



The ABC's of RFID

What is RFID?

Radio Frequency Identification (RFID) technology is the use of small tags to track the location and history of items. It is not new, having been invented in 1948 as a result of radar technology used in World War II. It was used in electronic article surveillance (EAS) equipment to counter theft in the 1960s. The 1970s saw the development of tags for animal tracking and electronic toll collection for highways. Personnel access applications surfaced in the 1980s along with a number of commercial companies hoping to capitalize on the growing list of uses. Inventory tracking, asset management and condition monitoring applications received extensive attention in the 1990s.

How can RFID help the automotive aftermarket?

The industry hopes RFID will help resolve issues like excess inventory, shrinkage and counterfeiting.

How is RFID different from bar codes?

RFID is different from bar codes in that "line-of-sight" is not required for readers to detect the information contained on small tags. RFID also offers greater amounts of information and allows for better tracking of products throughout a facility and a supply chain.

How does RFID work?

RFID is a general term for technologies that involve the use of radio waves to transmit information from small tags, or chips,

to a receiver. The tags can be located on tires, parts of engines, tools, pallets of shipped goods, individual cases or individual parts, and they carry a basic series of numbers that comprise an item's Electronic Product Code (EPC).

Applications include tracking of items throughout a process or location, e.g., monitoring luggage throughout an airport and directing the luggage to specific conveyors, carts and planes automatically; tracking goods throughout a manufacturing facility; sensing changes to the ambient conditions around the tag, such as tire pressure; checking incoming shipments of pallets to ensure products were shipped correctly; tracking of pharmaceuticals to prevent counterfeiting; tracking animals; security access and egress; and many more.

RFID utilizes small tags that contain small microchips. Low-frequency radio wave signals travel between the tags and interrogators (readers), which convert the signals to digital information and move the data to a network.

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Data delivered from RFID tags to readers can include part/container/pallet identification information, location, recently completed actions and a complete history. Readers are responsible for delivering the data to an intelligence device, such as a host computer or network. Eventually, the data is sent to a database, the EPCglobal Network, which is a series of servers that coordinates the flow of data among warehouses, operations, manufacturing facilities and retail locations. Each time a tag is scanned and the information on the location of the item is delivered to the EPCglobal registry, the item's history and life cycle expand and are accessible by others allowed to view it.



What are the benefits of RFID?

Benefits of RFID implementation depend on the type of application, but some of the highly touted benefits of the technology include:

- improved data linking/info exchange between ERP and MRP systems,
- ability to better manage parts proliferation,
- recall management,
- tracking reusable assets,
- tracking MRO assets,
- tracking history of goods throughout a supply chain,
- tracking history of items along a production process,
- reduced shrinkage due to theft,
- reduced threat of counterfeiting,
- greater data visibility throughout an operation or supply chain,
- improved forecasting capabilities,
- ability to scan multiple items in a small time span, and
- reduced labor costs.

What are applications for RFID?

Inventory Visibility

Greater opportunity to identify where parts are located would result in greater opportunity for collaborative forecasting (between suppliers and customers), planning and replenishment. Improved visibility enables manufacturers to more closely produce parts that the demand chain will need to meet retailer and consumer needs. Specific areas that could be improved include:

- shrinkage,
- visibility of incoming raw materials,
- excess inventory,
- control of work in progress, and
- sequencing of raw materials/subcomponents.

Recall Management

RFID potentially will be able to identify parts that were

made with recalled materials or components. A selective recall would dramatically reduce unnecessary shipping and handling costs related to returning good parts.

Labor Savings

Strategic placement of RFID interrogators can detect the flow of items in and out of an area. This enables the system to understand where products are located and can provide data on how many products are in a certain area. The more use of RFID in a facility, the less labor is required to manually count or bar code-scan individual items and containers.

Tracking Reusable Assets

Containers, racks and other items used in the production and movement of products are assets that are carried on balance sheets and require management and tracking. These assets represent costs due to shrinkage, wear, damage and inability to locate them. RFID technology can enable manufacturers and their trading partners to track container location, contents and condition, resulting in improved management of the asset's costs.

Tracking MRO Assets

Typical manufacturers have sizeable investments in replacement parts and tools for equipment. Managing optimal levels of these items is essential to minimizing costs and ensuring manufacturing processes experience as little downtime as possible. RFID tags placed on tools, parts or parts containers and even equipment can provide data to help eliminate loss due to theft, misplaced items and poor control over or visibility of items.

Product Location

Real Time Locating Systems (RTLS) utilize RFID tags, software and a triangulation to locate parts, containers and pallets. RFID is limited to the knowledge of the location of the last set of interrogators that tags passed while RTLS allows an ongoing update of tag locations. RTLS tags transmit information, such as part identification and location, at varying intervals with a low-power radio signal. A central processor receives the signals from thousands of different tagged items and continuously provides information on the locations.

Product Authentication

The magnitude of counterfeit parts in the aftermarket and other automotive market segments continues to grow. RFID has been touted as a partial solution to the huge counterfeiting problem in the pharmaceutical industry. It is possible that RFID applied properly to imported aftermarket parts has the potential to significantly curtail the problem.

Ongoing Vehicle Maintenance

Although reading tags through dense metal remains a formidable challenge, technology improvements may one day allow installers to detect whether vehicle parts are OE or aftermarket and how long they've been in use. This would help

improve and speed the repair/maintenance process. Information from the tags also could help mechanics anticipate problems due to aging parts and schedule needed repairs.

Manufacturing Processes

Active RFID tags can record information from a manufacturing process to track smaller components being added; identify location of the assembly; indicate which tests or inspections have been performed; provide an overall status; and provide information for a shipping list.


This would eliminate extra paperwork for tracking the flow of goods through an assembly process, which eliminates errors associated with manual data entry. Product databases can be updated when each process is completed, and quality and recall issues can be more quickly resolved through the data collected throughout the manufacturing process.

Performance Tracking

The tire industry has been working for some time on the use of RFID to track conditions, the environment and tire

performance while in use. The Automotive Industry Action Group (AIAG) has developed a standard for item-level tracking of wheels and tires. The AIAG B11 standard combines data from the tire with the vehicle identification number, which enables the tracking of tire performance. Improper tire pressure can be detected and drivers alerted through RFID.

Advance Shipping Notices

RFID-tagged pallets or containers can be automatically detected as they leave the dock of a distribution center or warehouse. The information generated can be used to automatically create an electronic Advance Shipping Notice, which would be sent via EDI to the customer and can be used to create EDI invoices that would be sent at the same time. 

The MEMA Information Services Council (MIS Council) has written and published a white paper on RFID in response to the growing demand for a better understanding of the technology within the automotive industry. To access the white paper, go to www.miscouncil.org.

Aftermarket Slow to Adopt RFID — But That May Change

There is very little commercial activity in the traditional automotive aftermarket regarding RFID, but that may change soon, according to Chris Gardner, vice president of marketing for MEMA's Management Systems Information Group (MISG) and director of the MEMA Information Services Council. Although a few suppliers are working hard to meet Wal-Mart's pallet-based tagging mandates and the equipment and part-tracking system being rolled out by the Department of Defense, most suppliers are waiting and learning.

"Most aftermarket manufacturers are increasing efforts to learn about RFID's challenges, benefits, required infrastructure changes and overall direction of similar supply chains," Gardner said. "The general tendency is to learn all that is possible, monitor other industries and begin implementation when large retailer customers begin mandating its use."

There are a few exceptions, however. Gardner provided examples of RFID initiatives among aftermarket companies.

Example 1 - Top 10 Manufacturer

A leading aftermarket and OE parts manufacturer has launched a pilot study to evaluate the internal benefits of using RFID tags to track inventories of parts moving from its largest manufacturing facility to its largest distribution center (DC). It is tagging individual heavy-metal parts that are stacked on pallets, scanning them and shipping the pallets to its DC.

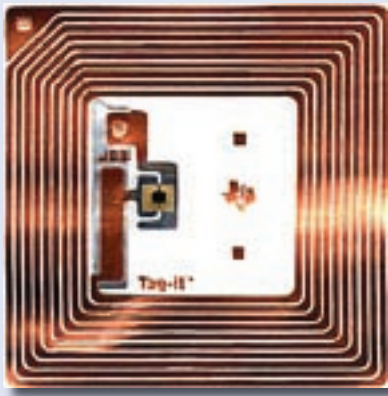
The company is identifying areas for real benefits, such as better visibility of parts as they flow through the system and tighter inventory control; however, challenges have appeared. The metal parts are dense, which limits the ability of the radio frequency waves to penetrate a stack of parts and read tags on parts on the bottom.

Example 2 - Goodyear Tire & Rubber

Suppliers to Wal-Mart are slowly ramping to meet the retailer's January 2005 RFID mandate, which requires the retailer's top 100 vendors to use RFID tags on every case and pallet of product shipped to select locations. Goodyear Tire & Rubber and a few other suppliers volunteered to participate in this initiative. The supplier's goal is to increase tire sales and reduce supply chain costs



Chris Gardner



over the long term. While this effort focuses on tracking products between supplier and retailer, Goodyear has been working on RFID implementation since 2001 to identify when tire conditions and properties change to eventually warn drivers of improper inflation.

Michelin also has announced new technology that will result in RFID tags being used to monitor tire conditions during operation. Different approaches may be used, such as tags within the rubber or mounted on wheels. Estimates for roll outs of the new applications range from the 2005 to the 2006 model years.

Example 3 - Parker Hannifin

A diversified aftermarket manufacturer, Parker Hannifin launched a pilot program in September to evaluate RFID's benefits. The company uses Real Time Locating System (RTLS), which is "active RFID." The company plans to take advantage of the technology's ability to track and locate products throughout a facility's inventory or shipping/receiving areas.

While RTLS is a more expensive application than basic RFID, Parker has determined that, if successful, it will enable greater levels of item awareness and will easily justify the costs. Initially, the supplier will establish a test facility and use RTLS to supplement its Kanban triggers associated with lean manufacturing. Plans are to track components and parts from receipt, throughout the entire production facility and through shipping. Human intervention will be minimized or eliminated. Parker will be able to know at any time where parts are, how many parts are in-house, the number of Kanban cards needed on the production line and how many Kanban cards are missing.

The program will be implemented at the receiving dock of the manufacturer's Modesto, Calif., facility by mid-2005. Two other manufacturing facilities will be targeted for implementation by mid-2006.

Parker expects benefits in managing physical inventories, locating parts in process and locating parts in inventory. Although this is an internal implementation, results should translate into improved customer service, thereby providing benefits to the supply chain.

A Slow Growth in the Aftermarket?

Growth of RFID in the aftermarket will be a slow and gradual process for many reasons, including:

- the cost of testing, infrastructure changes, training, new equipment and new software;
- recurring costs of tags (until costs come down significantly);
- limitations of radio waves to accurately penetrate heavy metal and containers of fluid;
- investments in bar code technology and infrastructure;
- slow-to-market efforts by Warehouse Management System (WMS) providers to integrate RFID capabilities with their systems;
- and the lack of collaborative industry effort to develop standards.


However, growth can be spurred, according to Gardner. "Open-loop" scenarios require companies to evaluate RFID benefits based on tracking of parts, cartons or pallets between their facilities and those of their customers. Benefits from inventory management, shrinkage/theft control and counterfeiting control must outweigh the direct and indirect costs of launching a full-scale RFID program. A standardized infrastructure for RFID tags specific to the aftermarket will be required to ensure efficient use of the technology.

"Creative cost-sharing initiatives in the industry also may be required to prevent the supplying side of trading partner relationships from bearing the entire burden of the costs. This assumes that customers — distributors, jobbers and/or retailers — will realize benefits from this technology," Gardner said.

"More concerted and collaborative efforts by the aftermarket to reduce inventory levels will bolster support for RFID development and implementation," he added. Identifying where "returns" are located and where specific part inventories at various WD locations will help manufacturers schedule the production of parts the aftermarket needs, according to Gardner. "Today's disconnected supply chain results in a lack of data visibility, which automatically generates production runs that create excess inventory," he noted.

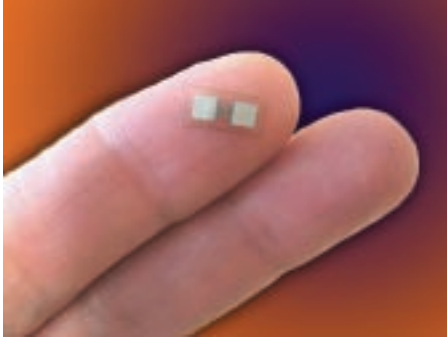
RFID technology will help resolve this issue, but its use will only grow, in this case, as fast as data visibility and industry collaboration will allow. Benefits generated from improved forecasting by the supply chain should provide enough "carrots" to motivate aftermarket companies to launch pilot RFID programs.

Gardner adds that customer mandates may be the central force that drives RFID use in the aftermarket. The Department of Defense and Wal-Mart have launched well-publicized efforts to require suppliers to use RFID at some level. Recently, Target announced a program to have all suppliers using RFID tags with the large retailer by spring 2007.

"Aftermarket retailers are evaluating RFID's value proposition and probably will begin active programs within two years," Gardner said. "Aftermarket suppliers and distributors should begin active programs to research and evaluate RFID's impact on their businesses in preparation of mandates by retailers." 

How to Get Started With RFID

Almost every company in the aftermarket probably has people reading articles on the promises of Radio Frequency Identification (RFID). Wait and see is the flavor of the day. Estimates on widespread RFID implementation throughout the aftermarket vary from two years to five years or more.



At some point, companies will be forced to comply with a customer-mandated method or will complete an ROI analysis to move forward with an RFID program. Initiating an RFID program now will facilitate the

process of meeting future mandates when they are issued. There are different approaches, but most companies will, based on today's technology and available expertise, use some or all of the elements listed below:

- ✓ **Clean your data.** The aftermarket is “all over the place” regarding product identification, and with efforts to standardize it there really is no excuse to ignore this critical area. Product identification should not be based on varying customer and internal needs, but on a standard. Efforts to clean and certify product data will make the supply chain RFID implementation process much easier.
- ✓ **Map internal, demand chain and supply chain processes.** Almost everyone agrees that RFID should be implemented only when supporting or enhancing business goals and processes. Benchmarking existing infrastructures and total cost of ownership forms the basis of all ROI analyses. It is essential to consider existing infrastructure and process investments, such as bar coding and internal networks, and how they will be utilized or integrated with RFID programs.
- ✓ **Develop a plan.** Create an RFID policy stating the program's purpose, management approval and support, project owner(s), specific goals, implementation plan, areas that will be affected or touched, training implications, etc.
- ✓ **Identify potential applications.** Internal inventory or asset tracking, customer requirements for part identification or demand chain through suppliers are obvious areas, but there are many opportunities to realize RFID's benefits.
- ✓ **Purchase a starter kit.** Companies can “get their feet wet” by learning RFID technology through inexpensive kits. Costing \$2,000 to \$15,000, information technology staff can apply tags, scan them, collect data and practice part tracking on a limited basis.
- ✓ **Test.** The most strategic approaches to launching an RFID initiative include a prototype or testing program. This enables a company to identify problem areas before significant investments are made in a wide-scale program. Companies can manage this in-house or utilize the outsourcing services of companies that have warehouses with RFID equipment in place for “rent.”
- ✓ **Contact a consultant.** Inevitably, companies face the in-house vs. outsourcing decision with new technologies. The number of companies offering RFID evaluation and implementation services is growing quickly. Consultants can help with ROI analysis, internal process and infrastructure reviews, implementation plan development, implementation and periodic program evaluations.
- ✓ **Identify potential sources of interference.** These sources can include transmissions from other wireless sources, vibrations from conveyor belts or floors, inconsistent radio frequencies used by trading partners or throughout an operation, non-synchronized readers in close proximity to each other, etc.
- ✓ **Standards.** Internal implementation may not require industry standards, but receiving and shipping parts or containers with RFID tags almost certainly mandates the use of some form of standards. Companies should allocate resources to collaborative efforts to develop RFID standards that are specific to their respective industries.
- ✓ **Early efforts.** While it is impossible to predict when widespread usage will occur or when customers will launch mandates, aftermarket manufacturers should begin to do more than simply read articles. With low-cost starter kits, the learning curve should begin soon and not be delayed until mandates are issued.
- ✓ **Identify collaborative partners.** Select one or two customers and suppliers that have demonstrated a willingness to introduce new technologies and launch a trial program. Much can be learned by a limited RFID launch with a little investment and a few challenges.

Beginning almost any new information technology results in an ROI analysis being performed, which means direct and indirect costs must be carefully identified. Even casual observers of the RFID technology trend understand that tag costs remain an issue. While passive tags have dropped in price in recent years, they are still far from the 5 cents per tag level that experts agree is required for typical companies to justify implementation. Prices currently range from 30 cents to 80 cents. 