

RFID Application Brief

ASSET MANAGEMENT and TRACKING A Brief Overview

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Introduction

The most prevalent technology for inventory, management and tracking of “portable” assets is the fixed inventory tag. Such tags are typically metal or paper and are permanently affixed to the asset to be managed. The tags may contain a simple serial number or a barcode which can be manually read or scanned with a hand-held barcode reader for inventory purposes.

What’s good about these systems? They are very cost effective and, when combined with an appropriate inventory control software application, are more than adequate for the straightforward management of asset inventory. Ownership or department/individual responsibility for the asset, the asset description including associated serial numbers, installed options, physical location, acquisition date and cost, and other related information can be made available and reported through the inventory control software and its associated database.

What’s not so good? Unless assets are bolted in place, their location at the time of periodic inventory may not be known. Good examples are portable or even desktop computer equipment, recording and other sound/video equipment used outside of fixed studio locations, and high value test equipment. The act of taking inventory requires a physical, hands-on visit to each asset to first locate the tag and then record or scan (in the case of barcode tags) the tag itself. Items can be missed during the process because they are not in plain view. The person taking the inventory may not recognize that a particular item has a tag and so may simply not record the item, or the item may have been removed from the premise (even if authorized) and so is not recorded as part of the in-house inventory process.

Inventory Control Number or barcode-based asset management systems are very good at recording facts about an asset, including the fact that the asset is known to exist and its location at the time the asset record was created. They are much less effective, and may not be effective at all, in tracking the location, disposition or physical possession of “portable” assets once the assets have been placed in general use in the enterprise.

Applications of Radio Frequency Identification (RFID)

In 2003, DoD published its mandate on the use of RFID tagging systems for suppliers, and in April, 2005 the DFAR Supplement was published which outlines the regulations suppliers must follow when shipping RFID-tagged goods to DoD as a key element of the “track and trace” functionality being introduced across the supply chain. In March and May 2005, DoD awarded BPA contracts to several suppliers for the provision of tags (UHF), readers and related equipment and services in support of the RFID migration program.

While these activities do not bear directly on the issue of using RFID technology for the control of government-owned enterprise assets, the contracts in particular may provide a simplified purchasing vehicle for certain classes of RFID products for all DoD agencies.

RFID for Asset Management

At its most basic level an RFID-based asset control system simply replaces the Inventory Control Number (ICN) or barcode tag with an RFID tag. Manual recording of ICN or scanning of barcodes in the inventory process is replaced by electronic scanning of the RFID tag. For inventory purposes only, back-end inventory management system architectures are virtually identical with a barcode-based system – one tag and reader type is replaced by a different tag and different reader.

This, however, is where the similarity between the two general types of systems ends.

Substantial operational advantages exist for the RFID-based system. On the downside, cost is also substantially higher. The cost of printing a barcode tag is negligible. The cost per tag for RFID tags ranges between \$0.50 and \$40.00-50.00 depending on the type of tag and the scale of the “track and trace” application. Supporting electronics (readers, etc.) also add to the cost.

So what does RFID bring to the table? The primary advantage is the ability to actively track an item with an RFID tag, and the ability to remotely “read” the tag on one item or an entire group of items simultaneously.

Tag Types

Tags generally fall into two broad categories: Active and Passive (there is also a hybrid category not addressed here).

An Active tag is self (battery) powered, can hold substantial quantities of information internally (e.g., 1 MB+), and because of the relatively high available power can transmit its information over a high range (80-100' or more). Active tags are also the most costly, and would generally be used to mark large containers of material in a warehouse or other large storage facility.

A Passive tag takes its power from the signal used to interrogate it and has no internal power source. The amount of information actually stored in the tag itself is minimal. Because the available power is very small, passive tags can be interrogated and read in the 3-9' range, which means they must pass close to a reader, whether fixed or handheld, to be recognized and recorded. The current price point for passive tags is in the \$0.50 range, and it is this type of tag most often used to mark an individual item or asset.

Tag Protocols

Two bodies currently publish protocol standards for RFID tags: ISO and EPCglobal. EPCglobal is a consortium of member organizations (including DoD) driving toward industry standards for the Electronic Product Code (EPC). ISO is committed to compatibility with standards driven from EPCglobal.

The BPA contracts let by DoD are for Class 1 Generation 1 RFID tags and products. A Generation 2 protocol has been completed and Gen2 products are in early delivery and testing. DoD is expected to migrate to Gen2 products as the standard, although the timeframe for doing so has not been published. Some Gen2 products are among the existing CLINs from the contract group awarded in May 2005. A Gen2 reader will be able to read a Class 1 Gen1 tag, so the expense of implementing Gen1 products today will be the potential upgrade of reader technology in the future. Gen2 products will be faster and offer additional capabilities, but the need for those capabilities in an internal asset tracking application requires further study.

Tag Operating Frequency Ranges

Of the several authorized frequency ranges for RF tags, two are of interest here:

- UHF tags operating in the 900 MHz and 2.4 GHz frequency ranges.
- HF tags operating at about 13.5 MHz

The characteristics of signal transmission and attenuation in these frequency ranges are such that HF tags may be most appropriate for a property tracking system. UHF signals can be significantly attenuated by moisture or wetness. For example, tagged property items held close to the body, or even carried with just a hand covering the tag, can be missed by UHF readers because of signal attenuation. HF signal attenuation is not an issue in these same circumstances. The choice of operating frequency range will be application dependent, and can only be determined after evaluation of the application objectives.

Although there are many variables including the objectives of the asset management system to consider, a broad conclusion is that a Passive Gen1 or Gen2 tag system, operating in the HF range would be the most appropriate. UHF tags might well be suitable, however, depending on the system performance objectives.

Advantages of RFID-based Systems

The advantages of RFID all stem from the fact the asset tags can be read remotely.

- Inventory Process

Multiple tags can be read simultaneously, and there is no requirement to physically locate each tag so that it can be read, other than to be within the nominal range of the tag. If the same tag is read multiple times, which could occur during the process of scanning a group of items or scanning sections of a large room, the application software can discard the duplicates.

- Asset Tracking

The ability to physically track the movement of a tagged asset as it passes in the vicinity of permanently installed tag readers is a major advantage to the extent that it helps prevent lost, missing or stolen assets. The effectiveness of asset tracking will be dependent on the positioning of readers at points of access to areas of a facility within which control is to be maintained.

In simple form, a reader at a doorway can indicate that an asset has passed through a doorway or control point – but cannot determine the direction of movement. With multiple readers and intelligent reader control software the actual direction (in or out) can be determined and recorded.

Asset tracking and CATV security systems can be integrated to not only record the passage of a controlled asset past a control point, but to provide a video record of how and by whom the asset was moved.

Another approach to the “who has the asset” question is to read RFID tags on both assets and people. Many organizations use RFID-based ID Cards to control access to buildings, floors, rooms, secure spaces, etc., and these cards, along with asset tags can be read and the results integrated. One application for this technology is to set an alarm condition if a controlled asset and an individual not authorized to move (or possess) that asset pass a control point together.

RFID Issues

It sounds good on paper, but

RFID has been represented as already in wide use, ready for takeoff, inexpensive and able to easily solve business problems. Gartner estimates that RFID will hit the Trough of Disillusionment in the Hype Cycle model by the end of 2006¹; however they remain positive about RFID for the long term.

There are still many challenges that have to be overcome in any RFID project.

- The costs are much higher than what people expect them to be. ²
- The standards are in terrible shape.
- The hardware and equipment are immature and do not perform as advertised.
- Privacy and security are an afterthought in most architecture plans for RFID deployment.
- The litany of reasons why RFID faces massive obstacles seems to go on forever.

The question is: how big is the problem you are trying to solve with RFID? Wal-Mart and DoD, for example, see strategic ways to transform the way they do business using RFID technology, but the business cases of that size do not necessarily scale.

¹ Management Update: Prepare for RFID Disillusionment, Jeff Woods, Gartner, Inc., ID Number G00121740, July 7, 2004

² Management Update: Why Wal-Mart Is Still Excited About RFID, Jeff Woods, Gartner, Inc., ID Number: G00126248, Feb 9, 2005

Particularly in an asset management scenario, what is the magnitude of the problem of lost/missing assets? What is the criticality of the assets to the operation of the enterprise? Will enough be gained to offset the potentially substantial costs? How will RFID actually transform (rather than just substitute for an existing technology) the way assets are controlled and tracked?

The industry is fragmented with many small new players, many of which will be absorbed into others or simply fold as the RFID market begins to mature. Which players will survive? Which players can reasonably survive a downturn in RFID spending should that occur?

Even the seemingly simple task of re-tagging existing assets can be an enormous one, depending on the number of items in the inventory.

The point is not to downplay the potential effectiveness of RFID projects, but the business case for and completion of a successful RFID project will require attention to a large number of technology, logistics, and process related issues in addition to development of critical requirements and evaluation of ROI.

Conclusion

The implementation of RFID for controlled asset management and tracking has the potential to result in significant benefits over competing technologies. But the case is not clear. The decision to commit to an RFID project is not a trivial one, and must include a thorough business case evaluation to determine whether it is a sound decision at all, and if so, what industry, supplier and technology impacts may dictate about the appropriate timeline and methodology.