

What Innovations in RFID Technology Mean for Asset Management

RFID Technology Approaching the Mainstream

In the past decade, RFID technology has evolved significantly from a niche technology to a widely adopted asset tracking and identification solution. In some cases, it has even replaced traditional 1D or 2D barcodes.

You may have heard more about retailers using RFID tags to track the movement of merchandise on the floor and to assist in supply chain management. But the application of RFID technology goes far beyond the retail industry. The use of RFID tags in retail stores has no doubt contributed to the wide visibility and value of RFID technology. But less known is the fact that RFID technology has found many applications in a wide variety of industries. These applications have solved problems that previously had no solutions. As a result, the first adopters in these industries were able to strike a competitive edge, and the laggards found themselves playing catch-up.

Examples of RFID technology applications:

- Hospitals tracking surgical equipment, hazardous materials, and patients to improve operational efficiency
- Oil and gas refineries tracking and monitoring remote assets to reduce operational costs
- IT departments tracking laptops, desktops, printers, and servers to increase utilization and manage maintenance
- Farmers and food distributors tracking shipments to reduce spoilage

Recent Innovations in RFID Technology

Like most new technologies, RFID technology has been steadily improving since its inception. However, in the past few years the development and deployment of RFID technology has accelerated. The accumulated innovation has led to an expanded selection of products and services. This in turn has driven new applications for RFID and has increased the proliferation of existing applications.

The expanded selection of products and services can be grouped into two categories:

What is Radio Frequency Identification (RFID)?

RFID is a data collection technology that uses electronic tags to store data.

A tag is made of one RFID chip attached to an antenna. Tags may be battery-powered or may derive power from a reader.

How are RFID Tags Different from Barcodes?

Unlike barcodes, RFID tags don't require line of sight in order to be read, so RFID tags can be embedded in a package.

RFID tags can also be read faster, and at a wider range of distance.

Finally, RFID tags can store more information, such as location, history, waypoints, and condition data.

The History of RFID

- First introduced in WWII to identify friendly aircraft
- Grew in use in the 1980s and began to reach the masses in the 1990s
- In 1993, the E-ZPass highway toll system was launched using RFID
- In 1996, General Motors introduced OnStar, a satellite-based RFID tracking solution
- In 1997, Mobile introduced Speedpass, which let customers wave a key chain with RFID tag at gas stations to pay
- In the 21st century, RFID technology began to proliferate

RFID tags

There are more variations in RFID tags, with different performance levels for different environments.

RFID readers, data communication, and analytics

RFID readers are becoming sophisticated enough to read and process data in real time. The intelligence in RFID readers has reduced costs of integrating RFID data with enterprise data

A wider selection of RFID tags

Until recently, there were only two types of RFID tags: passive and active.

Passive RFID tags do not transmit energy, but backscatter energy from a RFID reader. These tags are more affordable but have limited performance and capabilities. For example, they can only be read within a short range. They also typically won't function in RF-challenging environments, such as around liquids or metal surfaces.

Active RFID tags, which are powered by batteries, transmit information to a reader. They have better range performance than passive tags. Moreover, active RFID tag systems are based on proprietary technologies and so often require custom integration.

In November of 2010, a new category of RFID technology was launched with the approval of the ISO/IEC 18000-6:2010 Standard. This newly standardized category of RFID is known as Battery Assisted Passive (BAP) RFID or sometimes "Class 3" RFID. BAP RFID technology is providing new levels of visibility and enabling new applications for RFID.

In a nutshell, BAP RFID combines features of both passive and active RFID. Building on the successful EPC C1G2 passive RFID Standard's relatively simple, low-power communications protocol, the new BAP Class 3 Standard enables capabilities previously only available with active RFID. BAP RFID sports long-read ranges in excess of 100 meters. It also can deliver reliable performance in RF-challenging environments. This all comes at what could be a pretty compelling price point.

In addition to Battery Assisted Passive RFID, another area of innovation is being introduced: RFID tags that can be read on metal surfaces. Traditionally metallic material has been a challenge for RFID tags. Many RFID tags suffer significant performance degradation when near metal. This can cause poor tag read range, phantom reads, or no read signal at all.

The challenge of designing RFID tags to perform on metallic surfaces has been largely solved. This has broadened the application of RFID technology in asset tracking and industrial applications. Some examples include tracking of servers and laptops in IT data centers, industrial manufacturing quality control, and oil and gas pipeline maintenance.

Comparison Between RFID Tag Types

| Passive Tags | Class 3 Battery Assisted Passive Tags | Active Tags |
|--|---|--|
| <p>Pros</p> <ul style="list-style-type: none"> • Reader talks first communications • Low power passive backscatter • Low overhead, simple communications protocol • Low cost | <p>Pros</p> <ul style="list-style-type: none"> • Long read range (>100m) • Reliable in RF-challenging environments • Can add sensors and store data • Reader talks first communications • Low power passive backscatter • Low overhead, simple communications protocol | <p>Pros</p> <ul style="list-style-type: none"> • Long read range (>100m) • Reliable in RF-challenging environments • Can add sensors and store data |
| <p>Cons</p> <ul style="list-style-type: none"> • Shorter read range • Unreliable in RF-challenging environments • Limited, if any, sensor capability | <p>Cons</p> <ul style="list-style-type: none"> • Higher cost than passive tags | <p>Cons</p> <ul style="list-style-type: none"> • Tag talks first (beacons) communications • Higher power requirements • More complex communications protocol • Higher cost • Proprietary technology |

RFID readers, data communication, and analytics

Intelligent RFID readers are built with more processing power, longer lasting batteries, and more connectivity options. Class 3 RFID readers are optimized to read Class 3 tags to achieve maximum performance and range. They also come with the option of communicating data via ethernet, WiFi, or cellular protocols, which makes instant data communication possible. Data from RFID tags can be captured and communicated instantaneously to the database. This enables businesses to analyze the data and make decisions quickly, improving operational efficiency.

What Does This Mean for Asset Management?

With the development in RFID technologies, businesses and government agencies need to challenge their existing assumptions about asset tracking tools.

Assumption 1: RFID technology is not affordable

The cost of RFID asset tracking technologies includes three components: tags, readers, and middleware. All three have significantly decreased in cost in recent years.

- **Tags:** Passive RFID tags today cost less than \$0.50 per tag. In bulk, you can often buy RFID tags for less than \$0.30 per tag. Active RFID tags cost more but are still significantly cheaper than what they cost only a few years ago.
- **Readers:** RFID readers can be costly, ranging from the hundreds to the thousands of dollars depending on the functionalities. However, there are new smartphone applications that read RFID tags. This enables the use of cheaper consumer smartphones, or even a Bring Your Own Device system, bringing costs down significantly.
- **Middleware:** It used to cost at least \$200,000 to connect RFID readers to a server. Now, cloud-based middleware is available at a fraction of this cost.

Assumption 2: RFID technology is too limited to be useful

RFID technology faced many limitations in its early years. Many people are not aware that RFID technology has developed past these limitations

- **Performance on metal surface:** Modern RFID readers can reliably read tags on a metal surface. This functionality has already been used in manufacturing settings to track tools and machinery parts.
- **Limited reading range:** Modern RFID tags can be read within a 100-meter range reliably without the need to install readers. This means that RFID tags should work for most warehouses, data centers, and outdoor staging areas.

What to Look for in RFID Technology

In conclusion, we'd like to encourage you to explore RFID technology to push the boundaries of what your organization can do. Running a great business is all about understanding the facts, challenging your existing assumptions, and seeking cost-effective solutions to address your problems.

If you haven't invested in RFID yet, it may be time to shop around. If you have used RFID, but only in limited applications, you may be surprised by how RFID has changed in just a few years.

For those who are willing to challenge some existing assumptions about RFID technology, it may be time to look into an RFID solution.

Should you decide to seek a solution, you'll need to know the critical factors you should consider. So, what should you look for in a solution?

- Assess the operating environment your assets are located in so you can determine what types of RFID tags are most appropriate.
- Be holistic when you think about managing assets. Consider not only equipment and tools, but assets like furniture and vehicles as well.
- Think about "managing your assets" instead of "tracking assets." You want to start with a strategy to improving the operational efficiency of your assets, rather than just locating your assets in space and time.

While rapid technological changes can be intimidating, it can provide a multitude of opportunities. We hope this white paper serves as a useful introduction to the modern possibilities of RFID technology.