

RFID Applications in the Healthcare and Pharmaceutical Industries

White Paper Revolutionizing Asset Management and the Supply Chain

Document Revision: 1.0
Release Date: February 7, 2005
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Overview

While RFID has been around for decades, it took the recent announcements by Wal*Mart and the Department of Defense (DoD) to really get the buzz going concerning the use of RFID. Even though the applications being driven by these mandates are both related to the use of passive RFID in the supply chain, the entire RFID industry benefited from the added attention that resulted. Thus, other industries that had been considering RFID now felt more comfortable as RFID manufacturers and system integrators large and small began coming to the forefront with solutions, bringing an added sense of validity to the use of RFID.

One area that had previously been evaluating RFID is the healthcare industry that for years had been saddled with issues relating to managing and tracking their assets. But while thousands of dollars were being lost by healthcare organizations and providers, most were still skeptical about the use of RFID and had difficulty accepting the return on investment messages and benefits that were being touted by the RFID industry.

Recently however, the healthcare industry has been encouraged by the evolution of the RFID technology, and more have begun to seriously consider RFID for a variety of applications. Today there are several facilities that have implemented RFID systems and others that are in the early stages of conducting pilots to determine the value that these systems stand to offer. This white paper will attempt to touch on four of the applications that appear to be driving much of that recent activity.

Hospital / Healthcare Applications

Asset Management and Tracking

Long before the recent mandates related to RFID in the supply chain, the problem of managing and tracking assets has plagued hospitals and healthcare facilities worldwide. Even the typical 200 bed facility has at least several thousand assets, ranging from IV pumps to wheel chairs that they must not only account for, but ensure their availability when needed to treat a patient. Examples of how this can create operational and economic challenges for a healthcare facility include:

- Increased labor costs associated with dedicating individuals to search for equipment when needed.

- Decrease in number of revenue generating procedures that can be performed due to time lost because of equipment not being available as needed.
- Increased inventory costs as more equipment is acquired via purchase or rental in order to offset the perceived lack of available equipment.
- Disgruntled staff as the already overworked employees become increasingly frustrated with the operational inefficiencies.

RFID offers a solution to this problem. Utilizing active RFID, tags can be placed on those assets which are most valuable, whether due to cost or operational necessity. In a typical 200 bed hospital, that could mean approximately 3,000 assets. The active RFID tags beacon on a periodic basis and in some cases may offer the ability to detect certain conditions such as movement, tamper or certain environmental conditions through the use of sensors that can be incorporated into the tags. Active RFID tags are able to be read from distances ranging from 20 feet up to over 1,000 feet based on the surrounding environment and the characteristics of the asset. There are a variety of active tags on the market of varying shapes and form factors, and more are becoming available to accommodate the different types of assets that clients now wish to tag.

In order to read the signal from the tags, active RFID readers are placed in strategic areas of the facility. The location of the readers is dictated by several factors:

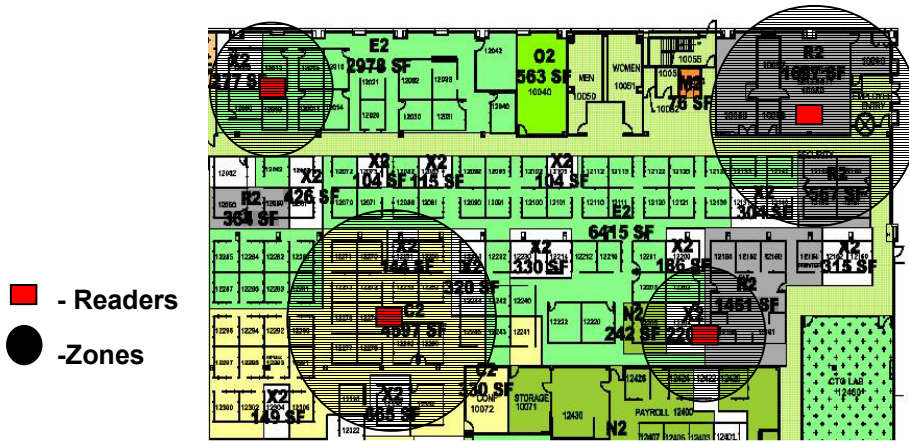
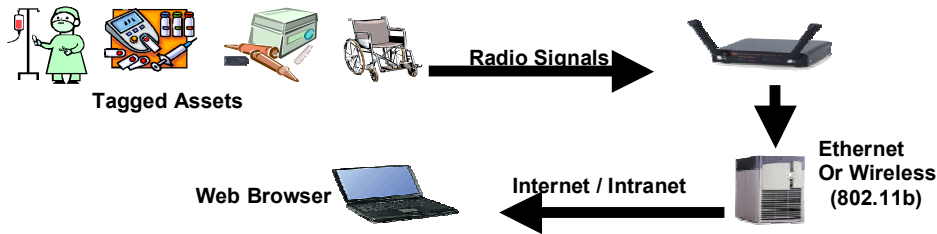
- Characteristics of the facility.
- Individual requirements of the facility and/or organization.
- Relative importance of the asset.

For example, for assets such as wheel chairs, it may be sufficient to simply know that they are within the building or perhaps are on a particular floor as the primary goal may be to prevent them from leaving with patients. Other assets such as IV pumps or certain surgical equipment may require that the location be determined and narrowed to a particular area within the facility.....such as the southwest quadrant of the 3rd floor for example. In either case, the technology chosen and the location of the readers should be dictated by the requirements and not the other way around.

The final piece to the puzzle is a software application that is able to accumulate tag/asset information from the readers and organize it into a format that allows individual users to make use of the data to locate an item or to perform an inventory. Ideally, an off-the-shelf application that has basic functionality, but can be tailored to the individual needs of the users is preferred over a complete custom application. Custom applications are time consuming and therefore more costly to develop, further complicating the return on investment equation. The majority of clients appear to prefer web based applications based on an industry standard such as SQL that have the flexibility to operate on different platforms, and can easily interface to other host systems such as WMS, or ERP systems.

With a solution composed of the above components, and working with a system integration partner that understands RFID and how to “glue” the systems together, a solution can be implemented whereby a nurse or technician can quickly determine the

location of an asset utilizing any computer that is tied into the network. In addition to locating assets, a variety of queries and reports can be run by anyone who is provided access to the system, whether onsite or remote. These queries can provide inventory information in addition to any number of other parametric searches (clean or dirty for example) based on the individual needs of the organization. A graphical representation can also be utilized to identify the asset location. A more advanced system may also provide means to manage service and maintenance.



Patient Tracking

One of the applications less talked about as it relates to RFID is its use to track people, more specifically patients. In terms of its applicability, look to an incident that occurred in Phoenix recently, where a patient diagnosed with dementia wandered from her room and was lost within the hospital for four days before being found in a storage area. Situations like this could be avoided by implementing RFID tracking technology whereby specific patients receive an active RFID tag. The tag could take on a number of form factors, including wrist straps or a special badge. The tag would contain a tamper mechanism that would prevent it from being removed, or would emit a tamper signal if an attempt to remove it occurs.

RFID readers would then be placed in particular areas of the facility such that a tagged patient can be located within a reasonable distance. The definition of reasonable distance is one that would be defined by the system integrator working with the client to define an area large enough to be cost effective in terms of the number of readers required, but small enough so that the patient's location can be ascertained with some degree of confidence. As was discussed previously, the read range for active RFID can vary from 10 feet to over 1,000 feet so there is a good degree of flexibility in how the coverage areas can be set up. Even for outdoor coverage, readers can be deployed so that patients can be tracked as they exit a facility and roam the campus. Special alerts can be programmed based on the unique needs of a facility, an area or a patient. Similar systems are in place at a number of water and theme parks today where families are able to obtain tags which provide them with visibility to the location of children and other family members throughout the park. The same technology utilized there can be implemented in hospitals.

It should be noted that if adequate RFID reader infrastructure is put in place to track assets, that same infrastructure can also be utilized to track patients. The client would simply need to acquire and deploy the additional tags necessary to tag the patients. The adverse is also true so that the infrastructure put in place to track patients can be used to track assets. Thus the ROI for an RFID system has a number of possibilities and can be deployed in a phased approach to attack the most critical problems first, before evolving the system to address additional issues.

Pharmaceutical Applications

Supply Chain (WalMart/DoD)

With the Wal*Mart and DoD mandates, suppliers are required to begin tagging a subset of the cases and pallets that are being shipped to select distribution centers. For suppliers this creates a number of challenges:

- Determining the RFID “friendliness” of their products.
- Identifying the best location for the tag.
- Deciding how the RFID system should interface with their existing host systems.
- Determining where in their flow the tagging process should occur.
- Deciding whether RFID will be used solely for outbound compliance or if it will become a part of their overall operation.
- Selecting the best technology and partner(s) based on their requirements.

As one can imagine, each of the challenges above has a longer list of issues and questions that must be analyzed and thought through. There are additional challenges related to this

application related to the type of RFID hardware that must be utilized, the performance of that equipment, and the availability of that hardware from the various manufacturers. Collectively, all of these issues have caused suppliers to be very cautious about if and how to proceed.

The basic EPC RFID system consists of the following:

Passive RFID tags/labels

Tags or labels which comply with the EPC Class 1, Gen 2 specifications. Note that this standard was only recently ratified and hardware to support the standard is scheduled to begin coming available in mid-2005 depending on the manufacturer. Currently, the hardware being utilized is Class 0 or Class 1, Gen 1. Specifics relating to the differences in the specifications can be found on the EPCGlobal website, as well as on the websites of the various RFID tag manufacturers.

Passive RFID readers and antenna.

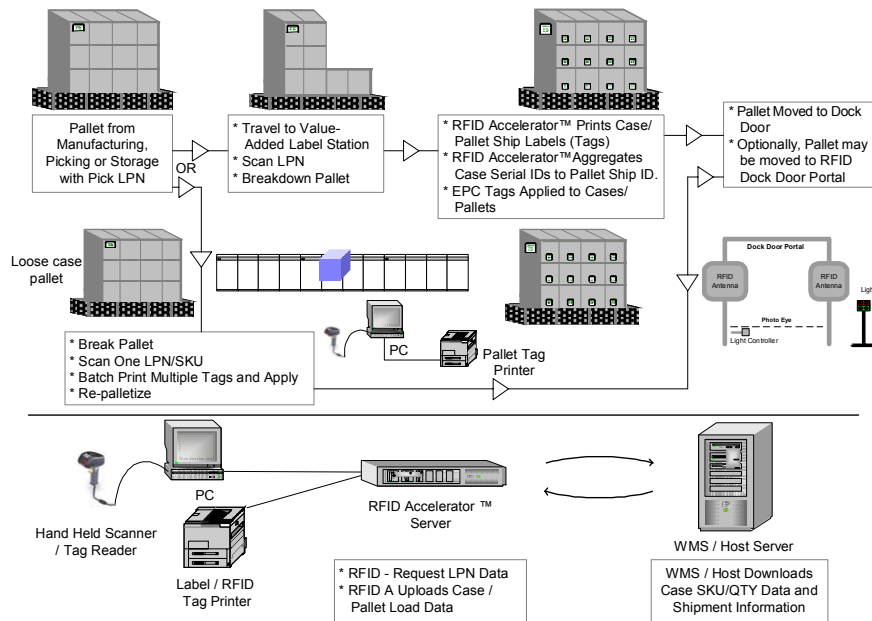
There are a variety of readers available, some of which read only specific EPC tags according to the manufacturer or the EPC Class. Other readers, often classified as “agile” readers are able to read a variety of EPC tag types. Read ranges for EPC compliant systems is approximately 10 feet.

Middleware

Can have multiple purposes:

- A. RFID reader management and data filtering
- B. Collection of data into a database format as a precursor to providing that data to a higher level end application (i.e. WMS, ERP, etc).

There are a number of ways in which an EPC RFID system may be implemented and much of it has to do with the way in which the challenges mentioned above are addressed. One such implementation would call for RFID labels to be placed on cases as items are picked in support of an order. Information associated with the items to be picked is extracted from the host system and used by the middleware to generate the RFID label which is then placed on the case during the picking process. This information is stored in the middleware database and may also be shared with the host system. During the creation of the pallet, an association is made between the cases and the pallet and this association is stored in the middleware database and shared with the host. The middleware uses this data to generate the pallet tag which is then placed onto the pallet. During the shipping process, the pallet is read by a reader prior to exiting the dock so that verification can be done to ensure that the pallet build was completed as expected.



Preventing Pharmaceutical Counterfeiting

One of the massive problems facing the pharmaceutical industry is the problem of counterfeit products that end up on store shelves instead of the real thing. According to the World Health Organization (Fact sheet N^o275, November 2003), an estimated 10% of all pharmaceuticals worldwide are believed to be counterfeit. These figures place the annual earnings from the sales of counterfeit and substandard medicines at over US\$ 32 billion globally.

RFID is seen as a way to eliminate the problem. The same solutions that are being put in place to satisfy the retail and DoD mandates will have an impact in that cases and pallets from pharmaceutical manufacturers will be tagged and able to be tracked back to the point of origin. So as the mandates are broadened to include more suppliers and a larger percentage of products, retailers such as Wal*Mart will have the ability to ensure that only cases and pallets that were shipped by the original manufacturer are on their shelves. The nature of the EPC numbers that will be placed on the tags and labels is such that they can not be duplicated. Each case and pallet will have a unique EPC number that is based on the manufacturer so if the proper checks and balances are in place at the retailer, rogue cases and pallets should be able to be identified. In the meantime, the pharmaceutical companies along with the FDA are looking at steps beyond the current retail mandates which only call for case and pallet tagging, and are driving for the tagging each item. To that end, the FDA has concluded that "The adoption and common use of RFID as the standard track and trace technology, which is feasible in 2007, would provide better protection." The timeline for RFID adoption released by the FDA is as follows:

2004: Pilots and feasibility studies

2005: RFID deployed on pallets, cases & packages of high-risk products

2006: RFID on most pallets & cases of high-risk products, and on some pallets & cases of other products

2007: RFID on pallets & cases of all products and most packages

As mentioned, a solution similar to the one described in the supply chain discussion above will approach what is needed in order to tag cases and pallets. To tag each item will generally require the manufacturers to roll RFID into the manufacturing process. Individual packages, bottles or containers will be tagged with an RFID label that contains relevant information related to the product, manufacturer, etc. As individual packages are then “assembled” into a case, an association is made between the individual item and the case, utilizing information from the host system. From there, the process flows as outlined above, with the specifics being a function of some of the issues previously addressed. Other factors that must be addressed to facilitate tagging of individual items also include the evolution of the technology to support this requirement, which has unique challenges beyond those encountered with tagging cases and pallets, such as the cost, size and location of the label. Studies and pilots underway or soon to be launched will help to uncover and resolve these and other challenges in time to support a timeline consistent with the desired FDA roll-out.



Summary

While the issues plaguing the healthcare and pharmaceutical industries are not new, it is advancements in RFID hardware technology and software that have brought RFID to the forefront as a viable solution. There are a number of existing installations and pilots within the healthcare space, and many others outside of healthcare in areas such as manufacturing, automotive, and enterprise asset tracking to name a few. The results of these implementations are beginning to provide solid ROI data which acknowledges that the use of RFID is able to provide significant labor savings and efficiency improvements, which in some cases are allowing clients to see a payback very quickly.

About RadiantWave

RadiantWave is an RFID/AIDC System Integration firm providing end-to-end, best of breed RFID consulting and integration services. Services include:

- RFID and AIDC consulting services
- Hardware and Software vendor selection
- Implementation services
- Project Management
- Application Hosting support
- RFID hardware and software reseller

To learn more about RadiantWave, contact us at jimdachelet@radiantwave.com or jyoung@radiantwave.com.