passive ultrahigh-frequency RFID sensor tags, introduced in the past few years, enable companies to monitor these and other conditions, because they are not hampered by the limitations of wired or battery-operated sensors. Wired sensors can be bulky and difficult to install and access. They require a power source and can't be used in remote environments. Active wireless sensors have batteries that must be changed on a regular basis, which can drive up costs and interrupt processes.

When manufacturing electric motors, for example, companies need to monitor the temperature of motor rotors to ensure they don't overheat and shut down. Embedding wired temperature sensors in rotors is not an option, because it would prevent the rotor from rotating,

says Mikel Choperena, product development manager at Farsens, which offers a variety of passive UHF RFID sensor tags. If a company uses active sensor tags to monitor rotors, he says, it must stop all production whenever a battery is low to take the sensor out and perform a battery change.

Passive on-metal temperature

To help make the International Space Station's Urine Processor Assembly more efficient, Phase IV Engineering designed a system to capture temperatures from a spinning drum.

NASA

PHOTO: N



tags, on the other hand, can be attached or soldered onto the motor rotor. RTEC's sensor tags, for example, can be as small as 5.5 millimeters (0.2 inch), says Drex Lee, marketing and sales executive for the company.

Smartrac's Sensor Tadpole, equipped with RFMicron's Magnus S2 integrated circuit, comes in 21.5 by 73.0 by 2.5 millimeters (0.8 by 2.9 by 0.1 inches) and its wet inlay format is easy to implement and works on difficult surfaces, such as metal parts in car chassis, says Christian Achenbach, a Smartrac spokesperson. "The size is thin and small, which is tailored to the demand of car manufacturers or other industries. where moisture detection is an essential part of quality control," he says. "The tag detects small amounts of water leakage inside vehicle compartments that can damage a car's electronics bays, cabins and trunks. Window seals, weather stripping and body seams are the primary causes of factory water leakage."

Passive UHF RFID sensor tags are also less expensive than wired and active options. Prices range from less than \$10 to more than \$200, depending on the type of sensor and features, such as high-temperature tolerance, rugged enclosures, number of sensors per tag and read range (more on that later). Load cells that monitor pressure, for example, are more expensive than other types of sensors, Choperena says. That means it's cost-efficient to monitor the moisture level of soil in large fields for realtime irrigation control. A Farsens RFID sensor tag used to monitor soil moisture costs €15.50 (\$16.87) for 500 units, Choperena says. "Most of our projects are R&D investments for our customers, and they want to keep everything confidential until they finish all developments," he notes.

"I was recently at a plant where they were using slip rings to connect wired sensors to rotating equipment," says Scott Dalgleish, CEO of Phase IV Engineering, which offers UHF sensor tags, as well as low-frequency, high-frequency and battery-assisted versions. "These slip rings can cost thousands of dollars, and they provide poor signal quality and are a high-maintenance item. With several \$89 UHF RFID temperature sensors, the temperature on the rotating equipment can be accurately monitored wirelessly and never needs to be maintained."

Providers of passive RFID sensor tags say companies in a wide range of industries are interested in monitoring the conditions of their assets, products, buildings and machinery, to reduce costs, boost production and improve safety. RFID sensor tags can monitor ambient light, humidity, moisture, pressure, proximity, resistance, strain, temperature, tilt, weight and voltage. To find an RFID sensor tag that meets

"With several \$89 UHF RFID temperature sensors, the temperature on the rotating equipment can be accurately monitored wirelessly and never needs to be maintained."

SCOTT DALGLEISH, PHASE IV ENGINEERING



Smartrac's Sensor DogBone (left) and Phase IV Engineering's on-metal tag are compatible with EPC Gen 2 RFID handheld readers.

your needs, see "Some Leading Providers of Passive UHF RFID Sensor Tags" on page 40.

#### WHAT YOU NEED TO KNOW

RFID sensor tags are versatile, Dalgleish says. "They can be mounted on high voltage, and they can monitor spinning things," he says. "All these things are possible because the sensor can be read wirelessly about every second and never wear out." Monitoring without interruptions to change batteries can mean huge cost avoidance, he adds. In an industrial application such as monitoring production equipment, an unexpected failure can cost hundreds of thousands of dollars.

In aerospace, passive sensor tags that measure pressure can monitor the inflation of airplane tires on a regular basis. Manual pressure checks can take roughly an hour to complete for a single aircraft, compared with a matter of seconds using sensor tags and a handheld RFID reader. Crane Aerospace & Electronics, for example, offers the SmartStem wireless tire-pressure monitoring system, which includes Phase IV Engineering passive sensor tags and readers.

In construction, two potential uses for passive sensors are monitoring deformation, and monitoring bending in pillars and beams used in tunnels, bridges and buildings. Customers are looking into using strain sensors to monitor deformation and accelerometers to monitor variation in structures over time, Choperena says.

Some sensor tags are designed for harsh environments. RTEC, for example, provides tags that can withstand high temperatures, Lee says. Other RTEC tags are waterproof, protected by industrial plastic material or embedded in metal casing.

Phase IV Engineering offers an in-pavement moisture-sensing tag that can be buried in asphalt, and a sensor tag designed for high-voltage bus bars that has a high-temperature plastic lid to withstand temperatures of more than 200 degrees Fahrenheit. "We are also encapsulating some of these sensors in special plastics for use in aerospace applications, where the fluids used, such as hydraulic and brake fluid, are highly abusive to materials," Dalgleish says.

For some applications, passive UHF RFID sensor tags do require maintenance. "Strain gauges [used to measure the strain on an object], for example, lose accuracy over time and need to be recalibrated," Choperena says. And, he adds, most chemical sensors have a limited life because they rely on chemical reactions. "When the sensor runs out of the required components to react to the targeted component, it will stop measuring," he explains.

Most UHF RFID passive sensor tags are compatible with EPC Gen 2 RFID handheld

"The size of the sensor tag and how it performs on metal is dependent on the antenna used. In general, the bigger the antenna, the longer the communication range."

**MIKEL CHOPERENA, FARSENS** 

readers. "UHF sensors have a read range of about 6 to 10 feet in open air and 3 to 6 feet when metal-mounted," Dalgleish says. The longer read range would enable an organization to monitor the temperature of high-voltage conductors, he says. HF, LF and Near-Field Communication sensor tags have read ranges of only a few inches.

The size of the sensor tag and how it performs on metal is dependent on the antenna used, Choperena says. "In general, the bigger the antenna, the longer the communication range," he says. "Different antennas can be designed, both smaller or bigger, without any problem at all regarding the size. The issue is the performance you need versus the size of the antenna."

The read range also depends on the output power of the handheld, says Charles Greene, chief operating and technical officer at Powercast, which co-developed passive sensor tags with Vanguard ID Systems.

Another consideration is whether any kind

# some leading providers of Passive UHF RFID Sensor Tags

COMPANY	PRODUCTS	WHAT THEY CAN SENSE	INDUSTRIES	KEY APPLICATIONS	SPECIAL FEATURES
<b>Farsens</b> farsens.com	Atlas, Cyclon, Fenix-Vortex, Hydro, Hygro- Fenix, Kineo, Shadow and Pyros	Ambient light, ambient and surface temperature, humidity, moisture, orientation, pressure and strain	Agriculture, construction, industrial manufacturing	Irrigation control in greenhouses and fields; monitoring the conditions of buildings and other structures, and rotors and other parts	Printed circuit board is available as a generic format for testing purposes; casings and antenna can be customized
Phase IV Engineering phaseivengr.com	UHF, HF and LF passive and battery-assisted RFID sensor tags	Moisture, pressure, proximity, strain, temperature, voltage and weight	Aerospace, agriculture, civil engineering, food processing, oil and gas, and power distribution	Monitoring aircraft tire temperature and pressure, and the conditions of rotating equipment and high- voltage components; inventory bin count	Ability to do precise sensing with low- level sensor signals; expertise with temperature extremes and harsh environments
<b>RTEC</b> rfrid.com	Sen Series Atom Magnus and Proton Magnus; RS Magnus printed circuit board-based tag	Humidity, moisture, proximity and temperature	Automotive, electronics, mining, oil and gas	Monitor water-intolerant assets; safety measures (determine whether screws or joints are tight) and preventive maintenance	Ceramic on-metal tags; can be customized to sense pressure
Smartrac smartrac-group.com	Sensor DogBone and Sensor Tadpole	Moisture	Automotive industrial environments, construction, energy and health care	Enhancing production control, quality control and maintenance	Users can set or adjust humidity measurement range based on the application; the IC is fixed on the UHF inlay
Powercast and Vanguard ID Systems powercastco.com vanguardid.com	High-Function RFID Sensor Tags	Temperature and tilt or angle	Food production, health care and pharamceuticals; logistics	Monitoring shipments of perishable items and high-value assets contained in packages, to ensure packages are not tilted	Can be customized to detect moisture, humidity and other conditions; supports read ranges up to 10 meters (33 feet)



# CUSTOMIZED MARKETING SOLUTIONS THAT GET <u>RESULTS!</u>

WHY SPEND ALL OF YOUR MARKETING DOLLARS ON A LARGE AGENCY, WHEN YOU CAN HAVE CREATIVE CAMPAIGNS DEVELOPED MORE EFFICIENTLY—AND AT A MUCH LOWER COST—BY INSIDERS IN THE RFID INDUSTRY?

## WE CAN HELP YOUR COMPANY:

Raise Brand Awareness Create a Product Launch Plan Increase Website Traffic

Generate Qualified Leads And so much more!

We help clients achieve REAL results while remaining focused on their ROI. Our expertise crosses all key marketing channels, including e-mail, Web, search, print, public relations, social media, events and telemarketing.

For more information, visit www.rfidjournal.com/marketing



of software is available with the sensor tags, and if so, what functions it provides. Phase IV Engineering, for example, offers "Reader Assistant" software, which runs on a Windows PC. It controls the readers the company provides with its sensor tags, and allows users to do a "read now" of the sensor or "read every x seconds," Dalgleish says. The data can be logged to an Excel file so users can verify the system is getting the readings they need.

"This allows new clients to try the system in a proof-of-concept mode before they do a full integration of the RFID system," Dalgleish says. "The software reports sensor identification number, sensor readings, number of reads, percentage of successful reads and other information that helps the user configure the system to get the data they need."

One drawback of passive UHF RFID sensor tags is they can't log data. The need for datalogging capability ultimately depends on a company's applications, requirements and environments, Lee says. "There are many that don't require data logging," he says.

#### **SPECIAL NEEDS**

Passive UHF RFID sensor tags can be customized to meet specific requirements. Vanguard ID Systems, for example, offers standard passive tags that are slightly larger than a credit card, but it can design custom-sized tags to meet customers' needs, says Alan Neves, global RFID account manager.

Some sensors can be adjusted to meet specific needs. "End users often have special requirements for sensors," Smartrac's Achenbach says. Based on the application, users can set or adjust the humidity measurement range on the Sensor DogBone moisture-sensing passive UHF tag.

"We have tuned our sensors' performance and sensitivity to be suitable for many [customer] applications," Achenbach says. "Sensor tuning is made by modifying antenna design, which also has an influence [on] read range. Antenna design determines if a sensor is very accurate and can recognize small changes in the environment or can measure large changes in the environment but be insensitive to small changes."

Still, some solutions require ingenuity. To help make the International Space Station's Urine Processor Assembly more efficient, Phase IV designed a system to capture temperatures from a spinning drum. It used an epoxy encapsulating material that could both mold the sensor tags to the surfaces of the drum, and protect the tags from the sulfuric acid and other chemicals added to the urine (see Solving NASA's Water Problem).

"Antenna design determines if a sensor is very accurate and can recognize small changes in the environment or can measure large changes in the environment but be insensitive to small changes."

CHRISTIAN ACHENBACH, SMARTRAC **POWERCAST** 

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.

## **UPDATED WITH NEW CASE STUDIES**

**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. Hear presentations from RFID Journal events, including:

- RFID in Health Care
- RFID in Energy
- RFID in Aerospace
- RFID in Manufacturing
- RFID in Retail and Apparel
- RFID in Supply Chain and Logistics



TO LEARN MORE, VISIT WWW.rfidjournal.com/dvds

# Why Isn't Everyone Doing It?

There are four main reasons some retailers have not adopted RFID, and they are all shortsighted.

By Bill Hardgrave



DURING the past decade, I have spent a lot of time with many retailers, providing information, insight and advice on the adoption and deployment of RFID. In the past year, the number of meetings and conference calls has accelerated.

Recently, a major U.S. retailer asked: If RFID works so well, why haven't more retailers adopted it?

This is an excellent question. First, I told him that adoption rates are probably higher than he thinks, because many retailers choose to stay quiet about their RFID activities. A recent GSI US study showed a 57 percent adoption rate among U.S. apparel retailers, which corresponds with the RFID Lab's estimate of at least 50 percent adoption.

There are four main reasons some retailers are sitting on the sidelines, and they are not unique to RFID adoption. We see them, or a variation of them, when it comes to adopting most new technologies.

*Company culture:* Some firms are innovators and early adopters. Others belong to the early majority or late majority, and then there are the laggards. RFID adoption is clearly following this technology-adoption curve, with adoption at the early majority stage. Some companies like to let the innovators explore things and then they follow quickly. The laggards wait until 90 percent or more adopt before they make the move.

Retail strategy: Some retailers have not yet determined how RFID supports their retail strategy. Lululemon is committed to delivering an unparalleled customer experience and has discovered how RFID helps meet this goal. A cogent strategy for all retailers is to use RFID to compete—or survive—in an omnichannel world. Macy's, for example, moved to omnichannel and then aggressively incorporated RFID to support this strategy. (Need help developing an omnichannel strategy? See <u>Omnichannel Retailing, Get Hip to BOPIS</u> and <u>Beyond Inventory Visibility.</u>)

Long-term versus short-term goals: Retailers must make a capital investment to properly deploy RFID. How much they invest depends on the size and scope of the project. We have seen payback periods of less than two years,

but the up-front capital expenditures can make a retailer's fiscal quarter in which the investment is made look bad. So, many retailers trade off long-term benefits for short-term profits.

Technology development: A retailer recently told me the company was "waiting for the technology to stop advancing." I have heard this before. It's an excuse that often means the organization fears buying some-

thing only to have it become obsolete in the near future. Others think "the technology may get better, so I should wait." I can assure you that the EPC Gen 2 UHF RFID standard being used in RFID retail deployments is well established. And if you are waiting for the technology to get better, you will always be waiting, because improvements in the technology are constant.

If you are an on-the-sidelines retailer, I encourage you to consider the reason(s) you have not adopted RFID and address them accordingly. I firmly believe retailers must adapt to an omnichannel world or they will not survive.



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:

# **CONNECT** WITH THE RFID COMMUNITY 365 DAYS A YEAR!

The most robust virtual community of RFID professionals CHECK IT OUT TODAY!

# > Product searches:

Find the right product to meet your needs.

## > Forums:

Post questions and have discussions with other business professionals.



#### > Blogs: Post your own blog, or

comment on

others

## > RFID Journal event daily planner:

>> And so much more!

Schedule meetings and plan your itinerary.

## JOIN MORE THAN 16,000 INDUSTRY PROFESSIONALS SET UP YOUR PROFILE TODAY—VISIT www.rfidconnect.com







SIGN UP FOR THE FREE IOT JOURNAL NEWSLETTER

THE NEW WEBSITE IS DEVOTED TO COVERING INTERNET OF THINGS TECHNOLOGIES, AND FEATURES THE SAME HIGH-QUALITY EDITORIAL COVERAGE AS RFID JOURNAL.

## IoT technologies are being adopted in a wide variety of areas, including:

**BUSINESS:** 

Efficiency

Automation Transportation

Supply Chain

**CONSUMER:** 

Smart Home

Devices

Health & Fitness

**Smart Vehicles** 

**TECHNOLOGY:** 

Software

Security

Standards

Sensors

www.iotjournal.com

IOT Journal is the place to turn to understand how Internet of Things technologies are being utilized, and how you can take advantage of them as well. The site's content includes in-depth feature stories, case studies, news articles and expert views.

# RFID Replenishment Solutions for Medical Supplies

Here's how to develop a business case for tracking high-value or low-cost items in hospitals. *By Ygal Bendavid and Harold Boeck* 



WITH MORE THAN 20 percent of a hospital's operating budget tied to logistics activities, it's no wonder hospitals are implementing RFID replenishment solutions for inventory management. These solutions can monitor highvalue medical supplies and surgical devices such as stents, valves and pacemakers, or lowcost items such as syringes, sponges and gloves. They also automate manual processes, enabling hospitals to reduce operating costs and improve efficiencies.

The first step to determine the return on investment from an RFID replenishment solution is to identify whether benefits will be recurring or nonrecurring. Time savings is often at the top of the recurring benefits list. It includes productivity gains from automating processes, such as counting stock and requisitioning supplies. Reducing or eliminating inventory shrinkage—the cost associated with expired products, for example—is also a recurring benefit. Providing traceability, which facilitates recall management for specific drugs and implantable devices, is another benefit.

An important nonrecurring benefit is inventory reduction. An RFID replenishment solution provides real-time visibility into the consumption of supplies. That means hospitals no longer have to stock excess inventory to ensure doctors or nurses have the supplies they need when they need them.

Next, identify which products you need to manage to determine the solution that best fits your needs. If you decide to monitor highvalue items, you'll want to evaluate cabinets with built-in RFID readers and antennas. Some cabinets are refrigerated for temperature-sensitive products. The cabinet will track who opened the door (nurses have RFID-

enabled badges), which RFIDtagged item was removed and at what time. The RFID reader transmits the tag's unique ID number to the hospital's inventory-management system. The item also can be associated with the procedure number to automate billing, if the cabinet is linked to the clinical management system. Another option is RFID-enabled smart shelves, which work in a similar way, but without controlled access.

For small, low-cost items, it's more economical to RFIDtag the bin in which the items

are stored instead of individual items. Many hospitals, for example, use a two-bin kanban system equipped with bar-code technology, which requires nurses to scan each item when it is removed. A more efficient method relies on RFID-tagged bins. When a bin is empty, a nurse simply removes the RFID tag and puts it on a panel that has a built-in reader.

As you develop your business case, keep in mind that an RFID replenishment solution frees nursing staff from spending valuable time monitoring inventory, thereby allowing for improved patient care.



JOURNAI

ILLUSTRATION

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.

# The Right Way to Encode RFID Tags for Consumer Products

Brand owners, retailers and solution providers must understand how to use the SGTIN standard.

By Ken Traub



RECENTLY, an IT executive from a sporting goods manufacturer told me his company was beginning to RFID-tag products in its own retail stores to improve inventory operations. The solution provider the company

was working with asked: "Do you want to encode the tag with text or hexadecimal?" The company had no idea how to answer, and asked me for help.

I told him neither option is good. The company should use a global standard: Serialized Global Trade Item Number (SGTIN). That's because brand owners and retailers worldwide have agreed to identify consumer products with EPC Gen 2 ultrahigh-frequency RFID tags and encode each with an SGTIN number.

The SGTIN is so widely accepted because it builds on the Universal Product Code (UPC) bar code that is on nearly all consumer goods and can be scanned by all point-of-sale systems. Retailers outside of North America use the European Article Number (EAN) bar code, which has one more digit than the UPC but is part of the same standard.

The GTIN number that is encoded into the UPC or EAN bar code distinguishes one product from another. All like items—say, Brand X 123 Skis—have the identical GTIN, but no two products anywhere in the world have the same GTIN. The SGTIN is a combination of the GTIN plus a unique serial number that distinguishes identical items from each other. This enables suppliers and retailers to use an RFID reader to manage inventory.

There is a specific way to encode an SGTIN into an RFID tag. This is defined by the GS1

EPC Tag Data Standard, which tells us how to map the digits of the SGTIN into specific locations within an RFID tag's memory. This mapping is called the SGTIN-96—a specific arrangement of 96 bits of tag memory. To learn how to set up your printer-encoder software, see <u>RFID-Labeling Apparel Items</u>; the method is the same for nonapparel retail items.

I explained to the IT executive that if the

company used either the text or hexadecimal option, no RFID system would know how to decode the tags. The solution provider would have to develop a custom system, and the company would be locked into a solution that was incompatible with all other RFID systems used in retail today.

Moreover, if the retailer carried merchandise from other

companies that was identified with RFID tags encoded with SGTINs, those tags would interfere with the custom system. Worse, other retailers might not want to carry his company's sporting goods, because the tags could interfere with their systems.

I'm shocked that, in 2015, with billions of SGTIN-96 tags being used in consumer retail every year, this solution provider seemed totally unaware of the widely accepted global industry standard. Don't make the same mistake. Before you hire a solution provider for an RFID retail project, be sure it uses and is well versed in the SGTIN-96 standard.



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.