

Active RFID for Real-Time Asset Visibility: *Is the technology ready for mass adoption?*

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Perhaps the time has come for reaping the benefits of Active RFID Technology?

When a facility is dealing with thousands upon thousands of assets that include inventory, equipment and human resources, it is difficult to manage these resources through traditional means, let alone have a real-time view of the presence and movement of these resources. Having highly efficient operations requires real-time visibility in order to make effective decisions. If this visibility is then coupled with quantitative measurements, processes can be refined to increase these efficiencies even further. According to a Lean Process adage; what you cannot measure you cannot control.



Tracking has evolved from simple hand-written lists to barcodes, and passive RFID. With each evolution, the range of detection of an item has increased, as range is important, and so has the amount of data that can be stored to identify the item. The further you can read a label on an item, the less effort is required to identify it, and less effort means less cost. But what if you can not only identify an item at a distance but also monitor its movement in real-time? The advantage of this is significant, as having such real-time visibility allows for informed real-time decisions. Going further, add to this the ability to provide sensor

data, such as motion, environmental conditions and others in the immediate vicinity of the item and that's a bigger ball game.

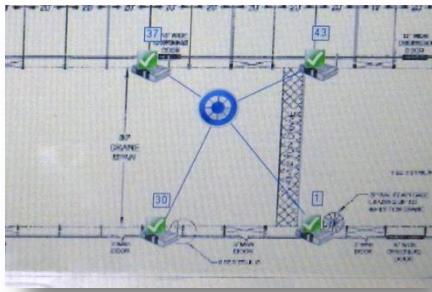
A Typical Use Case

Let's take the example of a company that provides the logistics for communications companies. The operations consist of a main hub that carries a large population of different cable reels. Weighing 2 tons or more, all cable reels need to be stored in a large yard. Each reel is placed in a row that is identified on a grid. Every reel has its own unique characteristics, suitable for a certain type of application. When orders are received for a certain type of cable, the physical position of the reel is manually identified on the printed grid and a fork-lift truck is used to retrieve that particular reel. The reel is then required to be returned to its original location. On the surface, this appears to be a well orchestrated and efficient way of carrying out the operations. But what if the reel is returned to the wrong location, or never returned at all? From an operational standpoint, would it be of value to have a mechanism that ensures that the right reel is retrieved, and also automatically log which reels are being



transported, for example? With copper being an expensive commodity, there is also risk of loss. The value of resolving just these simple examples is enormous in terms of operational efficiencies, leading to significant cost benefits.

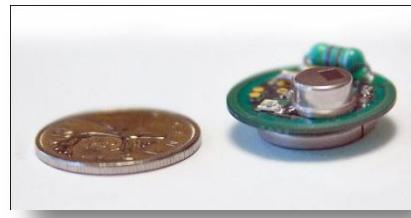
The solution was to apply Active RFID tags to all cable reels, with readers in the yard that could monitor the presence of these tags within the yard. As each tag is associated with a particular reel, this provides a real-time view of all inventory present in the yard, with a sense of where in the yard that reel may be located using the active RFID system's location capabilities. Additionally, each tag contains a motion sensor, enabling it to report movement of the reel it is placed upon. This allows confirmation of the right reel being picked up for processing, avoiding time and effort wasted in picking the wrong reel and automatically recording reel movement. As reels are moved, processed and returned to the yard,



statistics of these movements are automatically recorded as well, so that business critical information such as most required cables is captured. Unauthorized movements of a cable reel are instantly detected, allowing for immediate responses to boot. As reels required in different locations leave the yard they are automatically detected and recorded. Installing readers in those locations would also allow visibility of successful delivery of the reel, and the inventory present at that site. These functions are the tip of the iceberg as the benefits of such visibility are only as limited as the imagination.

What makes Active RFID so special, and what is it?

Whereas barcodes and passive RFID tags can be detected within a short range, active RFID tags are miniature transceivers that can be detected at distances of hundreds or thousands of feet. Active RFID tags are self powered, using a built-in battery, and contain processing intelligence so that they can transmit status information with or without external stimuli. They can also monitor various types of sensors and report their status, which can also be based on preprogrammed rules. Some active tags also accept commands to retrieve information or execute a task.



Active RFID technology operates at several different radio frequencies, including 433MHz, 900MHz and 2.4GHz. Recently, technology has also been developed to work using a wide radio spectrum, hence dubbed Ultra Wide Band Active RFID. Each of these technologies lends itself to specific applications that can take advantage of its unique characteristics. The RF properties of the 433 MHz frequency band provide opportunities to mitigate problems that would be more challenging to resolve with other technologies:

- The ability to operate in dense and RF hostile environments, due to the RF characteristic of the 433MHz signal of being able to propagate better than higher radio frequencies, allowing greater communication range with lower power requirements.
 - Lower cost to produce such tags due to readily available components being used for many other applications at this frequency, yielding tags priced at a point that allows a decent return on investment.
 - Non-interference with the busy 2.4 GHz band which is used for widely proliferated technologies such as Wi-Fi, Bluetooth, Zigbee, etc.
 - Worldwide acceptance by regulatory bodies.

GuardRFID's Industrial Tag



The Industrial Tag is extremely durable, for use in areas that are exposed to environmental extremes and harsh handling

Blink Transmissions

Tag location is accomplished using the periodic Blanks transmitted by the tags.

Capture Zone Detection

Immediate notification is sent to the system when the tag enters such a capture zone.

Mounting

Built-in magnetic base allows instant attachment to metal objects, or screws may be used for mounting to non-magnetic materials.

Motion Detection

Version with optional motion sensor can be used to detect movement of article that the tag is placed upon.

Several tags are equipped with sensors to detect motion, visible light, a sudden fall and others, to be able to report tag tamper attempts or movement of the item that the tag is placed upon. The cost of tags can be \$10 or less in very high volume, depending on the tag type and its associated functionality. GuardRFID's Argus Middleware Engine is at the heart of the system, providing all tag and system management capabilities, and storing status information in a SQL database. All it takes to create a complete solution is connecting the appropriate software application to Argus via GuardRFID's API.

Conclusion

Active RFID has certainly matured during the last few years, and adoption of the technology is rapidly increasing. This is because the technology offers total cost of ownership that allows a fairly quick return on investment, and provides functionality never before possible, such as the ability to track and locate people and objects at significant distances. As evidence of its maturity, standards such as the proposed IEEE 802.15.4f, the ISO-18000-7 and the DASH7 have emerged which will further accelerate adoption. The proverbial chasm has been crossed, and we should expect the application of Active RFID in a wide variety of environments, from healthcare to commercial to heavy industry. If you can track and locate your resources, you can manage them better, and do so with much less effort.

GuardRFID's Active RFID Technology

GuardRFID's Active RFID system uses the 433MHz frequency, thus offering a large family of the smallest tags available, with long battery lives. The system consists of tags placed on people and objects, and a network of Readers that receive "here I am" "blink" messages that are constantly transmitted by the tags. This allows for real-time tracking and long-range location of the tags within the area of coverage using a special algorithm. The system is unique in that it also includes a second mechanism for detection of tags in close proximity to a location, using low frequency Excitation Fields.



Such "capture zones" have unique IDs and can be adjusted fairly precisely between 2 to 20 feet, thus permitting zones of different capture distances to be set up depending on specific situations. A tag entering such a zone will instantaneously transmit its entry within that specific capture zone, and will also announce its departure from the zone. This permits both Long Range and Proximity location capabilities, allowing for the design of systems that can provide Real Time Location and Tracking as well as Security and Loss Prevention within the same system.

