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# RFID JOURNAL

www.rfidjournal.com May/June 2015


- **PERSPECTIVE**
  The State Of RFID Adoption PAGE 8
- **TUNED IN**
  Increasing Sales By Turning Local Inventory Into Global Inventory PAGE 44
- **HEALTH-CARE BEAT**
  How Hospitals Should Choose A Real-Time Location System PAGE 47


2015 RFID JOURNAL AWARDS

# Honoring The Best In RFID


**Interstate Batteries** PAGE 14

**Kuehne + Nagel** PAGE 18

**NASA Marshall Space Flight Center** PAGE 24

**Detroit Diesel** PAGE 30

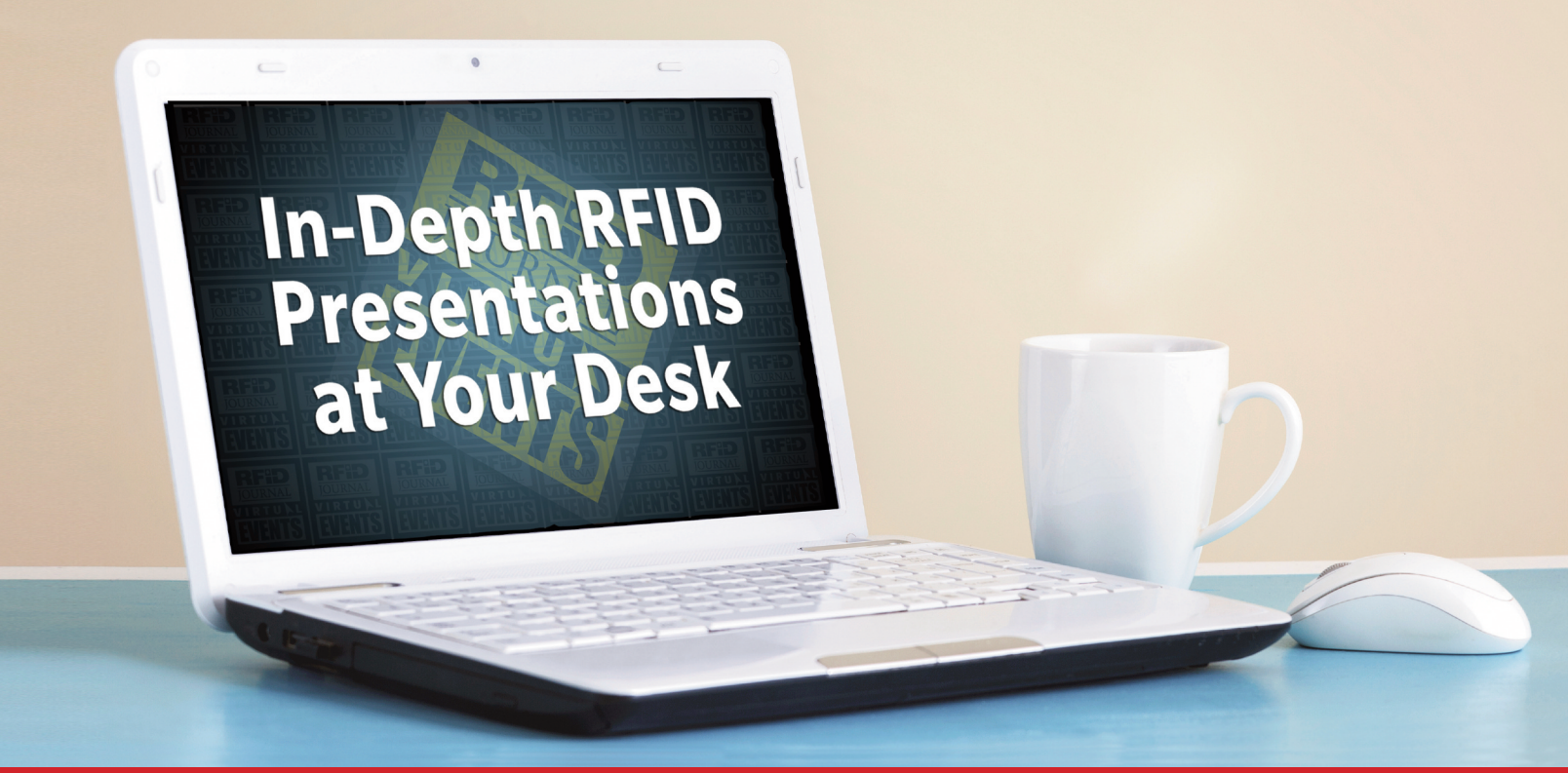
**Skoubee** PAGE 36

**Zebra Technologies** PAGE 40

**Carlo Nizam** PAGE 42


Carlo Nizam, Airbus

Special Achievement Award

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**RFID in Retail and Apparel**
June 17, 11:00 AM – 1:00 PM EDT
Deployment Guide Sponsor: Checkpoint

**Getting RFID to Mass Adoption: What Solution Providers Can Do to Grow the Market and Their Business**
June 23, 2:00 PM – 3:00 PM EDT

**RFID in Manufacturing**
July 15, 11:00 AM – 1:00 PM EDT
Platinum Sponsor: Omni-ID; Gold Sponsor: HID Global
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**RFID for Warehouse and Inventory Management**
Sept. 23, 11:00 AM – 1:00 PM EDT
Gold Sponsor: HID Global
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To register for these events and to view the most up-to-date calendar, visit:

www.rfidjournalevents.com

RFID JOURNAL

Vol. 12, No. 3 May/June 2015



## 2015 RFID Journal Awards

**14 RFID Helps Interstate Batteries Remain No. 1**
The 63-year-old company embraces new technology to manage inventory and keep its dealers well stocked. *By Jennifer Zaino*

**18 Kuehne + Nagel Monitors Pharmaceuticals to Improve Customer Service**
The global transportation and logistics firm turns to RFID to track the location and temperature of shipments. *By Samuel Greengard*

**24 Solving NASA's Water Problem**
RFID temperature sensors could make the International Space Station's Urine Processor Assembly more efficient, potentially saving millions of dollars annually. *By Michael Belfiore*

**30 Visualize This: Detroit Diesel Goes Green With RFID**
The engine maker replaced reams of paper with visual tags to reduce waste. *By Jill Gambon*

**36 NFC Tags on Collars Identify Lost Pets**
Skoubee developed a digital medal that can be read with a smartphone, making it easy to locate the owner of a missing dog or cat. *By Bob Violino*

**40 Zebra's Next-Gen Technology Powers Next-Gen Stats**
The National Football League adopted the Sports Solution to track players during games and training. *By Paul Prince*

**42 The Man Who Gave RFID Flight in Aerospace**
Carlo Nizam realized his vision to use the technology to improve efficiencies within Airbus and across the airplane maker's value chain. *By Mark Roberti*

## departments

**4 Editor's Note**
And the award goes to...

**6 Out in Front**
Spare the sensor, spoil the food; graphene antennas could reduce the cost of RFID tags; a hungry world.

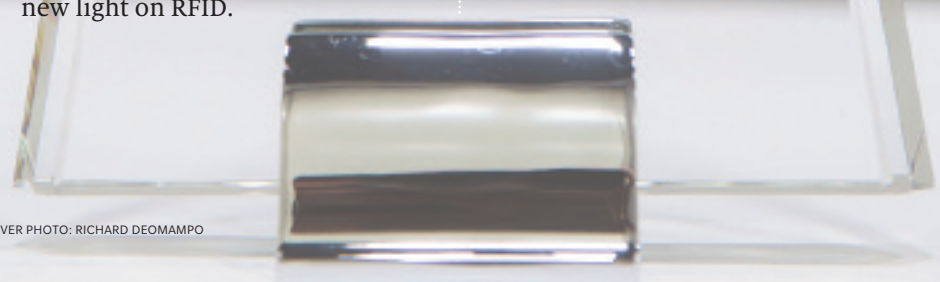
**8 Perspective**
LIVE! 2015 and the state of RFID; searching for meaning in Google's RFID statistics; academia sheds new light on RFID.

## columns

**44 Tuned In**
Shopping the planet.
*By Bill Hardgrave*

**47 Health Beat**
An RTLS self-exam.
*By Ygal Bendavid and Harold Boeck*

**49 Software Savvy**
Big RFID data software.
*By Ken Traub*



COVER PHOTO: RICHARD DEOMAMPO

# 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. RFID Requests for Proposals is updated regularly, with new RFPs from companies in diverse industries. Each RFP includes detailed information, contacts and submission deadlines.

## Coming Soon to RFIDJournal.com

RFID JOURNAL VIRTUAL EVENTS

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

RFID in Manufacturing, July 15
RFID for Warehouse & Inventory Management, Sept. 23

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Find products that can help you deploy RFID successfully, such as MWT Materials' RFID Isolation Curtains, which reduce interference so you can get an accurate inventory count. The thin, flexible, absorbent products are custom-manufactured to size requirements, and they can be waterproofed for outdoor use.

## Most-Read Stories in May

- Zebra's Sled Reader Enables UHF RFID Tag Reads Via Smartphone
- Brazil's Von Braun Labs Brings New Secure UHF Chip, Solutions to U.S.
- R-pac Releases EPC UHF Label for Spirits, Wine, Cosmetics
- Army Training Centers Enlist RFID to Help Track Uniforms
- RFID Delivers Location-Based Data at Helsinki Mall

## Top 10 Search Terms On RFIDJournal.com

1. NFC
2. Security
3. RTLS
4. Supply chain
5. Beacon
6. Airport
7. Automotive
8. Walmart
9. Library
10. Bill Hardgrave

## The Inside Scoop

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

## Ideas Exchange

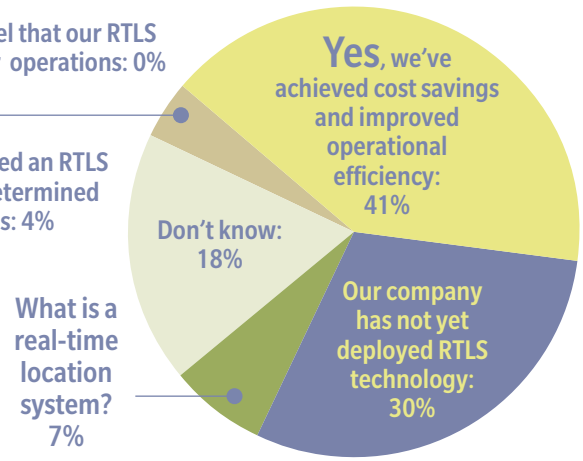
RFID Journal maintains an Ask the Experts forum, where you can submit questions about RFID technology and its applications. Your questions will be answered by RFID Journal editors or outside experts. Recent questions include:

- How can I provide security for RFID tags?
- Can museums and galleries use RFID to track the locations of loans onsite and offsite?
- What devices interfere with passive tags?
- How does backscatter modulation take place in RFID?
- Can RFID track lettuce?
- How can I connect an RFID reader to the Internet?

POLL RESULTS

## Does your company benefit from using a real-time location system (RTLS)?

**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.



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editor's note

# And the Award Goes to...

AT THE END OF the RFID Journal Awards ceremony at RFID Journal LIVE! in April, we gathered many of the winners and finalists on stage, where they held up their trophies and let out a cheer. It was a great moment. They were all proud of what they had accomplished for their companies and pleased to be recognized for their efforts.

I was thrilled to celebrate with them, of course, but for me, the awards are about more than the individual achievements or the successes of the RFID teams involved. RFID Journal recognizes these projects so other companies can learn from them.

Bruce Hellen, Interstate Batteries' director of business practices, gave a keynote address in which he discussed the deployment that won our Best RFID Implementation Award. After his presentation, an executive from a health-care company said he'd like to use Interstate as a model for inventory management in hospitals.

Kuehne + Nagel, winner for Best Use of RFID to Enhance a Product or Service, is using RFID sensors to monitor shipments of temperature-sensitive pharmaceuticals. The solution could benefit produce companies or makers of avionics and other temperature-sensitive products.

The RFID Green Award went to Detroit Diesel, for its use of visual RFID tags, which improve efficiencies and save more than seven million sheets of paper annually. The deployment could pave the way for other manufacturers to automate processes and eliminate paper documentation that winds up in landfills.

Similarly, various companies can learn from Skoubee, which developed a pet-tracking solu-

PHOTO: RICHARD DEOMAMPO


tion, how to use Near-Field Communication technology to enable customers to interact with products. And Zebra Technologies' "next-gen stats" solution has applications way beyond sports. Boeing is already using it in its airplane-painting hangars to prevent accidents.

So in my mind, the real winner is your company, because you can follow the path these leaders blazed to achieve greater efficiencies and profitability. You can read more about these projects on the following pages and view the finalists' and winners' presentations from our LIVE! event in our Video Library.

Mark Roberti, Founder and Editor

*From left to right:*
**Terry Sell,** Kuehne + Nagel
**Robert Hyden,** Detroit Diesel
**Scott Dalgleish,** Phase IV Engineering
**Carlo Nizam,** Airbus
**Mark Roberti,** RFID Journal
**Eric Petrosinelli,** Zebra Technologies
**Bruce Hellen,** Interstate Batteries
**Asim Siddiqui,** Age Steel
**Adam Seskin,** DirecTV
**David Wong,** Fukui Shell Nucleus Factory

AGRICULTURE

# Spare the Sensor, Spoil the Food

Finnish researchers have developed a passive RF sensor that can detect when food items have gone bad.

THE UNITED NATIONS Food Program estimates that roughly 50 percent of all the food produced in the world is never consumed. Much of it goes bad, in the supply chain, on grocery store shelves or in consumers' homes. Researchers at the VTT Technical Research Centre of Finland, a government-sponsored agency, are working on an early-warning system that could reduce waste by signaling when fresh food is beginning to spoil.

The VTT team—led by Himadri Sekhar Majumdar, an experimental physicist and senior scientist, and Thea Sipiläinen-Malm, a chemist and senior scientist—have developed a sensor that detects ethanol, which is emitted when fruits and other produce begin to spoil. The sensor is linked to a passive RFID transponder that can transmit information to a reader, which would pass it to a back-end system that could alert shippers or store managers to potential problems. The idea is to place the sensor in packaging. Majumdar, an expert in printed electronics, believes the sensor could be printed within the packaging in the future.

**Consumers could read the tag with an NFC-enabled smartphone to find out if the food they were about to buy was fresh.**

The team has worked on projects related to food spoilage in the past. The current research was carried out under the European Union's SusFoFlex project, which aims to foster the development of "smart and sustainable food packaging utilizing flexible printed intelligence and materials technologies." As part of the three-year project (2012 through 2014), 15 organizations from eight countries (Finland, Hungary, Ireland, Italy, Norway, Portugal, Turkey and Spain) developed packaging technologies aimed at improving the shelf life of fresh food.

The Finnish researchers linked their sensor to a passive Near-Field Communication tag. Since NFC is common in many smartphones, consumers could read the tag to find out if the food they were about to buy was fresh. But Majumdar told RFID Journal the sensor could also be linked to an active or passive ultrahigh-frequency tag.

The sensor can only indicate the absence or presence of ethanol above a certain threshold, which indicates the food is spoiled. The research team is working on a method to identify the level of ethanol in the package, so food that is just beginning to spoil could be consumed before it goes bad.

Researchers at Johns Hopkins University and MIT are also researching methods to detect spoilage through smart packaging. Majumdar declined to detail how the VTT approach is different, citing the need to patent its approach. The team hopes to commercialize the technology, but Majumdar believes for it to be truly viable, tag prices must come down.

"The biggest obstacle of using RFID tags on a product level is the price," Majumdar says. "Once the tags are cheap enough, there will be demand from the companies to use such technologies. This is one reason we would like to use printed technologies for manufacturing such tags, so we can push the price down further by using high-volume, high-speed production processes." —*Mark Roberti*

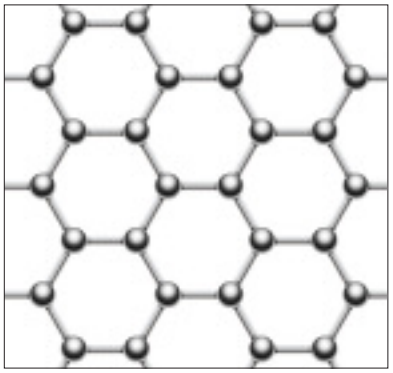
PHOTO: ISTOCKPHOTO

TECHNOLOGY

# Graphene Antennas Could Reduce the Cost of RFID Tags

U.K. researchers have developed a low-cost antenna that performs about as well as metal ones used in today's RFID tags.

ONE KEY WAY TO REDUCE the cost of passive ultrahigh-frequency RFID transponders is to reduce the cost of the antenna. Companies have tried printing antennas, but the cost is often just as high as the cost of metal antennas, or the performance isn't as good. Researchers at the University of Manchester may have achieved a breakthrough using something called graphene, a carbon material that is similar to graphite but with a different molecular structure.



Graphene's molecular structure

Xianjun Huang, an electrical engineering student at the university, and some of his colleagues were doing research into low-cost means of enabling wearable electronic devices, wireless sensors and RFID tags. Metallic inks have been used to create antennas, but the silver used in inks can be expensive and some countries have banned them from landfills.

Huang and his colleagues looked at graphene inks—graphene is a carbon-based material that is conductive. The problem with graphene inks has been that binders used to create the ink reduce conductivity. Heating the inks to temperatures of 250 degrees Celsius (482 degrees Fahrenheit) or more for 30 minutes can remove the binder and improve conductivity, but the high heat damages common RFID tag substrates (paper and plastic) and increases production cost. Binder-free graphene inks, which can be made at lower temperatures, do not conduct electricity well enough to create an RFID tag with the read range most users require.

The team mixed graphene nanoflakes, dispersants and solvents, but no binders. The result was a porous graphene film. They then used a roller to compress the film, creating a smooth, nonporous antenna. The antenna's conductivity was 50 times greater than the film's before compression.

"The rolling compression makes the porous graphene ink coating highly dense to form graphene laminate," Huang explains. "The contact resistance is significantly reduced, which improves conductivity a lot."

The conductivity of the graphene ink is slightly lower than that of inks with silver or copper nanoparticles, Huang explains. "However," he says, "the graphene ink is much cheaper and the process is much simpler and more cost-effective. It suits mass production well."

Compressed graphene laminate antennas do not require high-temperature annealing and can be printed onto paper or plastic substrates. The researchers have patented the technique and are looking at ways to commercialize the technology.

How much cheaper would graphene antennas be over current metal or metallic ink antennas? "Much cheaper," Huang says. "That's all we can say at this stage. Our goal is to make them cheap enough for itemization identification." *—M.R.*

ILLUSTRATION: ISTOCKPHOTO

PHOTO: ISTOCKPHOTO

## A Hungry World

Predicted total world population by 2030:
**8.3 billion**

Number of undernourished people worldwide anticipated in 2030:
**610 million**

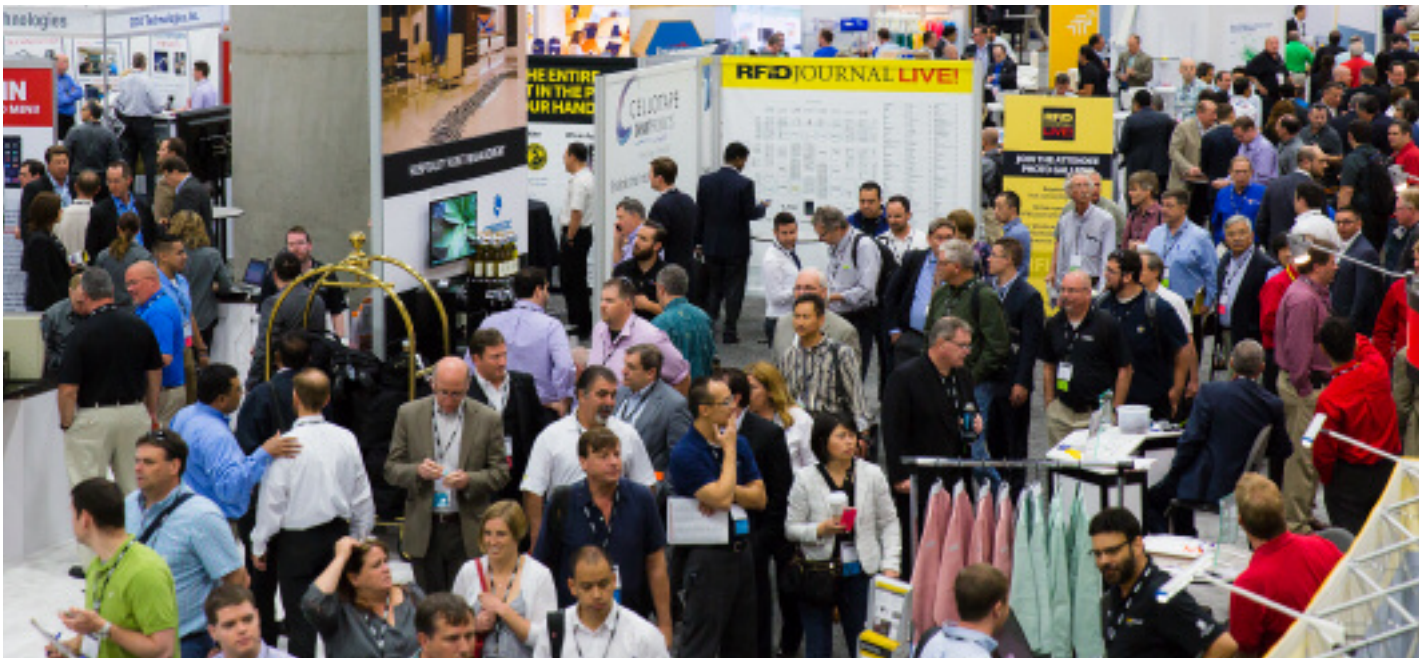
Amount of East Asia's projected 2030 food demand likely to be met:
**67 percent**

Amount of India's projected 2030 food demand likely to be met:
**59 percent**

Amount of Sub-Saharan Africa's projected 2030 food demand likely to be met:
**15 percent**

Amount of increased food production required to meet the needs of predicted 2030 world population:
**50 percent**

*—Rich Handley*




ADOPTION

# LIVE! 2015 and the State of RFID

## The technology has matured and is starting to gain traction. But progress remains slow—at least for now.

SINCE THE first RFID Journal LIVE! conference and exhibition in 2003, the event has been a barometer of the state of the radio frequency identification industry. The number and makeup of attendees, including end users and exhibitors, at LIVE!—the world's largest trade show focused on RFID technology—has indicated how the industry is faring.

In 2008, for example, the technology was gaining traction despite the fact that few retailers embraced Walmart's approach of tagging pallets and cases. Attendance that year jumped to 3,000 from roughly 2,500 a year earlier. Then came the financial collapse in September 2008, and attendance the following year fell to 2,400 people, as many companies put new technology projects on hold.

Analysis of attendance at LIVE! 2015 suggests the industry is beginning to regain the traction last seen in 2008. From 2009 to 2012, attendance remained flat, at around 2,500 attendees, as companies struggled to recover from the recession. Lawsuits aimed at users of passive ultrahigh-frequency technology also led companies to take a wait-and-see approach.

Attendance picked up slightly in 2013 and a little more in 2014. This year, overall attendance rose by 8 percent to just more than 3,000 attendees, a sign that interest in deploying the technology is picking up. Paid attendance, which includes end users, systems integrators and resellers, picked up by 10 percent from last year.

Moreover, more attendees purchased comprehensive conference passes, as opposed to exhibit hall-only passes, indicating strong interest in learning how to deploy RFID systems. The number of companies that sent more than one person to the event rose 34 percent over last year, again indicating strong interest in deploying RFID. Half of attendees were from companies with more than 1,000 employees, indicating large companies with complex operations are most interested in the technology.

PHOTO: RFID JOURNAL

Attendees hailed from 60 nations, the most ever for a LIVE! event. In 2014, attendees came from 53 countries, and in the previous five years the average was 42 countries. This suggests end users worldwide are seeing RFID as a solution to some of their business problems. There were many attendees from the industries typically seen at LIVE!—including retail, manufacturing, energy and logistics—but there were more from marketing firms and entertainment companies this year, indicating adoption is expanding to new sectors.

Adoption is clearly on the upswing in retail, where it is gaining the most traction among department stores. Most leading department store chains—including Dillard's, J.C. Penney, Kohl's, Macy's, Nieman Marcus, Nordstrom, Saks Fifth Avenue and Target—sent representatives. Several overseas department stores attended as well, as did a number of apparel and footwear suppliers and specialty retailers.

More bar-code resellers, systems integrators and other companies attended the event to learn how to deploy RFID, so they could meet customer demand. Two SIs told me they've been getting more inquiries about RFID, and they wanted to develop relationships with tag, reader and software vendors. The president of a company that manufactures tickets said he's being pressured by events organizers to offer RFID-enabled tickets, as well as interactive social media kiosks. He had no clue how to provide these things, so he came to the event to meet companies that could help him. And the director of operations from a company that provides asset-management solutions for Fortune 500 firms said more customers were asking for RFID tags to be used on equipment instead of bar codes.

All these trends point to a maturing RFID industry and a growing interest in the technology, but adoption still remains slow. Fewer than 5 percent of companies in any one industry use RFID today.

But as adoption picks up, it will accelerate. More success stories will lead to more companies deploying.

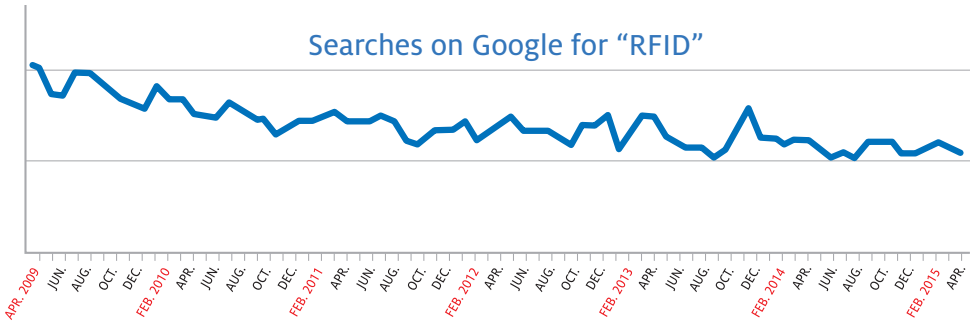
The rate of technology adoption is not linear—just look at PC sales. During the first 10 years after the first PC was released in 1975, cumulative sales totaled just more than 17 million units. The next decade, sales were nearly 194 million units. And in the 10 years after that, sales expanded to 1.15 billion units. The number of RFID deployments during the next 10 years will dwarf the number we saw in the past 10 years, and in the 10 years after that, RFID will likely become ubiquitous. Luckily, RFID Journal has booked space at convention centers that provide us ample area to expand the event. —*Mark Roberti*

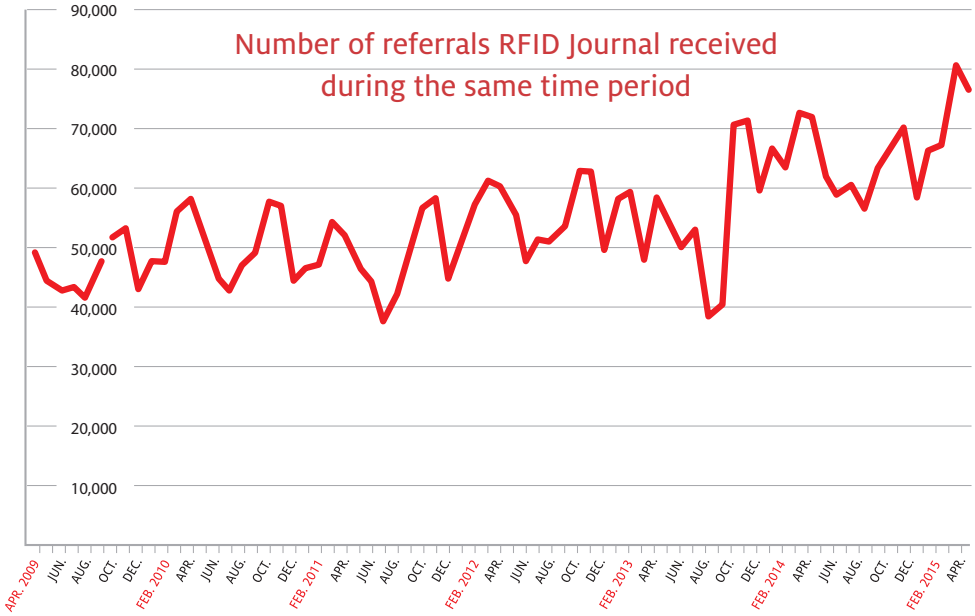
TRENDS

# Searching for Meaning in Google's RFID Statistics

## Google searches indicate interest in the technology is ebbing, but the truth is more complex.

FOR THE PAST FEW YEARS, Google has been displaying flu trends in various countries by tracking how many people are searching for information about the flu and where they are located. A recent article in *The New York Times*, Fashion Is Trending, in Google Searches, reveals how a study of 6 billion Google searches during a three-year period "shows how clothing styles spread from state to state."




GRAPHS: GOOGLE TRENDS / RFID JOURNAL

Google is a good indicator of interest in a specific topic. If you go to Google Trends and type in RFID, you will see that searches for the term "RFID" peaked in 2005 and now are about a fifth of what they were then (Google doesn't show the actual number of searches, just the relative change in search volume). It's no surprise, perhaps, that searches have declined since RFID was at the peak of the Gartner Hype Cycle, but what about more recent history? Since the financial crisis in 2008, search volume has declined by roughly half, and during the past 18 months or so it has remained relatively flat.

Google searches do indicate the relative interest the world has in a particular topic. And there is no doubt that back in 2005, RFID was a hot topic. Walmart, the U.S. Department of Defense and others had just begun requiring suppliers to RFID-tag shipments. Since those heady days, RFID has followed the classic Gartner pattern and entered the downward part of the cycle the research firm calls the "trough of

disillusionment." Interest—and searches—have waned.

But Google stats don't tell the whole story. The number of searches doesn't tell you the level of interest among those searching for a specific topic. Do people who saw the term RFID somewhere simply get a definition and never pay attention to it again—or do they keep researching the topic, with an interest in using the technology inside their companies?

We compared Google searches during the past six years with the number of referrals RFID Journal received from Google during the same period. That is, how many of the people who typed "RFID" into Google then clicked on RFID Journal to learn more about the technology? It turns out that as the number of Google searches for RFID has been declining, the number of referrals has been increasing—from an average of 47,368 per month in 2009 to an average of 64,631 per month in 2015.

**We can infer from the data that while general interest in RFID has declined, the number of people serious about deploying the technology has increased.**

What explains this 36 percent increase in referrals to an RFID website when general searches for RFID have declined by 50 percent? We can infer from the data that while general interest in RFID has declined, the number of people serious about deploying the technology has increased.

I believe general interest in RFID has declined because people are more familiar with the term. When Walmart announced in 2003 that it would require its top 100 suppliers to RFID-tag pallets and cases beginning in January 2005, it sparked a great deal of media buzz. Some articles claimed RFID would make bar codes obsolete. Others raised privacy concerns. Most people had never heard about RFID prior to this. Both businesspeople and consumers Googled RFID to learn what it was, and whether it could help their companies or it threatened their privacy.

By the time of the financial collapse in September 2008, RFID had entered the trough. Most businesspeople understood what RFID was and how early adopters were using it. Many companies put investments in new technology projects on hold, so only those people with a serious business problem continued to search for RFID.

At the same time, visits to RFID Journal's website increased. Businesspeople who had a serious business issue that no other technology could solve, such as inventory problems or loss of returnable transport items, Googled RFID. When they found articles about how others used the technology to address a similar issue, they clicked through to RFID Journal's website.

If you click on "Forecast" on the Google Trend site, it shows searches for "RFID" continuing to decline. That might remain the case during the next year or two. But RFID has emerged from the trough and is now well up the Gartner cycle's "slope of enlightenment," meaning more people are figuring out how to use it. As adoption picks up among those eager to solve a business problem, more articles will be written in the business press. More people will learn that RFID can help them address intractable business issues and better track their physical assets. Expect searches to rise as more people seek RFID solutions. —*M.R.*

RESEARCH

# Academia Sheds New Light on RFID

## As students learn about the technology, they bring fresh ideas for using it to improve the way companies operate.

ILLUSTRATION: ISTOCKPHOTO

AT THE RFID LAB at Auburn University, in Alabama, a graduate student has developed an autonomous robot that carries a handheld RFID reader. The robot can learn to navigate a store environment, capture information from clothing items on shelves and report back on inventory levels.

Elsewhere in the lab, students from the College of Engineering test the performance of passive ultrahigh-frequency tags on a variety of products in an anechoic chamber, while students from the College of Human Sciences tweak the layout of a mock retail store.

These students and hundreds of others at RFID labs worldwide are getting experience with RFID technology and learning how it can be used to improve the way com-

panies operate. Many labs, like the Auburn RFID Lab, bring in business, engineering and human sciences students to work on projects.

"This lab is really ideal for the students," says Randy Dunn, director of global sales and professional services at Tyco Retail Solutions, a sponsor of the RFID Lab. "The business students get to understand the business impact of RFID while learning a little about the technology. The engineering students focus mainly on the technology but get to understand its relevance to the business."

**Senior executives who have struggled with inventory problems their entire careers assume those issues can never be overcome. But students have no such ingrained "this is how we've always done it" attitudes.**

Target recently worked with the lab to learn how RFID could help improve its in-store inventory. And in May, during the formal opening of the RFID Lab at Auburn (it was relocated from Arkansas), Amazon announced a partnership with the lab. Students and professors will visit Amazon high-tech fulfillment centers to research ways RFID could be integrated into the company's technology infrastructure, which includes robotics to pick items purchased online. "We are partnering with the lab to develop new solutions for implementing RFID in our Amazon supply chain," says, Dave Clark, the company's senior VP of worldwide operations and customer service.

A big reason RFID adoption has been relatively slow is that many companies, unlike Amazon, are reluctant to change the way they do business. Senior executives who have struggled with inventory problems their entire careers assume those issues can never be overcome. But students have no such ingrained "this is how we've always done it" attitudes.

Many students who have worked in RFID labs have graduated and gotten jobs in related fields. Others will be graduating in the coming years, and they, too, will enter the workforce with an understanding of how RFID can be used. As they all rise through the ranks and replace retiring workers, they will be more open to embracing RFID, and RFID adoption will increase more rapidly. —*M.R.*

# BEST RFID IMPLEMENTATION

## Interstate Batteries

# RFID Helps Interstate Batteries Remain No.1

### The 63-year-old company embraces new technology to manage inventory and keep its dealers well stocked.

BY JENNIFER ZAINO

Many companies have difficulty dealing with change, but Interstate Batteries thinks change is essential. For 63 years, the company has been powering vehicles with its starting, lighting, ignition (SLI) batteries. Interstate sells more than 17 million SLI batteries annually through its distributor network of 300 wholesale warehouses that supply 200,000 dealers in the United States, Canada and other countries. The company also sells 16,000 other types of batteries for marine, commercial/fleet, motorcycle, lawn and garden, and other products.

Interstate Batteries is the No. 1 brand of auto-replacement battery in North America—a position that can be attributed, in part, to the company's "focus on making sure dealers are well supplied with the products they need" and its "very sustained legacy of innovation," says Bruce Hellen, director of business practices for the company.

Interstate realized it had to respond to changing markets if it wanted to remain the battery supplier of choice to dealerships, Hellen says. In November 2011, the company partnered with RFID solution provider Seeonic to develop a new, more efficient way to resupply dealers. The RFID initiative enables Interstate to improve its ability to help its dealers manage inventory, Hellen says, and support its goal of being a good environmental steward.

Since November 2013, five distributors, 29 trucks and 2,000 dealerships in five markets across the United States have participated in the project's validation phase. Interstate has RFID-tagged two million batteries, which are tracked on 2,000 RFID-enabled IBSmartRack storage or display racks. The solution eliminates the need to send personnel to dealerships to count battery stock, a process that was time-consuming and prone to human error.

The company is still determining when to end field-testing, but it is confident enough in the RFID solution that it is expanding the validation phase into six new markets (as yet unnamed) this summer. The validation phase has proven to the company that the system is very reliable, stable and scalable, Hellen says.

"RFID certainly has strong promise to be a solid foundation for tracking inventory of all types," even lead- and


Since 2013, five distributors, 29 trucks and 2,000 dealerships have participated in the project, with more to join this summer.

liquid-filled batteries that present some natural hurdles, Hellen says. "If you compare today to 30 or 40 years ago, those who clung to old distribution models have probably become so inefficient that they are out of business now. If you don't evaluate and improve your distribution model, you will get left behind by those who do."

**Powering a Solution**

Interstate Batteries considered several options for improving inventory management, and determined RFID technology was the most scalable and economical solution, Hellen says. But, he notes, there were two significant obstacles: There was no off-the-shelf solution and it would be hard to read tags on lead- and liquid-filled batteries. A program manager in charge of the project, supported by an evaluation committee and the company's executive board, determined that Seeonic fit their description of a development partner that had "an entrepreneurial spirit and a willingness to think out of the box," he says.

It took roughly 18 months to customize Seeonic's core RFID reader technology and develop a commercial device now known as SightWare. The SightWare devices, manufactured by ThingMagic, are placed on the top section of an IBSmartRack, available in seven sizes.

Each rack is equipped with patented Eye antennas, created by Seeonic. The antennas are placed in various locations to ensure maximum coverage and reliable reads of the EPC Gen 2 passive ultra-high-frequency tags, which are encoded with a unique ID number. Smartrac developed RFID inlays that could be read on lead- and liquid-filled batteries, and Flexo-Graphics attaches the inlays to the labels it produces for Interstate.

On a preset schedule, the SightWare device powers up from a sleep state to take inventory of the batteries on the rack. The device decodes the tag data into SKUs, and then transmits the information via cellular connection—either GSM or CDMA—to a cloud-based controller called Seeniq, which manages the IBSmartRacks and processes the data for delivery to Interstate's View My SmartRack business application.

> "If you compare today to 30 or 40 years ago, those who clung to old distribution models have probably become so inefficient that they are out of business now."
>
> —BRUCE HELLEN, INTERSTATE BATTERIES

PHOTOS: INTERSTATE BATTERIES


One of Interstate's key goals is to leverage its RFID deployment to achieve a 30 percent reduction in fuel consumption. Distributors that have a better understanding of what's selling at various dealerships can optimize distribution routes.

Dealers can have one or more IBSmartRacks in their stores, depending on store size. For stores with multiple racks, Seeniq can deconflict any cross-reads, to send concise, accurate inventory information.

Interstate also equipped 29 trucks used by distributors with SightWare devices. The IBSmartTrucks enable faster, more accurate inventory verification of the 350 to 400 batteries each may be carrying at any time, Hellen says. The data is sent to the driver's handheld mobile computer via a wired connection.

SightWare and Seeniq are delivering data from IBSmartRacks in stores on a daily basis at a 99.8 percent cellular throughput rate and extremely high accuracy, Interstate reports. Roughly one million cellular connections have been made with the SightWare devices. "We have products in so many locations where we don't have access to Wi-Fi systems," Hellen says, "so there is no other way to export the data on a consistent, reliable platform other than cellular."

Interstate had to make modifications to antenna placement on the IBSmartRacks and IBSmartTrucks to ensure coverage. Additionally, there was so much data pumping in from multiple systems that the company experienced problems processing the inventory information each night until it settled on a compatible data protocol, Hellen says.

### Powerful Benefits

Interstate Batteries uses the RFID data to understand the status of inventory at dealers, Hellen says. The View My SmartRack application gives distributors an automated way to get accurate visibility into dealership requirements, so they can make smart business decisions and better service their customers—and that, he says, enhances their relationships with the dealers. In addition, by knowing precisely what inventory needs to be replenished, distributors can optimize their truckloads and maximize service call outcomes.

Hellen emphasizes that while dealers benefit from the improved service, they haven't had to change a thing in their own operations. They do not have to maintain the IBSmartRacks or be involved in the automated inventory process. "We respect that dealers need to be engaged with customers," he says.

The IBSmartTrucks provide additional benefits. "We believe we are saving approximately 30 minutes per day per truck in inventory-management time," Hellen says. "You can imagine, if your intention is to load 400 batteries onto a truck, how easy it is to not be sure if you loaded 398 or 402 batteries. There are just inherent efficiencies in being able to electronically count large quantities of products."

One of Interstate's key goals is to leverage its RFID deployment to achieve a 30 percent reduction in fuel consumption, depending on the magnitude of the final rollout. And from what it's seen so far, the company believes it could achieve that, Hellen says. Distributors that have a better understanding of what's selling at various dealerships can use smaller vehicles to resupply stores and optimize distribution routes.

"In our test environment right now, we can see a path that would allow us to reduce fuel consumption," Hellen says. "As an environmentally conscious company, that's very appealing to us. We're focused on using RFID data to eliminate as many inefficiencies as possible throughout the distribution process, thus producing a positive environmental impact."

In the future, Interstate believes, it will be able to leverage RFID data to further promote environmental responsibility. Requirements from the U.S. Environmental Protection Agency regarding battery management are becoming more comprehensive. "We embrace that," he says. "The lead that

PHOTO: INTERSTATE BATTERIES

acid batteries contain is a valuable material if used appropriately, but there are hazards associated with it. This valuable product should be managed with all appropriate safeguards. Elevating the system to track things better is simply the right thing to do."

Getting additional data from batteries via RFID reads could also help dealers better manage "this hazardous, heavy and perishable product, [so] they are free to focus on interacting with their customers," Hellen says. It may be possible, for example, to give distributors greater insight into the age of their battery inventory, so they increase their ability to resupply dealers with products that still have a timely shelf life.

What's more, using RFID data to manage the supply chain back to the point of manufacture is an important issue for Interstate, Hellen notes. "We are not at that phase of the program yet, to utilize the data upstream that far, but we can envision it," he says. "We understand there are many other uses of the data that could be developed in the future."

Meanwhile, Hellen believes that even before Interstate's expansion into six new field test markets, the company has one of the largest commercial Internet of Things RFID networks. "The value of good data can't be understated," he says. "So, however you can obtain that data, and the more reliable it is, the better the chance you have of making good business decisions."

Interstate's RFID initiative has been a multicompany project involving hundreds of people, for which Heller says he's incredibly grateful. "It's been a team effort in every way imaginable, and I am excited about its future and what else RFID technology can bring to this market," he says. "Our model has served us well for 60 years. But that doesn't mean not to strive for ways to improve.

"We needed something that was very flexible, could be deployed in thousands of locations around the country, was autonomous and accurate, and had great cell connectivity," Hellen says. "To my knowledge, there is no other device like SightWare—it is second to none for customers looking for the ability to track inventory remotely. It will be one of the biggest unlocks for RFID because, at the end of the day, the more automated the system is, the more value the end user is going to harvest out of it."

Interstate Batteries has put thousands of IBSmartRacks in dealerships, Hellen adds, and they have performed reliably for months on end. "The vast majority of our dealer base appreciates the quality of the product," he says, "and Interstate is exploring innovation and not resting on what it has accomplished in the past."

# BEST USE OF RFID TO ENHANCE A PRODUCT OR SERVICE

Kuehne + Nagel

# Kuehne + Nagel Monitors Pharmaceuticals to Improve Customer Service

## The global transportation and logistics firm turns to RFID to track the location and temperature of shipments.

BY SAMUEL GREENGARD

Kuehne + Nagel has built a reputation as a global leader in business-to-business sea-freight, air-freight, overland and contract logistics. The 125-year-old firm, headquartered in Switzerland, has more than 63,000 employees and a presence in more than 100 countries. It serves a wide range of industries, including aerospace, automotive, industrials, high tech, oil and gas, retail, and pharmaceutical and health care.

Five years ago, Kuehne + Nagel set out to improve customer service. The company wanted to develop a system that would monitor the temperature of sensitive pharmaceutical and healthcare products in transit on a near-real-time basis. "It's critical to keep the majority of medications within certain temperature ranges during transportation," says Jon Chapman, Kuehne + Nagel's global pharmaceutical product manager. "If you go outside the range, you have no guarantee the product will work effectively."

Temperature fluctuations sometimes occur during the shipping process or if the temperature-control system fails, and that information wasn't available until a shipment arrived at the destination. "Historically, pharma companies have used data loggers, and they download the data at the destination and then make a decision whether the product is fit to use and can be sold," Chapman says. "Some of the shipments travel to very warm regions that present significant challenges." Kuehne + Nagel


AirFrance KLM Martinair Cargo partners with Kuehne + Nagel to RFID-track and monitor temperature-sensitive pharmaceuticals.

PHOTO: AIRFRANCE KLM MARTINAIR CARGO

wanted to "automate the monitoring process," he says, "to reduce the risk of a problem occurring, and make it easier to quickly identify if there was a problem."

In March 2011, Kuehne + Nagel launched KN PharmaChain—which features an active RFID solution to track and monitor shipments that travel by air and ground across continents, 24-7, in near real-time. RFID sensor tags attached to a shipment monitor and log temperature data. The data is transmitted to RFID readers as soon as a shipment arrives at a waypoint or final point in its journey. The data is transferred to Kuehne + Nagel software, which generates an alarm if an unacceptable temperature deviation occurs. That way, the CareTeam, a trained 24-7-365 monitoring and rapid response team, can take immediate action to correct the situation before the product is harmed.

Kuehne + Nagel has installed the technology globally at hundreds of points along the supply chain. Although the firm charges extra fees for the service, premium pharmaceutical and health-care companies use it regularly, Chapman says. "It's not something every company chooses to use or deploys for all products and situations," he says. "It's something that's valuable for critical shipments involving high-value products, and the partnership between our customers and our company is constantly expanding."

### Developing the Solution

Five years ago, Kuehne + Nagel formed a crossfunctional team—with project managers and representatives from logistics, procurement, pharma and IT—to explore how to build an advanced logistics and tracking system using RFID and wireless communications. The team examined an array of issues, including freight flows, technology options, total cost of ownership, data standards, IT compatibility with internal and external systems, and time and cost models. Once Kuehne + Nagel defined the scope of the project, the team whittled down a long list of RFID providers to two candidates, whose solutions they tested using predetermined criteria.

Kuehne + Nagel decided to use out-of-the box active RFID hardware and software from CartaSense, a provider of

> "It's critical to keep the majority of medications within certain temperature ranges during transportation. If you go outside the range, you have no guarantee the product will work effectively."
>
> —JON CHAPMAN, KUEHNE + NAGEL


One of the more challenging issues was ensuring the recyclable RFID tags would work correctly throughout the shipment process.

> Kuehne + Nagel has regional systems experts on every continent and a toolkit that can be used to deploy the technology rapidly at an airport or other location. "It's very much a plug-and-play environment."
>
> —JON CHAPMAN, KUEHNE + NAGEL

monitoring solutions. The firm's U-Sensor tags identify and monitor freight shipments, and U-Sensor Gateway fixed readers are located at warehouses and other facilities along the supply chain. U-Sensor Gateway Dashboard readers manage data reception and transmission during trucking.

CartaSense's software was integrated with Kuehne + Nagel's IT systems. The software receives data packets from the RFID readers in the field and drops them into a database that includes temperature measurements, times of readings and measurement receipts, whether the tags were connected to the system at times of measurement, and reader position. If a problem with a shipment is detected, KN Login, a Web-based shipment-tracking system, displays the data and issues an alarm to the CareTeam.

Kuehne + Nagel first tested the system in a lab and then built fixed installations in a warehouse environment. The next step was a proof-of-concept test on a single logistics lane. When this demonstrated the viability of the project, Kuehne + Nagel integrated the tracking and monitoring software into KN Login, which allows customers to see where their shipments are at any given moment. Once Kuehne + Nagel staff members were trained to use the system, the firm conducted a live test with a pharmaceutical customer on a single route. "Ongoing user feedback led to a variety of changes, upgrades and enhancements," Chapman says.

### The Global Rollout

Kuehne + Nagel first rolled out the solution at three locations in Europe and North America. The RFID readers were deployed at prominent locations, where they are visible but out of the way of possible forklift truck damage, and not readily accessible, to thwart tampering, Chapman notes. The company developed a layout plan, so the facility operator can identify and access equipment quickly and easily when maintenance is necessary.

Tag reads occur every 10 minutes when a shipment is within range of a reader. "The system uses a record mode when a mobile signal isn't available," Chapman says. "It ensures there are no gaps or missing data."

PHOTO: KUEHNE + NAGEL

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U-Sensor Gateway Dashboard readers manage data reception and transmission during trucking.

One of the more challenging issues was ensuring the recyclable RFID tags would work correctly throughout the shipment process, Chapman says. Customers place the tags in different locations, depending on the cargo dimensions and thermal packaging used. It took some effort to determine the optimal tag positioning.

"We developed very robust training procedures that are used by dedicated teams that focus on pharmaceutical and health-care shipments," Chapman says. The teams also receive training regarding government regulations, including U.S. Food and Drug Administration rules and procedures. Moreover, Kuehne + Nagel conducts audits at all its certified pharma locations, to ensure adherence to World Health Organization standards and quality performance.

Today, Kuehne + Nagel has regional systems experts on every continent and a toolkit that can be used to deploy the technology rapidly at an airport or other location. This makes it possible to address technical problems and other issues quickly. And because the company opted to use off-the-shelf equipment, "it's very much a plug-and-play environment," Chapman says. "It's possible to take the required hardware to a location, find a main power supply, put it in place, add it to the network and switch it on. After a few quick checks, it's fully operational." In a few cases, the company must add range expanders to ensure wireless connectivity across a facility or site. But in almost every instance, he notes, "We are up and running in less than a week."

**Safety First**

The RFID tracking and monitoring solution took roughly two years to reach beneficial operation," Chapman says. It is now in use with more than 20 partners.

Kuehne + Nagel estimates the solution detects 90 percent of temperature deviations within 30 minutes. The company reports there have been many instances in which the solution has helped spot problems quickly, so the CareTeam could take corrective action, such as reicing a container or replacing a defective battery, saving the pharmaceutical company from incurring six-figure losses.

Chapman points out that a typical pharmaceutical shipment can have a retail value of more than $5 million. "If something goes wrong with a shipment, the customer has to replace it, an insurance claim may be required, and it's necessary to destroy the product." Worse, he says, patients may not receive potentially lifesaving medication in a timely manner.

Kuehne + Nagel plans to continue rolling out the technology to additional locations during the coming months, and broadening the project to include all modes of transportation. System enhancements are ongoing, Chapman adds. The company, for example, plans to add sensors that measure shock and humidity, he says.

"There is an ever-increasing desire to know where a shipment is when it is in transit and the physical conditions at any given moment," Chapman says. "There is a growing expectation that this information is available at the touch of a smartphone or tablet screen. RFID and the Internet of Things are allowing Kuehne + Nagel to introduce capabilities that wouldn't have been possible only a few years ago."

PHOTO: KUEHNE + NAGEL

See the complete table of contents at
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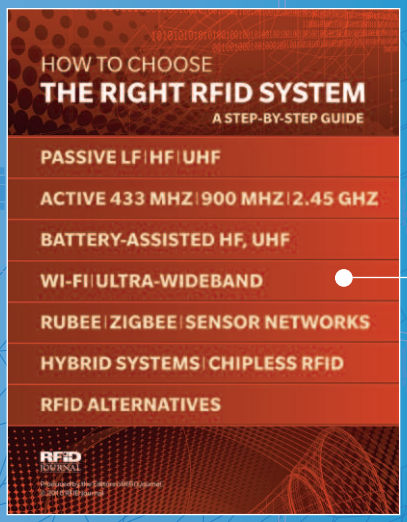


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# MOST INNOVATIVE USE OF RFID

## NASA Marshall Space Flight Center

# Solving NASA's Water Problem

RFID temperature sensors could make the International Space Station's Urine Processor Assembly more efficient, potentially saving millions of dollars annually.

BY MICHAEL BELFIORE

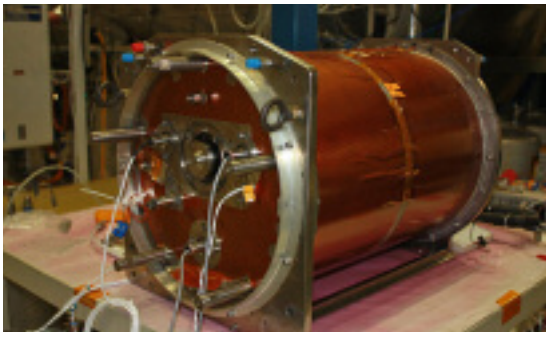
NASA has a weight problem. It costs $10,000 to lift a pound of payload—flight crew, scientific instruments and other cargo—into orbit. Every gallon of water carried to the International Space Station costs roughly $80,000. It's estimated an astronaut consumes $28 million worth of water during a yearlong stint on the station.

Shipping all that water into space would be inefficient, so since 2008, station astronauts have been drinking water reclaimed from urine, via the Urine Processor Assembly (UPA). The Distillation Assembly (DA), a keg-size unit at the heart of the UPA, distills water from urine, which passes into the device from the station's toilets. The rotating, electrically heated DA separates the water from the chemically treated waste; the water is then treated in another piece of equipment, the Water Processor Assembly. Astronauts report the water tastes no different from any other distilled water.

The UPA reclaims roughly 75 percent of the water from astronauts' urine, saving NASA and its international partners millions of dollars annually. That figure is expected to go up to 85 percent this year. But it still costs NASA more than $40,000 to ship a 2-liter bottle of water to the station. An unmanned Russian Progress resupply ship sends up approximately $9 million worth of water every few months. NASA engineers at the Marshall Space Flight Center, in Huntsville, Ala., asked: How much more weight—and money—could we save if we made the UPA even more efficient?

To answer that question, the engineers at Marshall needed better data on the temperatures generated by the DA. To get that data, they had to place temperature sensors inside the unit, where the spinning inner drum, high temperatures, near vacuum and caustic liquids would destroy ordinary temperature probes. And even if the probes could survive such a harsh environment, gathering temperature data from them could prove equally challenging.

In October 2014, NASA's engineers



Phase IV engineer Bill Simms spent several weeks developing the right technique for installing RIFD sensor tags on the Distillation Assembly's inner drum.

met these challenges with the help of Phase IV Engineering, an RFID and wireless sensor provider, and began collecting the data they need from a test DA at Marshall. The solution involves resin-encased passive RFID sensor tags attached to the device's titanium inner walls, custom-designed antennas and an external reader. The data collected could lead to both increased efficiency for the UPA on the space station and improved urine-distillation designs for future spacecraft. Ultimately, better data on the systems used in space to recycle water could benefit water-reclamation efforts proposed or in use in drought-stricken areas on Earth.

**An Out-of-the-Ordinary Solution**

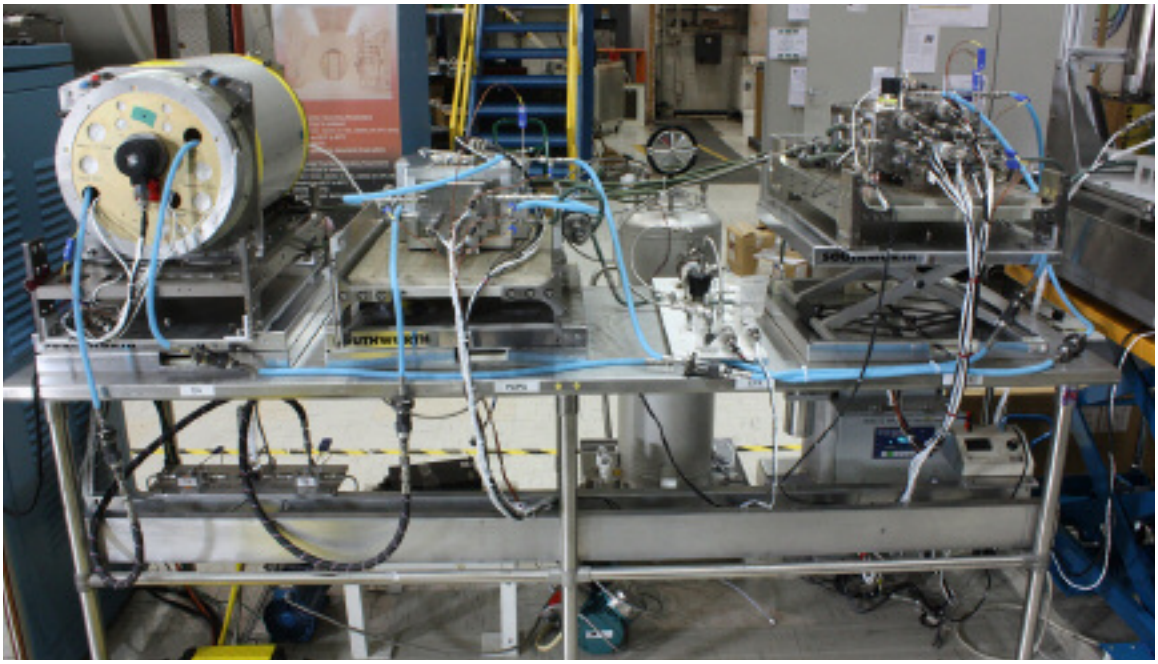
From the beginning, it was clear that current instrumentation would not work to collect data from the interior of the DA. The unit's heated outer jacket remains stationary, but the inner drum rotates at 220 revolutions per minute, ruling out wired temperature sensors. That factor alone led the NASA engineers to conclude that only RFID technology could get the job done. "Wireless operation was essential for us, since running cables in the system would be practically impossible," says Christopher Evans, an aerospace technologist leading the team.

In addition, with only an inch of clearance between the outer and inner drums, any data-collection solution the team put into place had to be compact. Finally, the solution had to be able to survive the high temperatures—up to 140 degrees Fahrenheit—as well as the caustic bath of urine and the chemicals used to treat it for extended periods of time. Passive RFID tags, with their low profile, seemed to fit the bill. Plus, once installed, battery-free passive tags would not need to be serviced. But RFID technology was outside the expertise of the NASA team.

"We needed a developer who could not only provide hardware, but also design, manufacture and install a complete sensing system that could be integrated into our setup," Evans says. "Since our application was unusual, we expected from the start that many com-

> "We needed a developer who could not only provide hardware, but also design, manufacture and install a complete sensing system that could be integrated into our setup."
>
> —CHRISTOPHER EVANS, NASA

PHOTOS: PHASE IV ENGINEERING/NASA



The RFID sensor tags, antennas and reader were installed and tested on a Distillation Assembly at the Marshall Space Flight Center.

ponents would need to be customized." After getting input from UPA experts, thermal and fluid physics specialists, computational and modeling experts, materials scientists and wireless sensing engineers, the team put out a request for quotation to find out if a solution was even possible.

Among those responding to the RFQ was Phase IV Engineering, based in Boulder, Colo. The company had a clear understanding of the challenge of crafting a purpose-built solution to meet NASA's needs. To prepare their response to the RFQ, Phase IV engineers constructed a mockup of the DA out of sheet metal, and documented the process of rigging up RFID tags to demonstrate that the tags could be read even as they passed out of the line of sight of external readers. "That's the way we operate," says Phase IV CEO Scott Dalgleish. "Probably 80 percent of our projects start with an inexpensive proof-of-concept test, so we agree with the client: What's the hardest, most challenging part?" That one-inch gap between the drums provided the biggest challenge for this project.

Satisfied that their requirements could be met, NASA put out a request for proposal to select a solution provider. Phase IV won the job in May 2014, and got to work putting together the hardware that would be used in the test UPA.

The Phase IV engineers designed a solution that included eight passive ultrahigh-frequency RFID sensor metal-mount tags, produced by their company. To be effective, the tags had to be mounted to both the inside and outside of the DA's interior drum. Four tags would be affixed to each surface.

To attach the tags, they used an epoxy encapsulating material that could both mold the tags to the surfaces of the drum, and protect the tags from the sulfuric acid and other chemicals added to the urine. The shape of the epoxy surrounding the tags was critical, Evans notes. "We wanted to minimize the impact of the sensors on the fluid flow," he says, "and we kept that in mind as we designed the shape of the sensors." With specifications from Evans and his team that included the need for rounded edges as well as a very low profile, the Phase IV team came up with the ultimate design.

The Phase IV team also custom-designed antennas to be placed both inside and outside the DA to read the sensor tags. The shape of the DA's interior dictated the exact placement and configuration of the antennas. "The shape of the DA hardware also posed some challenges as we worked out how to position the sensors and antennas to get readings in the areas we needed while also having clear sight lines to the reader," Evans explains.

The team placed two antennas on the DA—one on the stationary shaft running through the inner drum, and one on the outside of the outer drum. The antennas were connected to a ThingMagic Vega UHF RFID reader to collect data at the rate of one pulse per second from each tag as it spun inside the DA. Phase IV's own Sensor Reader Assistant software running on a Windows 7 PC computer would collect and display the data as well as output it to a comma-separated values (CSV) file on demand.

PHOTO: NASA

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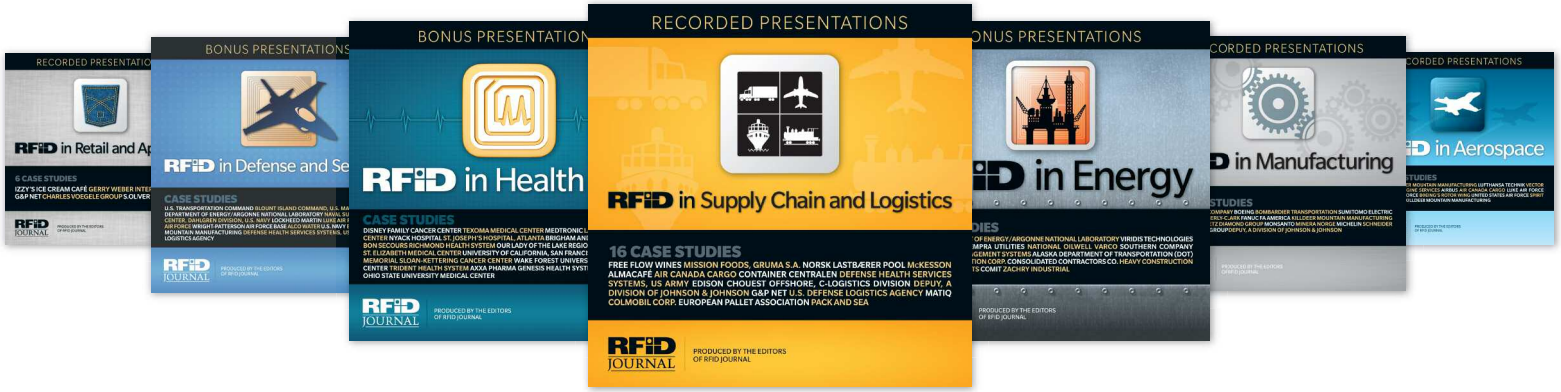


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### Going Where No RFID Tag Has Gone Before

The system worked well in theory, but in practice, molding the tags to the surfaces of the DA's inner drum and installing the custom-designed antennas proved tricky. Phase IV engineer Bill Simms spent several weeks developing the right technique for installation. "We duplicated the cylinder here at Phase IV," Dalgleish says, "and our senior mechanical engineer practiced and practiced and practiced molding the sensors onto the titanium drum." That meant that when Simms and his colleague, Joe Letkomiller, arrived at Marshall to install the system on the DA test hardware, they wasted no time completing the job. "They had it up and running the next day," Dalgleish says.

Besides mounting the tags and antennas in such a tight space, a major challenge was getting accurate and consistently strong reads from the tags as they spun around in the DA. "They would only be in view of the antenna for a short time during each rotation," says NASA's Evans. "Arranging components so reads could be completed in this short timeframe was a crucial task."

"In order to read the tag, we actually have to bounce the radio energy between those two drums," Dalgleish explains. He chalks up the project's success to the UHF technology incorporated in the tags and readers. "We're using UHF metal-mount antennas that are especially tuned to the titanium drum. That's something new in the last year or two. In the past, RFID sensing was just done at low frequency and high frequency, and those fields are magnetically coupled."

Tweaks are now in progress. "One challenge we're still dealing with is working out the ideal process for operating the sensor system," Evans says. "In our application, we want the sensors to provide continuous, real-time data, but there's a tradeoff between the accuracy and frequency of measurement. We're still working on finding the right balance as we experiment and gain experience with the new equipment."

> "The new sensors have already given us the first-ever temperature measurements from parts of the UPA that were previously considered inaccessible."
>
> —CHRISTOPHER EVANS, NASA

All told, Evans says, adding RFID-enabled temperature probes to the DA cost NASA less than $100,000, or the cost to send less than two gallons of water to the International Space Station. If the data collected can make the UPA on board the station even slightly more efficient, there's potential to save much more in launch costs over the remaining life of the space station, which is projected to remain operational until 2024.

### Down-to-Earth Benefits

"NASA was thrilled" with the results of the project, Dalgleish says. NASA's Evans concurs. "The new sensors have already given us the first-ever temperature measurements from parts of the UPA that were previously considered inaccessible," he says. "The readings from these sensors will give us much greater insight into the fine details of our process." That insight could help the DA now on board the International Space Station run more efficiently, even though there are no plans to install RFID tags on that unit.

In addition, the data gathered on the ground should help NASA engineers design next-generation water-reclamation systems that are more efficient than the UPA for future space stations and deep-space missions, as well as for reclamation efforts here on Earth, Evans says. Those future designs might well include RFID sensor tags built in to gather operational data while in use, not just from ground-based test units. Wireless tags that don't require batteries and that can stand up indefinitely to the environment inside an operational distillation system would require no maintenance by astronauts and could return valuable data for the life of the system.

Along with gathering data from the UPA, Evans also sees a benefit in increasing NASA's experience with RFID systems in general. "There's a lot of potential for using RFID sensors to take measurements in difficult places like the UPA, or to simplify sensor networks," Evans says. "The space shuttles had a huge amount of cabling for the numerous sensors located throughout the spacecraft. Using a wireless sensor network instead is an attractive option to make maintenance easier, not to mention the weight savings from eliminating a bunch of cable."

As for the future of RFID technology for the UPA sensing project, Evans sees additional possibilities. "There are many other locations in the system where we'd like to get data," he says, "and as we gain experience operating the system, we'll look into expanding the network with sensors in additional locations." That might include installing tags to measure not just temperature, but other parameters as well. "A benefit of RFID is that with the infrastructure we have in place, adding sensors to the network is relatively simple."

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# RFID GREEN AWARD

Detroit Diesel

# Visualize This: Detroit Diesel Goes Green With RFID

## The engine maker replaced reams of paper with visual tags to reduce waste.

BY JILL GAMBON

Detroit Diesel has turned out more than five million truck engines since it was founded in 1938, and until this year, the manufacturer was using a work process that had been in place for decades. The company, known as Detroit, relied on paper "build books" to provide workers with assembly instructions and checklists for each engine on its manufacturing floor. Given that the company produces a new engine every 2.5 minutes, this required thousands of reams of paper to be printed, delivered and distributed daily to assembly-line operators and then recycled when the job was completed.

Last year, Detroit, which prides itself on its environmentally sustainable practices, decided to take aim at the paper-intensive process. In February 2015, the company adopted Omni-ID's ProView RFID manufacturing solution, which features visual tags that display instructions on an electronic screen, eliminating the use of millions of sheets of paper every year. The solution also allows the company to easily update any changes to an order in real time on the production line.

"The process visibility and control the system provides have created a number of efficiencies for us—not to mention the savings from the paper alone," says Robert Hyden, a Detroit systems engineer who served as project leader on the RFID implementation.

### A Push for Paperless Manufacturing

Detroit Diesel builds engines, axles and transmissions for long-haul trucks, such as those from Freightliner and Western Star, as well as fire trucks and other heavy-duty vehicles. Demand for its products has been strong, and the company runs three manufacturing shifts a day to keep up. This reflects an overall trend in the market, with heavy-duty truck makers reporting a


Mounted on an automated guide vehicle, the battery-powered View 10 tag (inset) has a 10-inch screen that displays work instructions.

15.6 percent year-over-year increase in 2014, the highest level since 2006, according to WardsAuto, a publication that tracks the automotive industry.

Against the backdrop of growing demand, there was a push at Detroit, an affiliate of Daimler Trucks North America, for efficiencies, and the build books were an obvious target, Hyden says. The engines are built to customer specifications, and workers rely on the build book that accompanies each engine on the manufacturing line to direct them as they assemble the engine. Each book contains 40 to 60 sheets of paper (8.5- by 11-inches) filled with a unique set of instructions. Some variations in the design may be relatively small—whether the dipstick goes on the right or left, for example—but all are important for delivering an engine that meets the customer's requirements. All told, Detroit was going through approximately 500 build books daily—seven million pieces of paper annually.


The process of creating and distributing the books was labor-intensive and time-consuming, and the printing requests required a 48-hour lead time. The books were printed off-site by a contractor, packed in storage boxes and delivered to the manufacturing plant each morning. A Detroit employee then had to distribute the books to workers on the vast manufacturing floor, which is divided into four quadrants, each laid out in a quarter-mile loop. If a customer

Detroit was going through approximately 500 build books daily—seven million pieces of paper annually.

PHOTOS: DETROIT DIESEL

Each tag has 25 megabytes of memory and can store more than 255 pages of data, depending on the compression ratio of the images. The tag includes active RFID, infrared and Wi-Fi technologies.

requested a change during production, there was no way to update the build book on the fly. When an update was ready, an employee would have to manually remove the outdated pages from the book, replace them with the new pages and staple the book back together. Assembly-line operators had to jot down notes by hand.

Detroit hired Lowry Solutions, a Brighton, Mich., systems integrator, to help identity options for streamlining the build-book process and cutting paper, ink and printing costs. Lowry recommended using Omni-ID's View 10 tags and its ProView software, which manages the tags and could be integrated with Detroit's existing Hewlett-Packard manufacturing execution system (MES) software.

The battery-powered View 10 tag has a 10-inch screen that displays work instructions. Each tag has 25 megabytes of memory and can store more than 255 pages of data, depending on the compression ratio of the images. The tag includes active RFID, infrared and Wi-Fi technologies to enable various processes. Passive RFID capability is also included, though Detroit isn't using it at this time. In addition, the tags are encased in rugged plastic so they can tolerate harsh manufacturing environments (according to Omni-ID, they can withstand being dropped on concrete at a distance of up to four feet), and they can be reused multiple times.

### Rolling Down the Assembly Line

The engines move through up to 60 stations, delivered to each station by an automated guide vehicle (AGV), a mobile robot that maneuvers around the 300,000-square-foot manufacturing floor. The View 10 tags are placed in the AGV pockets, which originally held the build books. Each tag is associated with an engine number, so the correct instructions can be downloaded to the tag to guide assembly. The tags have an infrared antenna on top of them. As the AGVs arrive at a new station on the line, an IR trigger mounted above the station wakes the tag and associates it with the specific AGV and the serialized engine block it carries and then downloads the instructions, which are stored in the manufacturing software system.

Workers use call buttons on the View 10 displays to flip pages on the View 10's screen, wake up the Wi-Fi network or send requests for the delivery of supplies or parts. Using a Web interface, a worker who needs, say, a camshaft, can touch one of the buttons and request the part. The ProView software forwards a message to the appropriate person on the floor to deliver the camshaft to the assembly line, reducing delays. Other commands may be added over time, Hyden says.

The ProView software queries the Detroit servers every 15 minutes to see if a new build book has been uploaded or any updates have been made. When an engine is completed, the AGV carrying it is taken off line and the associated files on the View 10 tag are purged to get the tag ready for its next assignment.

On a typical day, Detroit has approximately 90 AGVs on the plant floor. The company purchased 110 batteries for the View 10 tags, so there are extras recharging at all times, ready to be swapped in when needed, to avoid assembly-line downtime. Battery life is four to seven days; when a battery dips to 20 percent capacity, it is replaced with a freshly charged one.

While all the hardware used in the project was standard Omni-ID products, the middleware and software required some customization. The ProView build-instructions and asset-tracking modules were customized for Detroit.

The Detroit IT team worked with Lowry and Omni-ID's field engineers to evaluate the manufacturing facility,

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conduct hardware and software field testing and implement the project. The field tests were initially done at Omni-ID's test labs and then at the Detroit plant, where the project team evaluated the strength of the facility's Wi-Fi network to make sure the read range and angle of the infrared triggers performed as needed. Omni-ID's middleware was tested to demonstrate interoperability with the company's Hewlett-Packard MES software to publish the instructions on the tag's display screen instead of paper. The field tests led to adjustments in the placement of the tags and IR triggers to guarantee the necessary read-write ranges.

One challenge in designing and implementing the system was the need for the View 10 tags to interoperate with existing enterprise software systems over the corporate Wi-Fi network. It was critical that no downtime result when the new system was in place. During the design and testing, the project team focused on ensuring the interfaces and network connections were compatible.

**No Downtime, Uptime Improvements**

The RFID project, which took roughly 12 months from concept to deployment, was phased in, with both the paper and the visual tags in use at first. In February, the visual tags were introduced on the manufacturing line alongside the build books. The transition was smooth and the new process was well received, Hyden says. The changeover to the visual tags was completed in the spring.

To get employees up to speed on how to create the digital build books and download the content to the tags, the RFID team provided systems integration and software training. They also trained line operators on the View 10 functionality, so the workers could navigate through the build-book instructions.

In tallying the benefits of the project, Detroit measured the costs of buying, printing, distributing and recycling the build books. The company expects a return on investment in 15 months from the savings in paper alone. The manufacturer has also saved money on ink and on the reassignment of the employee formerly responsible for delivering the books to the production line. There are other benefits, too, Hyden says. The build instructions are less error-prone because instructions can be updated in real time as changes come in. The MES system sends the updates to the ProView software, which in turn revises the tags. This eliminates time wasted on the assembly line. "Now we have almost immediate accuracy," Hyden says.

What's more, Hyden notes, data about the location of the AGVs is now constantly available, eliminating uncertainty about where a particular engine is in the assembly process and improving visibility for the materials support team, which conveys parts to the assembly line. "We know down to the millimeter where the AGVs are," he says.

With the success and relatively quick payback of the ProView solution, Hyden expects the technology to be adopted elsewhere in the company. The solution is being considered for work-in-process applications in other parts of the plant, and divisions of the company across the globe are evaluating the technology.

"Our sister plants are looking at this," Hyden says. "It's really the first time the technology has existed to do this."

For Hyden, using innovative technologies to streamline operations and improve sustainability practices is part of a bigger story unfolding on the factory floors at Detroit and elsewhere in the Motor City, where the automotive industry, not long ago all but given up for dead, is now thriving. "You can knock us down, but we are coming back," he says. "We're very proud of it."

Data about the location of the AGVs is now constantly available, eliminating uncertainty about where a particular engine is in the assembly process and improving visibility for the materials support team.

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- How companies make RFID investment decisions
- The applications end users are pursuing

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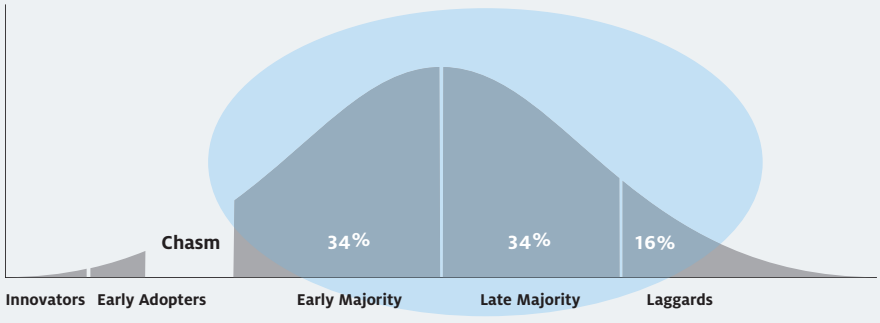


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# Best NFC Deployment

Skoubee

# NFC Tags on Collars Identify Lost Pets

## Skoubee developed a digital medal that can be read with a smartphone, making it easy to locate the owner of a missing dog or cat.

BY BOB VIOLINO

When a dog or cat runs off, his or her worried owner typically searches the neighborhood for the lost pet. If the pet isn't found immediately, the owner posts fliers with the animal's photo on utility poles and distributes them door to door, in hopes a stranger will find and return the beloved pet. The search can last days, weeks or months, during which time the pet may roam outside the neighborhood. But even if the lost animal remains within the dedicated search area, a stranger may not recognize and associate the stray with the photo on the sign.

Some dogs and cats have an embedded low-frequency RFID microchip that includes the animal's unique ID number, which is associated with the owner's information in a pet-recovery database. The tag is typically scanned only when a pet is turned into an animal shelter or a veterinarian's office.

Skoubee, a Swiss-based company, aims to make it easier to reunite lost pets with their owners. In October 2014, Skoubee introduced an ID medal that can be attached to a pet's collar. The medal has a Near-Field Communication (NFC) chip on the front, and a Quick Response (QR) code on the back. Both can be read with an NFC-enabled smartphone or other mobile device, so the finder can access the pet's public information on the Skoubee website and contact the owner. In addition, the tag has a printed eight-digit personal identification number (PIN) that can be entered on the website.

Most people don't have access to a low-frequency RFID reader to scan an implanted microchip, says Skoubee CEO Laurent Schwarz, but increasingly, people don't go anywhere without their smartphones.

Pet owners who enroll in the Skoubee program pay 30 euros ($33) for an ID tag. Then, they can create a public and private online profile for their pets. If a pet gets lost, the owner can log on to the pet's


Someone who finds a lost dog or cat can scan its tag, access the pet's public information on the Skoubee website and contact the owner.

profile and access the "lost pet" function, which will send an alert to other Skoubee members that the pet is lost.

The private profile can be used to manage a pet's medical records, which pet owners can access with a smart device. It's a convenient way to keep track of vaccination schedules, veterinarian appointments and medication refills, Schwarz says. The company is developing a way to send alerts to remind pet owners about these dates, most likely using Short Message Service (SMS) text messaging, he says.

**Universal NFC**

Schwarz conceived the idea for Skoubee while working on a national public transportation project in Switzerland, in which NFC smartphones were used to scan electronic tickets. Previously, he worked for more than 12 years at RFID companies, including Smartrac, HID Global and Sokymat, and was also involved for many years in the microchip implant business for animal identification.

In addition to being an animal lover and cat owner, Schwarz recognized a growing trend in the pet industry. "Dog and cat owners are more concerned with the health, well-being and nutrition of their pets," he says. "There was an incredible opportunity for a company to build a platform with products to address pet owner concerns. I identified the business case for using mobile devices to access relevant pet information."

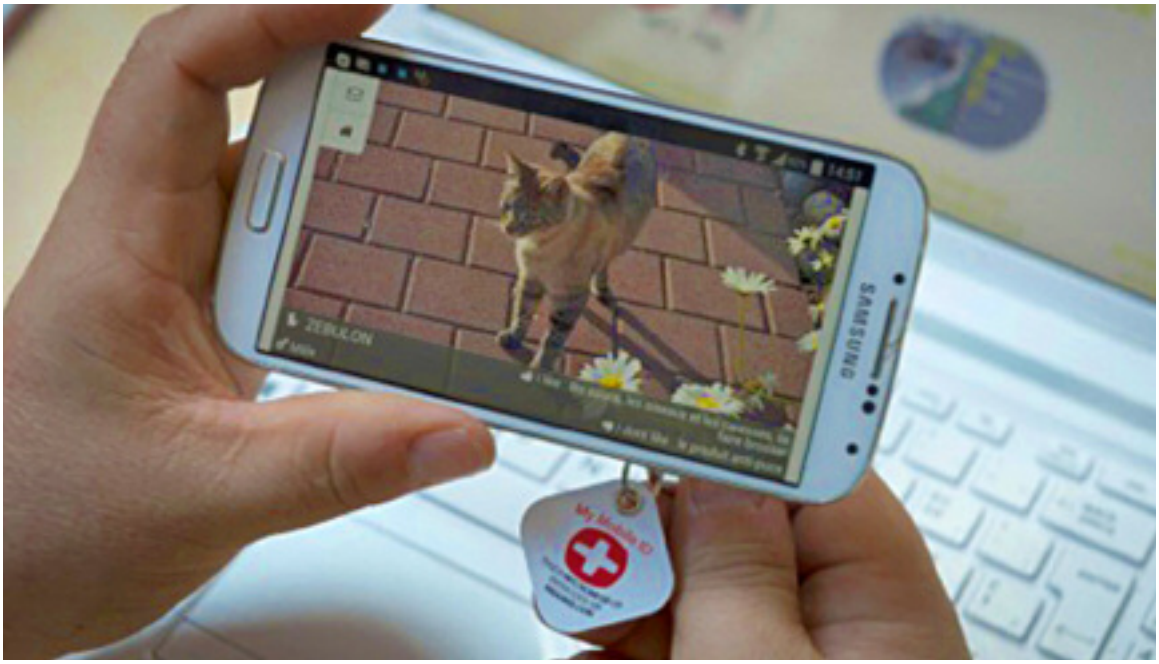
In March 2012, Schwarz formed a product-development team that included IT specialists, hardware and supply-chain experts (including his former boss at HID Global), and experts in digital marketing. The team didn't consider using any technology but RFID.

"Our first goal was to find a universal NFC chip that would work with all standard smartphones on the market," Schwarz says. The medal has an integrated NFC chip (ISO 14443) from NXP Semiconductors printed on the front and a personalized QR Code and PIN on the rear.

Then, working with SentiNode, a technology solutions provider in Poland, the team developed a software

> "Our first goal was to find a universal NFC chip that would work with all standard smartphones on the market."
>
> —LAURENT SCHWARZ, SKOUBEE

PHOTOS: SKOUBEE




Nearly 4,500 medals are in use in Europe, including Switzerland, Italy, France, the United Kingdom, Germany, Belgium, Portugal, Norway and Holland.

platform that allowed it to program the chip with customized information.

The company also evaluated a number of firms to mass-produce a high-quality finished product. Tatwah Smartech was the only manufacturer capable of programming the tag, engraving the QR code on each product and producing the tags in large quantities, Schwarz says. Today, Skoubee has a fully automated line producing the medals at a Tatwah factory in China, he adds.

Skoubee developed a number of trial products to find the right form factor for the NFC tag. The tag had to withstand the force and stress it would likely undergo when attached to pet collars, Schwarz says. The team tested the various tags on different-size dogs and cats.

"The medal has a metal rivet and two additional small metal rings to increase the mechanical strength of the product on the pet's collar," Schwarz says. The medal weighs 4.2 grams (.15 ounces) and is 28 millimeters wide (1.1 inches) and 1.2 millimeters (.05 inches) thick. It is designed to operate in a temperature range of -20 degrees Celsius (-4 degrees Fahrenheit) to 65 degrees Celsius (149 degrees Fahrenheit).

Once the company designed a final product, it tested the medal with the NFC smartphones that were then on the market and determined it could achieve a standard reading distance of 7 centimeters (roughly 3 inches) maximum.

Skoubee also reached out to the pet community to get feedback on product features and pricing that would appeal to the market. It sent questionnaires, conducted interviews and made presentations to vets, breeders, pet owners and groomers.

### Tagging Dogs and Cats

After 24 months of product development, Skoubee introduced the solution to pet owners in Switzerland. As part of its marketing effort, the company posted two videos on its website that show consumers how to use the product.

More than 500 medals were sold in one day shortly after the launch, Schwarz says, and to date nearly 4,500 medals are in use in the European market, including Switzerland, Italy, France, the United Kingdom, Germany, Belgium, Portugal, Norway and Holland. Skoubee foresees business in other European countries as well as in Japan and Brazil, he adds. The company plans to enter markets in the United States and Canada in 2016.

Skoubee recently began to promote the medal through Animalia, a pet insurance company in Switzerland. New Animalia members get discounts on Skoubee medals. This year, Skoubee also plans to market the product at Swiss pet stores.

The solution has a couple of potential shortcomings. Owners need to make sure their pets always wear their collars, even in the house or backyard, Schwarz says. Also, the tag provides minimal instructions—"touch NFC/Scan QR or enter code on Skoubee.com"—so someone who finds a lost animal might not know how to access the pet's information. To address this, Skoubee plans to educate the public about the product through television ads in the countries where it's available.

PHOTO: SKOUBEE

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# BEST NEW PRODUCT

## Zebra Technologies

# Zebra's Next-Gen Technology Powers Next-Gen Stats

### The National Football League adopted the Sports Solution to track players during games and training.

BY PAUL PRINCE

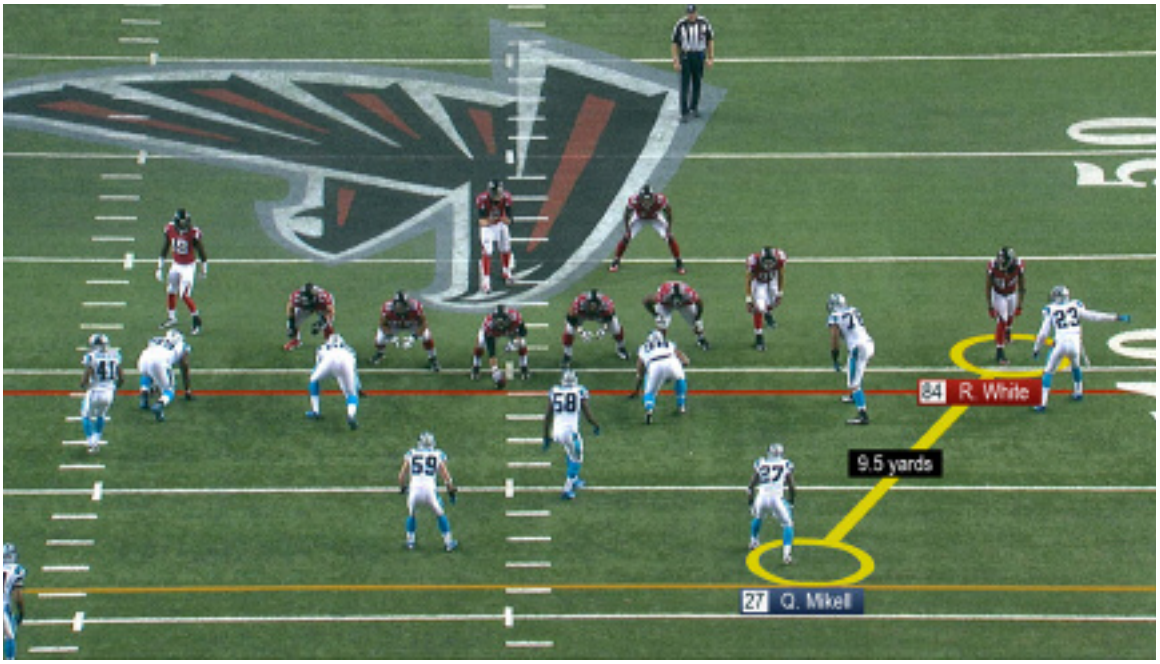
Tracking mobile assets can be challenging. But pinpointing the locations of high-value assets moving at speeds exceeding 20 miles per hour can be daunting—especially when those "assets" have two legs each and travel in tight formations. That's why the National Football League adopted Zebra Technologies' Sports Solution to monitor players, and installed the real-time location system (RTLS) at 17 stadiums during the 2014 season.

A total of 2,358 NFL players were tagged and tracked during games and training this past season. Each player had a quarter-size battery-powered RFID tag placed in each shoulder pad. The tag uses an ultrawide-band (UWB) signal to transmit its ID more than a dozen times a second to RFID readers. At each participating stadium, an average of 20 readers were mounted between the upper and lower decks. During a game, the readers captured tag data from all 22 players on the field, identifying their locations accurately and precisely, within inches.

Zebra's software pinpoints a player's position and clocks his speed, acceleration and distance traveled in real time. Algorithms aggregate players' statistics from the data and display them on analytics software, to provide context.

The RFID RTLS is delivering what the NFL and Zebra call "next-generation statistics." More than 100 million fans, including viewers of CBS Sports' Thursday Night Football TV, saw Zebra-powered graphics and data in 2014.

"It makes my job a lot easier," says Marshall Faulk, Pro Football Hall of Fame inductee and Thursday Night Football analyst. "The stats provide a better way of looking at the game, of analyzing the game, so I can tell you who has a better chance of winning, who's wearing down, what players are performing at a higher rate than others," Faulk says. "It makes me look smart!"




Players had a quarter-size battery-powered RFID tag placed in each shoulder pad, which delivered real-time location information.

When you watch one player pursuing another on the field, Faulk says, "you don't know if one is slowing down or one is speeding up. Most of the time, the guy behind—he is not slowing, he is trying to catch him. The guy in front is faster and you get upset because you think he's slowing down. We get to know now that the guy in front, he's just faster. So now you don't have to yell at the TV, or break your TV, thinking your favorite cornerback was dogging it."

The Sports Solution is also delivering unexpected benefits. "In the NFL, the most important assets are the athletes," says Eric Petrosinelli, Zebra's general manager of sports. One team that piloted the solution found a way to use it to protect those assets from injuries, Petrosinelli says. "We analyzed data for a particular club over the course of a two-week sequence of practices for two years consecutively," he says. "And what we found in year one was that they were getting peak injuries when they returned from their off day. So we worked with them to adjust their practices for the next season, where they lightened the load on the day returning from the off day. They reduced their injuries by 40 percent."

The NFL plans to deploy the solution at the remaining 14 stadiums. That will "dimensionalize the game in a new way that's going to enhance the fans' experience and understanding, and make football more sticky than it is, which we already know has a very avid and large fan base in this country," Petrosinelli says. Zebra expects to evolve its UWB RTLS technology in the coming years, and expand its reach into other professional and amateur sports.

Meanwhile, football fans in other industries have been impressed by what Zebra's technology can do on the gridiron. Boeing, for example, was inspired to employ the UWB tags and readers to track workers painting airplanes and ensure they are properly harnessed. By continuously tracking the locations of workers standing on moving platforms high above the ground, the system verifies that they are complying with Boeing's safety policy, and it automatically stops the platforms in the event that a noncompliant condition exists.

More than 100 million fans, including viewers of CBS Sports' Thursday Night Football TV, saw Zebra-powered graphics and data in 2014.

PHOTO: ZEBRA TECHNOLOGIES

# SPECIAL ACHIEVEMENT

Carlo K. Nizam

# The Man Who Gave RFID Flight in Aerospace

## Carlo Nizam realized his vision to use the technology to improve efficiencies within Airbus and across the airplane maker's value chain.

BY MARK ROBERTI

In 2005, Carlo K. Nizam was head of supply-chain operations at Airbus UK, and he had a problem. Roughly half the inventory he was managing was held at the aircraft manufacturer's first-tier suppliers' premises. The lights Airbus bought for use in its wings and landing gear, for example, were being shipped directly from the light manufacturer's facilities to the companies assembling those sections of the planes. That way, Airbus did not have to receive the lights, store them and then ship them to the wing and landing gear firms.

But control and traceability of all processes was government-mandated, and it was hard to keep track of supplies that were not under Airbus' direct control. Sometimes lights that were delivered to the landing gear company would not be entered into the SAP terminal Airbus had installed at the facility, so Airbus would not know the parts had arrived. Nizam had been reading about Walmart's use of RFID to track pallets and cases and realized it could be the answer to this problem.

Nizam ran an RFID pilot to track parts at a supplier's location, and while it worked beautifully, Airbus did not embrace the system. Undeterred, Nizam kept promoting RFID within the company. He eventually conducted a pilot at a manufacturing facility that led to deployment. Then, he did another pilot and another, until Airbus created its Value Chain Visibility and RFID Program.

As head of that program, Nizam oversaw a strategic effort to harmonize the full suite of processes across the Airbus value chain, to increase process visibility, measurability and operational efficiency. The effort led to the installation of an Airbus Business Radar infrastructure that consists of an active, ultrawide-band RFID system combined with a passive RFID system at assembly facilities to track aircraft parts, logistics containers, tools, jigs, subassemblies and other critical assets. The RFID technologies are helping to enable a "smart future factory" concept that lets managers see a digitalized view of what is happening on the


Carlo Nizam has been a frequent keynote speaker at RFID Journal LIVE! events, sharing best practices for deploying RFID technology.

factory floor in real time, automatically and without manual input or paperwork. Workers, for example, can look at their computer screens or tablets and see items moving in real time on the shop floor, click on individual items to see if they are delayed, and run reports that compare what is happening with what should be happening, so any issues can be identified and promptly addressed.

At the same time, Nizam led Airbus' effort to develop airline industry standards for RFID on parts. He also helped grow a new revenue line for the company from RFID solutions consulting for external customers, which has seen double-digit growth year over year. In July 2009, Airbus became the first commercial aircraft manufacturer to use permanent RFID tags on parts for its A350 XWB aircraft. Four years later, Airbus became the first aircraft manufacturer to permanently tag traceable parts across its entire fleet.

Nizam's team also has helped Airbus Helicopter, Airbus Defense & Space and other companies in the Airbus group use RFID to boost efficiencies. The Airbus RFID effort has helped to change the entire aviation sector. Parts suppliers, maintenance, repair and overhaul companies, and airlines are now beginning to take advantage of tags put on Airbus planes and looking for new ways to use RFID within their operations.

Moreover, Airbus' approach to using RFID as a platform to deliver benefits enterprisewide has set an example for companies in other industries. Since 2007, when Nizam invited RFID Journal to Hamburg, Germany, to learn about Airbus' grand plans for RFID and see some of its RFID deployments and pilots, he has been generous with his time and willing to share what he has learned with other potential users of the technology.

In April, Nizam was named head of digitalization for the Airbus Group's ICT organization. He will work with business leaders at the various Airbus companies to develop and implement an integrated digital transformation strategy. It's a big task, covering RFID, the Internet of Things and other existing and emerging technologies, but Nizam, as always, is up for the challenge.

> The RFID technologies are helping to enable a "smart future factory" concept that lets managers see a digitalized view of what is happening on the factory floor in real time, automatically and without manual input or paperwork.

PHOTO: RICHARD DEOMAMPO

# Shopping the Planet

RFID enables retailers to turn local inventory into global inventory.

*By Bill Hardgrave*

AS I DISCUSSED in my Consumers Rule! column, Pam Sweeney, Macy's senior VP of logistics systems, and I were on an RFID panel about omnichannel retailing at the National Retail Federation conference in January. I spoke about the value of seeing the "last unit." Pam said, "it is not the *last* unit, it is the *single* unit."

What did Pam mean by the single unit? Imagine this scenario. At a local store, a customer finds a dress in the perfect style, but the retailer doesn't have it in her size in the color she wants. The salesperson checks to see if another store has it and returns with disappointing news—the dress is not available. The really sad news is that the dress *is* hanging on a rack in another of the retailer's stores.

The salesperson could have—should have—known and offered to have the dress shipped to the customer. But the retailer wasn't RFID-tracking apparel items, so it suffered from poor inventory accuracy. Consequently, the customer left the store disappointed, and the retailer missed the sale on that item (and who knows if anyone shopping at the other location will ever want the dress in that color and size).

The concept of visibility to the single unit turns our thinking about inventory on its side. It globalizes all inventory. The single unit is not restricted to a person shopping at a local store—it is now available to anyone on the planet. It is the essence of omnichannel retailing—consumer-driven anywhere, any time, any product shopping. Unthinkable in the past, visibility to the single unit is now possible. In an omnichannel world, it is a requirement.

But as I wrote in my last column, Get Hip to BOPIS, most retailers don't have much confidence in their inventory accuracy. Retailers would rather tell an online shopper that an item is out of stock—when, in fact, they know they have three or more of that item in stock—than risk sending the customer to a store to pick up an item that may not be available.

Macy's in the United States and Marks & Spencer in the United Kingdom are among the very few retailers that get that RFID is necessary for inventory accuracy and inventory accuracy is necessary for omnichannel retailing. Essentially, a retailer must know what it has and


where it has it, down to the single unit. Local inventory becomes global, and customer demand can be satisfied from anywhere.

Until a retailer can be confident about managing its inventory to the single unit, it is just an underperforming omnichannel wannabe.

*Bill Hardgrave is dean of Auburn University's Harbert College of Business and founder of the RFID Research Center. 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.*

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RFID JOURNAL

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# An RTLS Self-Exam

Hospitals that ask the right questions can make a smart decision when choosing a real-time location system.

*By Ygal Bendavid and Harold Boeck*

IN OUR LAST COLUMN, *To RTLS or Not to RTLS*, we explained why hospitals should not wait to deploy an RFID-based real-time location system. Basically, the benefits outweigh the risks. We also acknowledged that choosing an RTLS is a complex process. But hospital managers that take a project-management approach—identify the business requirements, IT requirements and total cost of ownership—will be able to make a smart decision.

First, form a crossfunctional team of representatives from all departments that will be affected by the RTLS project. Make a list of the processes you want to improve. When you begin to consider the inefficiencies in your hospital, you may find that it's a long list. It might include, for example, asset tracking, hygiene compliance, patient management, and security and access control. Prioritize the use cases to determine which one to address first.

Next, define the technology performance requirements and the functionalities of the applications platform. Do you need coverage hospital-wide or only in specific zones or subzones? What's the precision and accuracy with which you need to identify a specific object or person? Do you need to know, for example, that a specific medical device is in particular alarm zone or patient room?

How responsive a system do you need? RTLS responsiveness is expressed as latency—the time lag in reporting the movement of an object or person. A short latency is essential when creating alarm zones, so staff can be alerted immediately to the presence or absence of assets or patients.

What are your tag requirements? Consider form factor when choosing a tag for tracking mobile assets or people. Do you need a tag that can monitor temperature or withstand sterilization procedures? Do you need a tag that can send and receive messages to the medical staff? Some tags can communicate the status of the equipment to which they are affixed, such as whether an IV pump is available or requires maintenance.

The answers to these questions will help you develop a call for tender for RTLS solutions that best meet your needs. To evaluate the proposals you receive, you'll have to ask another set of questions.

What are the potential installation issues? How would the system be integrated with your hospital's information systems? What analytics and reporting tools does the RTLS feature? Can the system address the other use cases you've identified?

What would the total cost of ownership be? This can vary greatly between active and passive RTLS solutions.

What is the system's overall ease of use? The answer to this question is paramount. What matters is not whether the system works, but whether it will work in your hospital with your staff.

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

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# Big RFID Data Software

End users and solution providers must work together to realize business value from massive amounts of information.

*By Ken Traub*

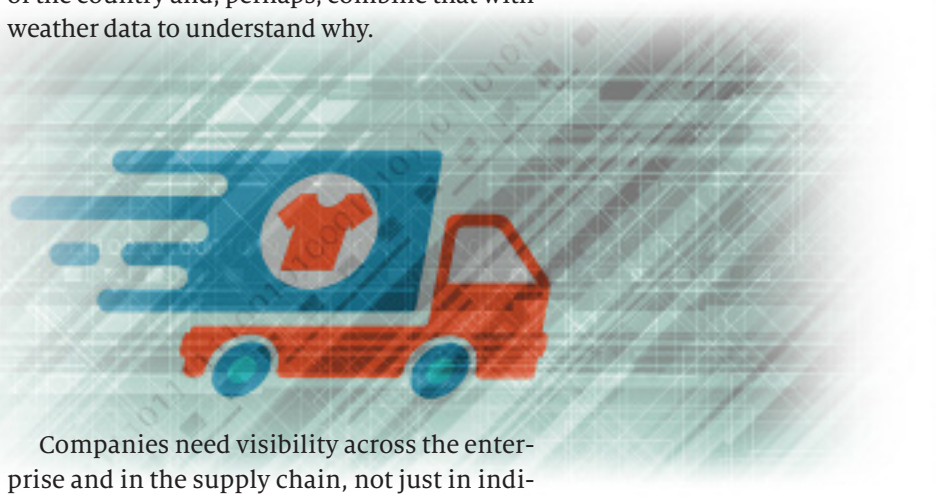
EVERY YEAR at RFID Journal LIVE!, I visit the RFID solution providers in the exhibit hall to see what new software products they're offering. This year, software innovation was even harder to find than last year. For the most part, software is designed for sector-specific applications, such as asset tracking for aerospace, manufacturing or oil and gas. This is well and good for the early stages of RFID adoption, because each company no longer has to develop a custom solution.

But early adopters are now moving beyond using RFID as a point solution to automate a single business process. They—and, increasingly, their business partners—are collecting (or have the potential to collect) a massive amount of data, and they need software that can harness that data to extract business intelligence and make new processes possible.

Take the apparel retail industry, for example, which, by all accounts, is the first sector likely to reach the tipping point, perhaps as early as next year. Retailers are using item-level RFID to improve inventory accuracy, to ensure products are on the shelves when customers want to buy them. Recently, the move to omnichannel retailing—the ability to shop anytime, anywhere—is propelling more companies to adopt RFID. At the same time, retailers are asking suppliers to tag items at the point of manufacture.

But for the most part, RFID tags in stores are read only when retailers are counting inventory, and the data is discarded as soon as the inventory is counted. This eliminates a tremendous opportunity to get true visibility into the supply chain—the ability to track items, individually and in real time, from manufacture to distribution centers and then to each store.

If companies could collect, store, share and analyze this data, it could transform their businesses. Instead of using RFID just on a local level, a retailer that was aware that Store A was running low on Item X could divert a shipment en route to Store B, and then submit an extra order to the supplier to replenish Store B. Or a manufacturer could see in real time how a promotional item is selling in different parts of the country and, perhaps, combine that with weather data to understand why.



Companies need visibility across the enterprise and in the supply chain, not just in individual stores or factories. But collecting and managing all that information is a "big data" issue that requires software. The software must enable businesses to securely share data with trading partners and carry out large-scale analytics in real time to generate business intelligence.

This is the future of RFID software. I hope next year I can report it's on display in the exhibit hall.

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

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