

## Pennies a Tag: Making “Cents” Out of RFID Myths

Updated May, 2004

Julie Lenzer Kirk, CPIM



Radio frequency identification, or RFID, has been touted as the wave of the future. It is a technology that is used for identification and tracking of people or goods such as inventory or assets. Although it is used like bar codes, RFID is ‘smarter’ than barcodes; it requires less human interaction, and has been compared to the Internet for its potential impact to business.

Though the technology itself is not new, recent hype over capabilities and potential uses has resulted in a great deal of misinformation and exaggerated claims. This paper discusses some of these claims, current and planned capabilities of RFID technology, and some applications where RFID could be a viable solution.

### ***Myth #1: “RFID labels cost only pennies per tag”***

Early manufacturers of RFID tags claimed that the cost would some day be pennies per tag. What they didn’t say is that it would take volumes in the billions for that to become a reality.

One of the biggest inhibitors to widespread adoption of RFID technology is the cost. Currently, the low-end cost for RFID tags is 30 cents per unit<sup>1</sup>, depending on the housing of the chip, the type of chip, and the volume purchased. Tags that can withstand the harsh environments often found in manufacturing can cost in the range of \$2 - \$4 each at volumes in the tens of thousands. As proven with many new technologies in the past – cellular phones and large-screen televisions - these costs will come down over time and with more widespread adoption. According to the independent research analyst firm AMR Research<sup>2</sup>, tag costs are estimated to be \$0.05 per tag by 2006 if the projected production demand of 16 billion is realized. To get there will require large companies to pave the way, such as what Wal-Mart is doing. They are requiring their top 100 suppliers to have RFID at the case and pallet level by 2005. Based on complications experienced already, that date has shifted from January to June and from a national rollout to regional in scope.

### ***Myth #2: “RFID can tell me exactly where my products are in a warehouse.”***

Many warehouse managers dream of using RFID to replace bar code systems that require human intervention to locate products, but RFID is *not* a Global Positioning System (GPS). It does not pinpoint the location of a product along a pre-programmed grid to give the exact rack or row where a specific lot of product is located. It can tell you that the product is *in* the warehouse and, with some special programming, in which zone but not exact location. In combination with a GPS, however, RFID can locate items with an accuracy of  $\pm 10$  feet. While this combination of technology is

being used to track trailers in a yard and rail cars, the cost prohibits it from being used in any low-cost item tracking.

RFID tags come in two communication types: active and passive. An active tag constantly communicates its existence so that when it comes near a reader, it is seen instantly. Passive tags wait to be polled before they communicate their existence. Both types require readers to be placed throughout the warehouse or area where product is being tracked. These readers can pick up the existence of a tag within its proximity; but unless you have several readers very close to each other or embedded in racks, you cannot tell where the product is located within the readers' proximity.

***Myth #3: “Consumers could check out a full basket of groceries at one time with no checkout lanes.”***

The idea was that each individual grocery item would contain an RFID label that would be automatically scanned during checkout without removing anything from the basket. In addition, the store shelf would be imbedded with a reader and whenever a consumer picked up a product, even if they put it back, the ‘smart shelf’ would know. In theory, this would provide manufacturers and retailers with information about the in-store shopping habits of the consumer as well as up-to-the-minute inventory information, virtually eliminating costly stock-outs. Wal-Mart and Gillette entered into an agreement to pilot this technology but the project was cancelled with Wal-Mart citing a need to focus on pallet and case-level RFID first.

The truth is that item-level RFID is still many years away. The cost of production for item-level RFID tags is not feasible for any but the highest-margin items or where other benefits can help justify the cost. In addition, the capabilities of the readers are hindered in a hard-to-control retail situation by potential interference from wireless networks, variable read rates, read errors, and accidental deactivation.

***Myth #4: “Manufacturers could read 10,000 boxes at one time as they are being produced or shipped.”***

Current RFID readers are reported to read up to 150 tags per second, not thousands. To read 1,000 boxes on the same pallet would require 10 seconds, accounting for the time required to filter out tags that are read repeatedly. Although this is slower than previously touted by some RFID vendors, it *is* faster than these products could be scanned manually using bar code technology. There are, however, additional factors that impact the speed at which the tags can be read such as the amount of data on the tag that needs to be read.

Although the distance from which RFID readers can pick up an active tag can go as far as 300 feet, those tags are more costly than the passive tags. The read range of the less expensive, passive tags spans from 2 feet to around 10 feet. Factors that can impact the range at which tags are read include the material that the tags are adhered to and the material the RF signal must pass through.

***Myth #5: “RFID will allow easy invasion of consumer privacy.”***

The idea of purchasing a product containing an imbedded transmitter has some consumers nervous. According to CASPIAN, a consumer advocacy group, there is a fear of “walking into a store and having a computer take an inventory of everything you're wearing...even read the contents of your wallet to determine whether you're a desirable customer or someone they want to ignore based on your financial value. The possibilities for discrimination are quite disturbing.”<sup>3</sup> Another fear is someone driving down the street and being able to tell what food or other products you have in your house.

Professor Sanjay Sarma, a founder and chairman of research at the Auto ID Center, an MIT-affiliated standards group, says, "We have taken privacy seriously for three years, and we've been working to add an opt-in and -out feature to chips."<sup>4</sup> These tags will allow a consumer to have identification features disabled when they leave a store. Also, the limited range at which tags can be read inhibit any type of external mass collection of consumer data from inside homes.

***Myth #6: “Bar codes can do what we need — we don't need RFID.”***

Bar codes and RFID will be able to, and must, co-exist. Cost alone may prohibit all members of a supply chain from implementing RFID technology. In order to determine the solution that will best serve them and their customers, each potential user must evaluate factors such as:

- The amount of data that needs to be gathered and how often it needs to change. Some RFID tags can be rewritten with new or changed information whereas a bar code, once printed, must be re-printed to reflect a change in data.
- The range and speed at which the product is to be scanned – is the line-of-sight that is required to read bar codes feasible? RFID does not require line-of-sight to be read.
- Can a person keep up with the required scan speed of bar codes, where manual intervention is required? RFID can be read without manual intervention and at much higher speeds than manually read bar codes.
- The environment where the tags will be used – is it conducive to bar codes? RFID tags, when properly encased, can handle much dirtier and harsher environments than bar codes.

***Myth #7: “RFID can eliminate the need for manual intervention in data collection.”***

At some point in the process, at a minimum, the unique identifier that is programmed into the RFID chip must be associated with a product and/or lot number and a quantity or amount. Full automation via fixed scanners and conveyors is possible with the right bar code printers and programming. But unless there are readers on the racks where product is put away, human intervention is required to assign containers to a specific inventory location. Likewise, if any information about the product in a container changes, such as quantity, human intervention is again required.

## About RFID Technology

RFID is accomplished with electronic chips and antennas (transponders) that can be embedded in raw materials, containers, equipment, or products. These chips, some as small as 1 square millimeter, contain a unique serial number that can be used to identify and track the product or person it is associated with. Some tags can be written to electronically and some can be *rewritten* to.

Tags for RFID can be ‘active’ or ‘passive’. Active tags have an integrated battery that runs circuits within the chip and continually sends out a signal. These chips are more expensive to use, but are advantageous for tracking high valued goods, like railroad cars on a track. The read range for an active tag can be in the range of 100 to 300 feet. Passive tags do not have a battery. They are read when a reader sends electromagnetic waves that stimulate a current in the antenna attached to the chip. Their read range is less than 10 feet.

When radio waves are sent from the chip, a fixed or handheld reader can interpret the waves into data. The radio waves can travel through matter, except liquids, so the chip does not have to be in the line of sight of the reader to be ‘seen’. Metal containers, too, can cause interference or deflection of the radio waves. The waves do transmit through many types of dirt and other substances such as paint. This makes RFID an ideal choice for environments where bar codes may not be feasible due to environmental conditions.

The Federal Communications Commission (FCC) regulates RFID systems’ radio frequency bands, field strength, and transmitter operation under Radio Frequency Identification Systems and Data Transmission by Remote Control Devices.

The Auto-ID center, a non-profit group established through Massachusetts Institute of Technology (MIT), is working to produce RFID standards and has copyrighted the Electronic Product Code (ePC) that allows links between RFID tags and product identification data located on the Web.

## Practical Applications and Solutions

RFID has been around within the government since World War II. The first widespread commercial application of RFID, however, started in 1991 with electronic tolling. This application developed into what consumers see as *E-Z Pass* or *Smart Pass* where a tag on a vehicle is linked to a billing account to allow access to highways of several toll authorities.

Further applications of RFID include dispensing fuel, gaming chips, ski passes, security access to buildings, and vehicle access. Applications are also being developed for tracking people within large areas such as amusement parks. Some parks are using this technology to assist groups that become separated or to provide a credit system so park attendees are not required to carry cash. RFID is also being

used in hospital maternity wards to link mothers with their babies. A resort in Brazil actually embeds an RFID chip into a patron's body providing an automated credit system for paying for food and activities.

Every industry will eventually identify a practical application for RFID, but prices will need to come down in order for many industries to consider the technology for enterprise-wide deployment. In manufacturing, there are many areas to consider for practical RFID use, even at today's prices. One immediately viable option is to track products in a closed-loop environment where assets are reused in the manufacturing process. RFID tags can be applied to totes, moveable bins, pallets, trays, or racks and used to validate that the correct ingredient is being used in a manufacturing process or to track quality or lot information through the process.

In a warehouse, RFID can be used effectively at the pallet or case level to track the existence of product in the warehouse and to read and capture the identity of the product when it leaves the plant through a dock door, validating customer deliveries. For most industries, though, prices would have to come down considerably before putting RFID tags on products that leave the plant can be considered feasible.

### The "Cents" of RFID

The first step towards mapping out how RFID can benefit your organization is distinguishing between myth and reality. While early adopters of RFID technology in the retail and apparel industries have seen a 3% to 5% reduction in overall supply chain costs and 2% to 7% increase in revenue from inventory visibility<sup>5</sup>, the initial implementation costs are high. Experts quote costs up to \$1 million for manufacturers to conduct a few pilot tests<sup>6</sup>. Additionally, there are many complex factors that can lead to the success or failure of a project such as dealing with the increased volume of data that RFID generates. The entire IT infrastructure and information retention policies may need to be reconsidered.

Some additional payback areas specifically for manufacturers to consider include:

- Reduced labor in high-volume product identification
- Reduced labor in lot tracking
- Increased information accuracy throughout the supply chain
- Automated proof of delivery
- Real-time inventory levels

As with any new technology, many companies will wait until the RFID technology has become more conventional before considering its use. RFID is coming and, like the Internet, will catch many companies by surprise. Based on the proven and potential paybacks companies would be prudent to include RFID in their technology plans now, providing those plans are not based on myth.

## About Applied Creative Technologies

Applied Creative Technologies (ACT) is an IT solutions provider for the food and beverage manufacturing industry. Our consulting and systems development offerings help our customers to improve profitability through the capture and dissemination of plant floor information. ACT is committed to identifying practical, results-oriented applications for RFID in the food and beverage industries.

---

<sup>1</sup> Murphy, C. & Hayes, M. (2003) Tagline. *Information Week*, June 16, 2003, 18.

<sup>2</sup> Abell, Peter & Quirk, Catherine, *ePC/RFID and Its Imminent Effect on the Supply Chain*, AMR Research

<sup>3</sup> CASPIAN. (2003). "Consumer group unveils RFID labeling legislation." Retrieved June 22, 2003 from [http://www.nocards.com/#Auto\\_ID\\_Non-Answer](http://www.nocards.com/#Auto_ID_Non-Answer)

<sup>4</sup> Shim, R. (2003). "Radio ID chips to come with kill switch." Retrieved July 30, 2003 from <http://news.com.com/2100-1039-999794.html>

<sup>5</sup> Abell, Peter & Quirk, Catherine, *ePC/RFID and Its Imminent Effect on the Supply Chain*, AMR Research

<sup>6</sup> Bacheldor, Beth, *Ready for RFID?*, Information Week, January 5, 2004