

RFID: Another Opportunity for Norfolk

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It speeds you through highway tolls. It pays for gas with the wave of a key fob. Wal-Mart, Best Buy, and other mass marketers are forcing their suppliers to use it, thus streamlining their own inventory and order systems.

MasterCard, Visa, and American Express are using it in “smart” credit cards. The U.S. government wants it built into the world’s passports. And many industry observers believe that it will trigger a revolution throughout agriculture, manufacturing, and services alike.

“It” is the RFID tag—RFID for “radio frequency identification.” Part computer chip, part radio transmitter, an RFID tag can store information and respond to queries from an RFID transceiver. RFID is one of the fastest-growing technologies today. We believe it offers a significant opportunity for a Norfolk area entrepreneur to create new jobs in the community and win substantial profits in the process. Think of it as a sort of super-barcode that can be read at a distance, even when it is hidden from the reader’s line of sight. RFID tags can store, and report, almost any information that could interest a user. Mostly, they just identify the item they are attached to, so shippers can track their location, much as UPS and FedEx use bar codes. EZ Pass tags carry a code that links to the user’s authorized payment account for billing.

The ability to send information over a distance gives RFID important advantages over previous technologies. Using RFID tags, manufacturers can track their products as they pass along the assembly line and are shipped to buyers without slowing them down for a barcode reader. Customers can scan an incoming pallet to make sure that each individual item on it—even one buried in the middle of the pile—corresponds to their order. Embed an RFID tag in a car key, as Toyota does with the Prius, and you can program the car not to start unless the proper key is in the ignition. Tag your workers, and RFID-coded locks can keep unauthorized personnel out of sensitive areas. Tag passports or credit cards, and you make fraud and illegal border crossing a lot harder.

RFID Technology

At least, that is how things are supposed to work, and they may someday. This early in RFID’s development, there are some limitations and “gotchas,” as we will see later.

There are two kinds of RFID tags, passive and active. Passive tags contain the computer chip and an antenna, but no batteries. They pick up their power from a magnetic field broadcast by the reader, much like the security scanners installed at the doors of many stores to discourage pilfering. In ordinary use, depending on the scanner for power limits their range to a few inches. These are by far the most common form of RFID tag in use today.

Active tags carry their own power, so they can send information to a scanner as far as 100 feet away. This is the familiar EZ Pass used by a growing number of highway toll systems.

RFID has existed in a primitive form ever since World War II, when the major powers used it to distinguish their own airplanes from the enemy in combat. In the 1970s, the U.S. Department of Agriculture began using RFID tags to track cattle destined to enter the food supply. Yet industry has been relatively slow to adopt the technology. There are several reasons for that.

Obstacles to RFID

One is that RFID tags don’t always work. Early adopters had to cope with large numbers of defective tags. Even today, as many as one-fifth of tags are inoperative when peeled off the roll. Often, too, the antennae are damaged in transit, making it impossible to communicate with the tag. And when too many tags are bunched too close together, the readers can become confused. Wal-Mart reports that it now reads between 50 and 90 percent of the tags on a pallet. The company would like to be able to read all of them.

Because RFID systems are so new, at least for commercial use, personnel also are a problem. In one recent survey, 75 percent of the companies polled said that there were too few RFID-trained workers to hire. Four out of five said that a shortage of skilled people would slow their use of RFID.

Worse yet, there is no global standard for RFID systems, so one manufacturer’s tags will not work with another company’s scanners. That means that each company in a supply chain has to buy the same hardware as everyone else—and that can be difficult when one manufacturer supplies many customers, each using a different RFID system, or one company—say, a restaurant chain—deals with several unrelated suppliers. Hewlett Packard and Phillips are working now to develop a standard, but it will be some time before the industry’s products are truly interchangeable.

There are security concerns as well. With the right equipment, even passive RFID tags can be read at much greater distances than they were designed for. Companies do not want people to walk by their customers’ homes and find out which prescription drugs they buy or what high-ticket consumer products are available for later theft.

But the real obstacle has been cost. At 10 cents per tag, it would cost a pharmaceutical maker \$100,000 to tag 1 million bottles of medication, not counting the cost of readers and skilled personnel to operate and maintain the system. As recently as 2003, a single RFID tag cost 54 cents. This is not a problem for some high-budget users. The U.S. military tracks all its containers by RFID. However, at that price, RFID was priced out of many applications.

Fortunately, the cost of RFID is dropping rapidly. By 2005, tags had reached 23 cents each. Even at that price, many companies could afford to track only pallets of their

products, not individual items. However, UPM Raflatac, a manufacturer of RFID systems headquartered in Tampere, Finland, says that it can already deliver passive tags at 10 cents each for orders of only 50,000. Passive tags are expected to reach 6 cents each by 2010, and just 1 cent per tag by 2015.

At those prices, RFID becomes very attractive. DiamondCluster International, a management consulting firm headquartered in Chicago, estimates that by 2008 it should be possible for some companies to recover their RFID investment in just one year.

A Retail Revolution

Already, the benefits are becoming difficult for some large companies to ignore. For manufacturers and retailers alike, the inventory system of choice is "JIT," just-in-time ordering and delivery. This is a demand-driven process: Companies keep careful track of their inventory and rate of use or sale for every item they stock and order just enough to keep from running out. This minimizes both inventory costs and the time, space, and manpower needed to handle items waiting to be used.

This is one area where RFID shines. Throughout the retail industry, on average, stores are out of stock on 8 percent of their merchandise. During a promotion, that leaps to 18 percent. Best Buy, which has equipped five of its major distribution centers to use RFID for deliveries from 80 percent of its suppliers, reports that on-shelf availability has risen from the mid-80-percent range to 93 percent in the stores drawing from those centers. The company estimates that one inventory worker can scan products that used to require five workers, and total labor for stock management is down by 15 to 20 percent.

Wal-Mart has seen similar improvements. The company now requires its 200 largest suppliers to use RFID for their deliveries. A study by the University of Arkansas found that out-of-stocks are down by 16 percent as a result. More surprisingly, RFID-tagged items are replenished three times faster than they were when the company relied on barcodes.

Agricultural Applications

For Norfolk, located in the land of farms and feedlots, the market of most obvious interest is agriculture. RFID tags have been used for some three decades to track cattle from breeder to butcher so that records will be available to trace any outbreak of cattle-borne disease back to its source. Given recent incidents in which the discovery of a single diseased cow has led other countries to ban American beef, it seems likely that regulations will demand even tighter tracking of cattle.

The recent, continuing concern over the threat of bioterrorism suggests that similar controls are likely to be extended, and applied to other farm species as well. Rather than searching for RFID records only when a sick animal is discovered, cattle, pigs, sheep, and even chickens may be

tracked in practice as well as in potential at each stage of their lives. They will be injected with RFID chips at birth and their movements recorded like those of manufactured products, to make sure that they arrive when and where they are expected at each step of their journey to the supermarket meat counter.

Temperature-sensing RFID chips would be particularly useful to ensure that frozen meat products have not been accidentally defrosted en route to the consumer. To ensure the quality and safety of consumer products, each package of meat soon could be tagged with its own RFID chip. This would go a long way toward eliminating outbreaks of *E. coli* and other toxic bacteria that have reached the news in recent years. It also would represent an enormous new market for chips that a company in the meat-packing region of the country would be well located to serve.

Security Concerns

In an age of worry over terrorism and identity theft, anything that improves identification and tracking offers obvious benefits for security. Of course, the easiest security application is likely to be adopted first and to greatest effect: Implant RFID chips in portable items to ensure that they are not stolen. (Permanent RFID tags on cars would go a long way toward eliminating auto theft, switching license plates, and police searches for fugitives in stolen cars.) Use GPS-enabled tags if you want to track down missing items.

RFID may help with visitor control as well. Give workers, guests, and service personnel such as plumbers and electricians an RFID pass when they arrive, and it will be possible to track their movements, keep them out of sensitive areas, and detect suspicious activities on the part of would-be attackers. For agricultural firms worried about food contamination, this is an obvious answer.

The largest test of RFID-based security system to date is US-Visit, a program designed to speed frequent visitors, such as Canadian residents with jobs in the United States, in and out of the country. Form I-94a, carried by all visitors participating in the program, carries an RFID chip that contains a digitized photograph and fingerprint of the user. The chip can be read from a distance, even in a car speeding through a border checkpoint at 50 mph. A busfull of passengers can have all their I-94a forms read at once. Similar RFID technology could be used to track trucks full of farm animals.

However RFID is used, it is clear that RFID technology has a bright future ahead of it. One market research firm, InStat, estimates that 33 billion RFID tags will be manufactured in 2010, up from just 1.3 billion in 2005. IDTechEx, a market analysis firm specializing in RFID, predicts that the market for RFID tags and readers will grow from \$2.7 billion in 2005 to \$26 billion in 2016.

It is easy to forecast that many of those tags will go to the farm industry. This makes RFID a major opportunity for a Norfolk-area start-up.