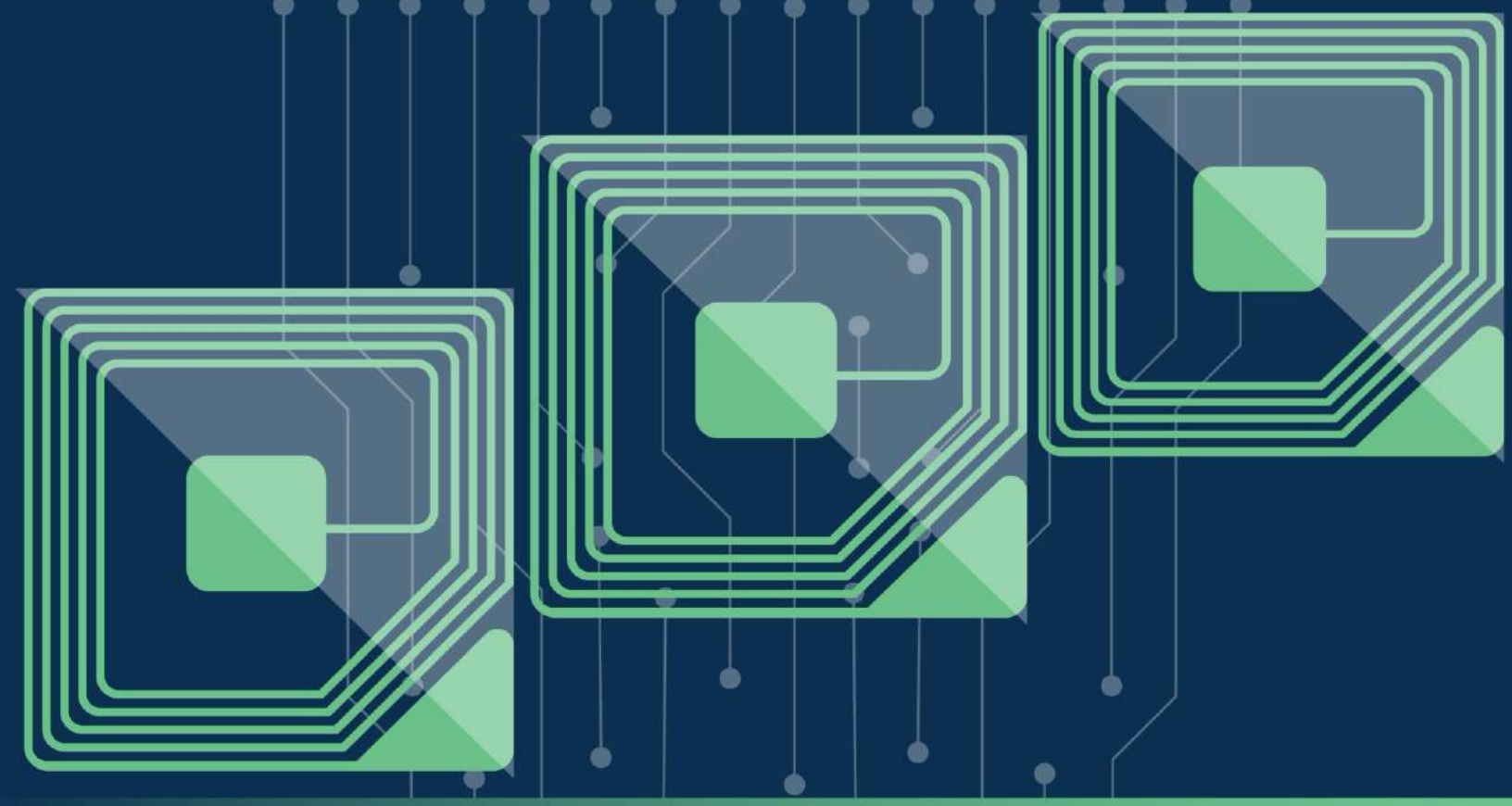

RFID & Inventory Management

clear spider

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Overview

> Companies using RFID (radio-frequency identification) can scan more items, speed up the shipping process, and gain more detailed processing information.

RFID is still a fairly new technology. It is a digital, data encoded smart label that is captured by a reader, via radio waves. With one scan, the system transmits **in-depth and detailed information** on a product in the form of a unique serial number. The digital label can support a larger set of unique ID numbers and can incorporate additional data such as expiration date, price, product category, and manufacturer, etc. RFID makes it simple to update product information anytime, or anywhere.

There are many factors to consider before implementing RFID into your organization. If it is the right fit for your company, the **benefits are endless**.

In this whitepaper, we discuss the various aspects of RFID and the role Clear Spider plays.

What is RFID Technology?




Radio Frequency Identification, known as RFID, is a wireless communication technology that uses electromagnetic fields to read information from tags.

The RFID system is made up of 2 main components. 1) the RFID reader, and 2) the RFID tags.

The waves transmitted from the tags are captured by the RFID scanner, which is then translated into digital data. It enables identification from a distance, and unlike earlier barcode technology, it does so without requiring a line of sight. Objects, with RFID tags attached to them, can be easily identified and tracked.

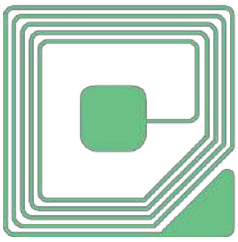
You will find RFID technology in logistics, inventories, and warehouses. RFID tags can help with access control, asset management, public transport and tolls, libraries and museums, and even with surgeries.

Let's take a more detailed look at what RFID technology is.

What is RFID Technology?

As mentioned, the RFID reader uses electromagnetic fields to read information from tags. There are two types of RFID tags: **active and passive**. Active tags are battery-powered and transmit their signals automatically. Passive tags come without a power source and only relay a signal when prompted by a Radio Frequency (RF) scanner/reader.

ACTIVE



PASSIVE

Read Range

While active tags have a read range of approximately 300 feet, passive tags have a lower read range of 2-40 feet. Since passive tags are less complex and more economical in nature, they are widely used in supply chain and inventory management.

Frequency

Within the electromagnetic spectrum, there are 3 primary frequency ranges used for RFID transmissions - **low** (125 KHz), **high** (13.56 MHz), and **ultra-high** (850-900 MHz). Passive tags typically operate on low frequency bandwidths, and active tags operate on high frequency bandwidths. Deciding which type of RFID tags to work with, depends on your **environment, scale of operations,** and **other considerations.**

For example, low frequency tags have a slower read rate and a shorter read range, but are more capable of reading data near metal or liquid surfaces. Ultra-high frequency tags are better suited for high volume asset tracking and inventory management. They have a longer read range and quicker read time, but are more sensitive to interference caused by surrounding metal or liquids.

Why Use RFID Technology?

There are many of benefits to using RFID tags in inventory management. Keeping identification intact, and improving the logistics of scanning and storing data, are just some advantages. RFID contains high levels of security, and once set up, it can run with minimal human participation.

- Real-Time Tracking and Tracing
- Efficient Asset Management
- Condition Monitoring

Here are some other benefits that RFID technology could bring to your operation:

1. **Durability** — RFID tags do not need to be positioned in a line of sight with the scanner. Since they do not have to be on the outside of packaging, it ensures the tags stay intact.
2. **Bulk Scanning** — You can scan a container full of items at the same time. The tags run on ultra-high frequency, meaning it can be read fast.
3. **Long-Range** — The typical read range is around 3 feet for high range scanners, and 10-20 feet for ultra-high range scanners. Items are read in less than 100 milliseconds.
4. **Data Storage** — They have large data capabilities maintaining anything from 2KB to 8KB. With one scan, you can find out information such as product maintenance and expiry dates.
5. **Dynamic** — All of the information that is stored on an RFID tag is dynamic, meaning it can be changed at any time. This makes it easy to update product information or reuse tags.

Barcodes vs RFID

When managing inventory, it is vital to consider which data collection method is best for you. Although both RFID and barcodes are used for this purpose, the methods differ.

Generally speaking, barcode scanning is more affordable and easier to implement since all it requires is a reader and printed label. On the other hand, RFID does offer added value. Barcodes have a 20 character limit and cannot hold as much information as RFID tags. They are very labour intensive; as they must be scanned individually, whereas RFID tags can be **read outside the scanner's line-of-sight**. Ultimately, you must choose the best system that suits the scale, and resources, of your operations.

Here is a breakdown of the major differences between **barcodes** and **RFID**:

Barcode	VS	RFID
$	Cost	$$$
Directly on the barcode (up to 15 ft.)	Line of Vision	Near the RFID tag (up to 300 ft.)
Can only scan one item at a time	Range	Can scan multiple items at once (up to 40)
Small and easy to use	Usability	Larger and can be more difficult to use
Very accurate	Accuracy	Fairly Accurate
Requires an employee	Automated	Requires little human interference
Typically not used more than once	Reusable	Can be used more than once
Can only be read	Write	Can have information added on

RFID in Use

Although RFID technology has been around for decades, it wasn't until recently that it was adopted into inventory management. When RFID tagging was first introduced to supply chain, it was not immediately received and the primary reason was cost.

In recent years, there have been advancements that made RFID more affordable, and has enabled large scale adoption for business operations. As a result, many companies have been able to use RFID in their supply chain, and are experiencing a wide range of benefits.

Here is an example of RFID in inventory management:

RFID Kiosk

An Industrial Supplies Company

Before RFID

Employees would manually create purchase orders or scan each barcode to refill orders.

Implementation

1. Set-up is quick and can be maintained remotely (vendor managed inventory).
2. Worker drops empty bin down a chute in an RFID **kiosk,** the bin of supplies needs to be restocked.
3. An RFID reader antenna inside the chute captures the ID tag on the bin.
4. Kiosk displays the replenishment order on the screen and **relays the same information** to the back end inventory management system.
5. Inventory software determines the item number and automatically creates a replenishment order.

Results

- Automatic replenishment
- Prevented stock outs
- Virtually eliminated human error
- Increased inventory accuracy and efficiency
- Created an intelligent workflow

RFID in Use

Here is another example of RFID used in inventory management:

A Heavy Machinery Company

Before RFID

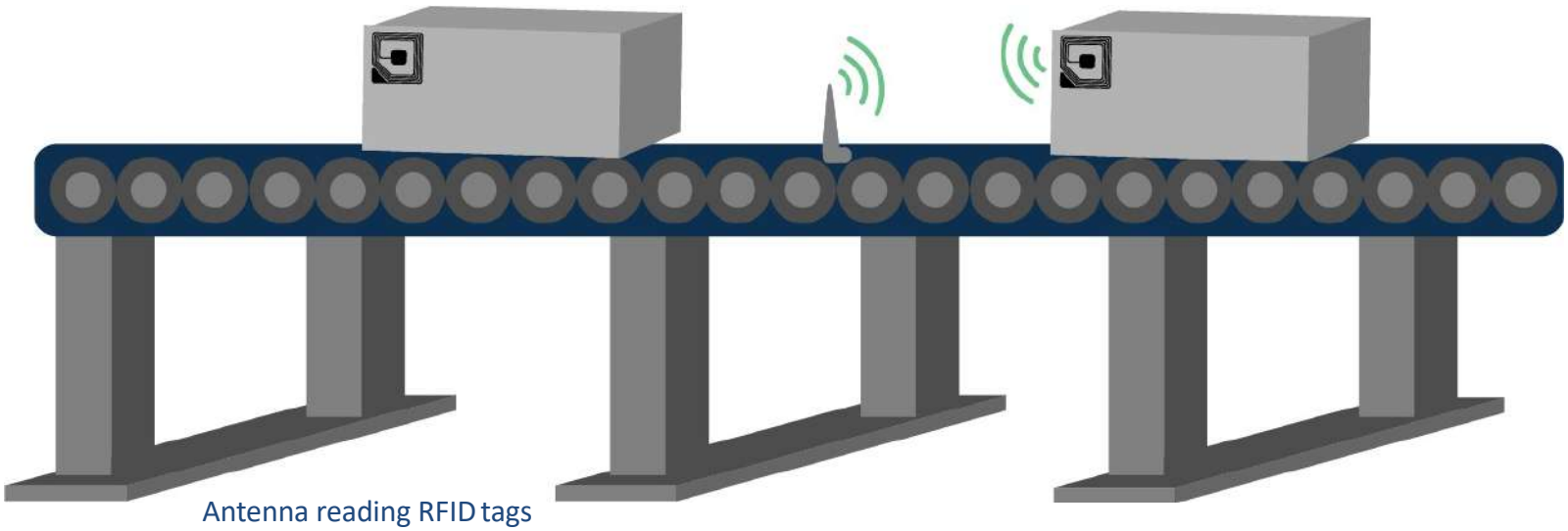
At each stage in production, operators used clipboards and checklists, to stay organized. This was the best way to ensure that each item that passed through the line, was in matching groups. Clipboards and checklists left a lot of room for error.

Implementation

1. Chose a **read-only RFID** tag because it worked better on the metal pallets.
2. All tags were custom programmed with serial numbers.
3. Installed on each side of the pallets to ensure the antenna would read it.
4. Antenna was installed in the conveyor line between rollers.
5. The tags help with the actual **manufacturing process**, as well as **order management.**

Results

- Eliminated human error
- Production was more accurate and efficient
- Provided flexibility



Antenna reading RFID tags

System Implementation Timeline

Before implementing RFID, determine if it is the right fit for you. Here are a list of steps that should be evaluated.

1. Research the existing standards and regulations

Particularly with ultra-high frequency RFID signals, have a look at the **frequency ranges** that are acceptable in your country. For example, Brazil has uncommon frequency ranges, which requires the reader to be set to a specific broadcast.

2. Perform a site survey

Consider performing a full **RF-spectrum survey** to find competing wireless or radio signals, to ensure the facility environment has no existing interference. You can also perform a physical survey to plan for the location for RFID readers.

3. Choose the right RFID tags

Decide if **active** or **passive** tags best suit your organizations needs. Also consider the number of tags you need, the tag sizes, your required read range, and tags that work around the interference you cannot eliminate.

4. Plan for attaching tags to assets

Properly attaching your RFID tags to inventory is crucial to ensure the accuracy of asset tracking. **Welding or bolting the RFID tags** to the product will make sure it stays securely attached. However, there are also semi-permanent options, like with zip ties, adhesives, and locking removable tags.

System Implementation Timeline

5. Plan for Commissioning Tags

Each RFID tag has a unique Electronic Product Code (EPC) that is similar to numbers on a barcode.

To commission the tags into use, it is generally recommended to do it before they are attached to the assets and away from the rest of the inventory storage area. This **reduces** the chance of **competing radio frequencies** mistakenly commissioning more than one asset.

Vendor-Commissioned Tags

RFID deployment is **faster** when you receive the tags already commissioned by your vendor. All you have to do is provide them your numbers and they will set it up for you. This works best if you are tagging sequentially, multiple inventory locations in a row, or assigning numbers to assets for the first time.

In-House Tags

This option is most suited for inventory that has existing **non-sequential identification numbers**. Set up an in-house commission line with an RFID reader or printer, and collect the data aisle by aisle. Then, program the tags in a separate area so there is no interference.

6. Create an Application Testing Plan

Conduct a pilot project and test how effective the technology is to your operations. You can test the readability of your tag and reader placement, and familiarize employees with the new system. During this phase, keep it small-scale and only involve a portion of your company's operations. Evaluate the challenges you run into so **you can resolve similar setbacks in the future.**

After all these steps are considered, you can move forward with your RFID implementation decision well-informed.

Costs & ROI

Consider

When considering purchasing and deploying any new system, an important question to answer is when will the company see a return on its investment (ROI). The ability to calculate ROI, and quantify the benefits, is not always easy due to the complex nature of the supply chain.

For many operations, the benefits of investment in RFID technology is found in:

Labour savings

Efficiency in performing warehouse activities

Cycle counts are done more accurately and frequently

The time it takes to receive and put away shipments decreases

RFID **reduces** operational expenses, and the automation of processes allows your employees to focus on higher value tasks.

Take into account the current costs of managing your inventory. Not only does this include the face-value of your items, but what if an item with highly sensitive information goes missing? The impact could result in **millions of dollars lost**.

Ultimately, each company will have to determine the ROI, based on the unique issues they are implementing the technology to solve. **Remember to consider the opportunity costs.** Evaluate objectives, and decide on a definable measure of impact, to reach an estimated ROI.

Costs & ROI

Calculate

The cost of implementing RFID depends on the scale, the scope of work, and the type of system, as well as many other factors. It is very difficult to pinpoint an exact, or close to exact, figure. Below are a few cost comparisons.[1]

RFID Tag

RFID Reader

Passive	Active	Passive	Active
$0.10	$20.00	$3,000 – $20,000	$1,250 - $1,500

There are a few costs to look at:

The cost of implementing an **inventory management software** system, depends on the number of features you want. The subscription or licensed RFID software, including implementation and hardware, typically starts at $5,000 dollars and can reach upwards of $500,000 dollars.[2]

Other deployment costs that can vary are:

Upgrading network or infrastructure in your facility to accommodate RFID.

Maintenance costs, such as battery replacements depending on life expectancy.

The amount of **time** it takes to implement RFID depends on your scope of work.

If you're introducing a simple RFID mobile reader solution, then it could be rolled out within a couple weeks. However, if you have a large warehouse and want to install a robust system, with all the RFID technology included, then the project may take months [3] to configure all the physical equipment.

[1] https://www.advancedmobilegroup.com/blog/the-true-price-of-rfid-tags
[2] https://www.sstid.com/the-cost-of-rfid-heres-what-you-need-to-know/
[3] https://www.atlasrfidstore.com/deploying-an-rfid-system-20-questions-and-answers/#question17

Best Practices

1

While RFID tags do not require line of sight, be aware of the surrounding environment. Make sure you have tags that can accommodate interference from metal or liquids.

2

Some tags may have a horizontal or vertical field of detection. Improve read performance by optimizing the placement and orientation of the RFID tag.

3

Properly secure the RFID tags to your assets. If your items are commonly moved around or exposed to harsh conditions, reconsider their placement.

4

Attach RFID tags to the assets only after they have been configured with your backend system, and are verified to be in working order.

5

When using RFID on metal, make sure to put your tags on the outermost asset. Having your tag properly placed will reduce the wear and tear effects.

6

Do not re-use tags unless your system has been designed to do so. It will increases the risk of confusion in the back-end system. The circuit system inside the RFID tag can be damaged with overuse.

Today, over 100,000 companies use Clear Spider on a daily basis.

Clear Spider is a web-based inventory management solution for companies to manage either their own inventory or the inventory of their customers and suppliers. There is no hardware or software installation, so deployment is quick.

Clear Spider is easy to learn, use, and maintain.

Interested in learning more?
Contact us to discuss how RFID can help with your inventory management needs.

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