



Updated
Questions
for 2021!

21 Questions to Ask Before Adopting RFID



RFID Expertise: Design, Deploy and Measure

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Introduction



RFID deployments have been growing exponentially for several years as the technology keeps evolving and becoming relevant in applications previously considered ill-suited for it. If you are one of the many businesses re-examining the potential RFID has for your applications, it is helpful to know what the right questions are before you start. This guide introduces the most common ones that lead to a successful pathway to implementation of RFID technology. While answers will vary depending upon the intended industry and application, we have covered the most common scenarios here for you to start with.

BEGINNER

Q1

What specific problem do we think we can solve with RFID?

There are many ways to improve your business with RFID.

But the problem, desired improvement, ROI, and measurement methods should all be identified upfront when making the business case.

There are several scenarios possible with the first-time deployment of an RFID solution:

1. **Setting a baseline understanding of current processes operations.** In this approach, RFID enables one to get a picture of how well important operations are working and identify the underlying specific problems or issues that need to be addressed. Ex: Product WIP Manufacturing
2. **Targeting a very specific area or process.** In other cases, RFID will be fundamental to improving an Area or Zone, Inventory Execution, Product Orders Ship Validation, or other specific processes.
3. **Focusing on Increasing Sales** – Not every improvement is about operations, as some RFID applications may be considered to target increased Sales via quality and accuracy improvements. For example, the elimination of out of stock items, split orders, or lost items, can improve sales directly or lower the cost of sales.
4. **Quality Control Applications** - Tracking an item from the beginning of its life cycle in manufacturing and through its entire production can improve the speed of finding quality issues. The same applies to finished goods tracked throughout the delivery chain, warehouse to the customer.

What items or material types can we track?

Depending on your industry, product portfolio and processes, the items and their constituent materials can vary greatly. Tracking work-in-progress (WIP) Parts vs. Finished Products vs. Office Assets vs. Equipment vs. Document Files vs. People take different considerations.

- For WIP, it is often the accompanying paperwork or the bin or container of the product that is tracked. Material handling equipment may also be tracked to enable directed moves.
- Items made from metal reflect RF energy and can result in misreads. These items require a specialized “on-metal” tag to optimize reads.
- Items which contain water require a specially tuned RFID tag or “raised inlay” separation since water absorbs RF energy.



RFID is now present almost anywhere outside of the warehouse now - on construction sites, in retail, in trucking fleets and more

What information about the items can we track?

In addition to the tracking keys (business asset ID and tag EPC values), many other items can be tracked and maintained.

- Each item usually has a meaningful ID, such as UPC or Asset ID, which is used for its identity. Since Universal Product Codes are not unique, so if required, the specific product instance may be tracked by the association to its tag's EPC value.
- Meta-data or attributes used to identify additional information about an item can be static or may change over the items' life cycles. For example, a product's production date, lot number, or serial number will not change with time, whereas its status ("sold", "shipped", "under repair", "returned", etc.) may evolve throughout its life cycle.
- A good rule is to avoid duplication of stored information across different systems. Customer systems such as ERP or WMS are the primary user systems, so the tracking system should only store attributes that are necessary for the operator to view during data capture, changed via portal reads, or changed via mobile device transactions. Any meta-data changes should always be passed back to update the primary business systems.
- Each item will usually have a business meaningful ID, such as UPC or Asset ID, which is used for its identity. Universal Product Codes are not unique, so if required, the specific product instance may be tracked by the association to its tag's EPC value.



Software that provides full visibility and works with your existing WMS, ERP and other platforms makes deploying RFID easier. Learn more about Vizitrace [here](#).

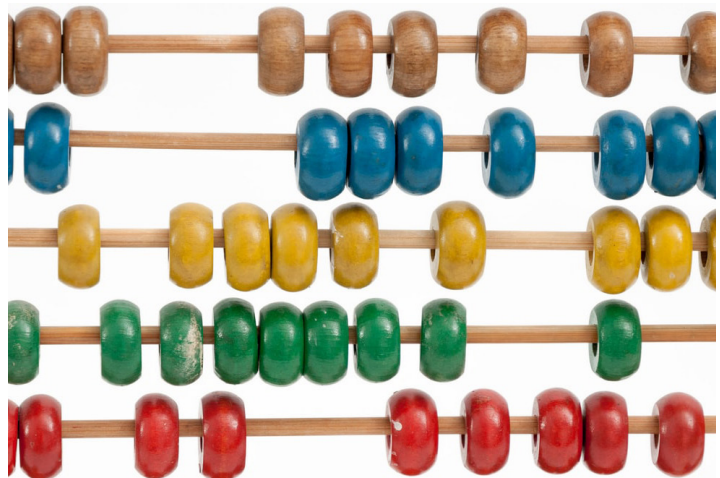
How many of each item type can be tracked - where, when, and how often?

One major benefit of RFID is that there are not many limitations on what can be tracked, how often and frequently they get scanned, or where you can scan them, though this does not mean it is a practical solution for everything.

Products can be tracked at many levels - the item itself, a case, pallet, or even container. You can track at one or all of these levels depending on what your needs are, even in combination with bar codes at some levels for a hybrid approach. Typical factors to consider are:

- The item volume, timings for the read (ex: conveyors), and the read locations of required tracking transactions. This information will be used by your RFID specialist to determine the optimal hardware and software configurations such as reader mode, session values, and tag states.
- Locations associated with specific steps in a life-cycle process. From these, we can infer a step is being completed based upon the item reaching (being “seen”) at that location.
- Recognizing and documenting the items’ life-cycle activities and their corresponding locations as input necessary for the design of the RFID system solution.

For example, a moving conveyor carrying 1000 parts in 5 seconds past a read point will need to configure the reader’s communications with the tags differently than 10 trucks stopping at a road gate read point over an hour. Finally, is there a cycle to their movement? The counting of amusement park ride lanyards and harnesses, which carry customers, creates information that allows for the creation of triggers used to initiate cleaning and inspections according to regulations.



What level of tracking or location accuracy will you need?

The more tracking accuracy required, the more tracking appliance infrastructure and consequent increase in implementation costs. Here are some basic guidelines to the kind of granularity that can be expected from RFID:

- As a passive UHF technology, RFID usually does not provide “X, Y” locating, but rather the last location seen (read) information.
 - o Fixed read points can have one or more antennas fields and are identified with a business meaningful location name.
 - o Operators use Mobile RFID readers (Integrated Devices or Bluetooth Sleds) to perform operations such as Geiger Counter find to locate items, starting at the last seen read point location.
- Adjusting the power or angle of the RFID antenna affects the size and location of the read point. All read points should be tested, tuned, and re-tested in cycles.
- The solution design including UHF passive read point sizes and shapes should be demarked on drawings.
- Reader Mode, Reader Session, Tag State, RSSI (Signal Strength), etc. affect read results and accuracy.
- Antenna Placement and Direction, Antenna Gain, Antenna Polarization, etc. affect the read performance and accuracy.



How are RFID tags different from Barcode labels?

In general, RFID tags are a far more complex technology than the standard barcode label, which is the main reason they are generally more expensive. But what goes into an RFID tag and how does it work?

- They generally include an inlay in a specific form factor such as “label” or “hard”, which takes the form of a computer chip connected to a dipole antenna.
- Chip RF sensitivity, inlay antenna size and shape all impact read accuracy and range. The larger the inlay antenna, the longer the tag’s read range will be.
- Tags are designed to work best with certain kinds of materials. For example, “On metal” tags may be tuned to use the metal as part of its antenna construct.
- Other tags may be tuned best for various plastics or polymers. Determining the best tagging solution for an application requires testing.
- Unlike bar codes, RFID tags need to be “commissioned”, which is the process of adhering the tag to the item and capturing the corresponding Tag EPC value.
- RFID tags have multiple methods for attaching to an object, depending on their type (label, on-metal label, hard tag, on-metal hard) and material to be tagged. While most materials use RFID tags using some form of adhesive, others may require being stitched and those on metal may be attached via embedding, screws/bolts, or even welding. These are usually used for capital assets such as computers, equipment, vehicles, tools, etc.
- Labels tags are less expensive than hard tag form factors.
- Rugged hard tags are manufactured to withstand considerable stresses (temperatures of 400 – 500 degrees Fahrenheit (off the shelf) or even higher temperatures for custom tags!).



How long will it take to implement an RFID solution?

While every implementation will vary based on the scope, most implementations can be scheduled based on a few common elements. An RFID specialist will save project time and cost for both design and implementation. Here are the key factors they look at when creating a project schedule:

- As life-cycle tracking of products or assets is usually implemented in major phases, the number of phases will matter.
- Each project phase duration varies depending upon the scope (Warehouse, Distribution, Transportation, Store, Direct to Customer), and the time will vary.
- The installation of fixed infrastructure takes longer than the deployment of mobile RFID applications. 30 - 60 days for installation, configuration, system integration, testing, and production release is common.
- Software platform customizations add time, cost, and increase risk. However, platforms with an API built to integrate with existing business systems can reduce that risk, time, and cost.
- For on-premise software, the requisition of a server or setup of a Virtual Machine will also impact the project schedule.



Q8

Who is going to support the solution once it is implemented?

Support from your chosen RFID software platform provider, RFID specialist, and the manufacturer is essential. A good RFID platform monitors health checks of connected devices to alert you to problems. Some platforms automatically recover from network outages or reader disconnects.

Ideally, there should be a Subject Matter Expert (SME) for the solution on hand who is familiar with the operation of the solution components, and IT must be available to provide network or server admin support, along with routine database backups.

Q9

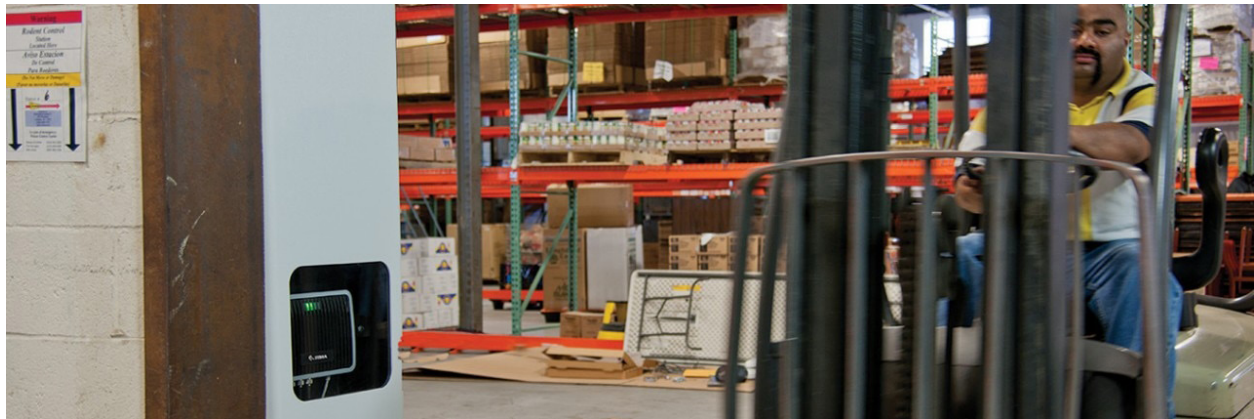
What about cloud-based tracking solutions?

Like most applications, RFID solutions are increasingly cloud-friendly. Check with your RFID specialist for Cloud-friendly solutions. These applications are commonly offered as a SaaS (Software As A Service) subscription model. Using a cloud-based solution has multiple benefits, including reducing the potential cost and support burden for IT, faster implementation, and better integration of data sources for analytics and reporting.



What tracking projects are not right for RFID?

While the continuously declining price of tags may make it tempting to look at almost everything as a fit for RFID, project profiles which include a low number of assets or assets with low value are typically not the best candidates for sufficient ROI. On the flip side, facilities managing high-value items are much stronger candidates because RFID can also be deployed as a security measure.



INTERMEDIATE

Q11

Who is involved in the decision process, and who are my stakeholders?

We always find it best to identify all stakeholders beforehand, including the executive sponsor, business management, operations management, users, and if not already included above IT management.

Once identified, stakeholders and Subject Matter Experts (SMEs) should be included upfront as team members, though the depth they are involved in after kick-off may vary based on the roles and responsibilities you have assigned for each.

And if your organization is light on process expertise or project management (not uncommon in smaller businesses), that should be a consideration when bringing in a solution provider. Ideally, you would engage a full-solution provider that is Brand agnostic – one that is not wedded to a specific manufacturer but rather brings the best solution for your business. They should also be able to handle the hardware, software, tags, installation, and support that is required to ensure your solution is implemented efficiently and works as designed.

How do we choose the right RFID tag?

A trained RFID specialist will have the expertise to help you do this. When selecting your RFID tags, the following factors should be considered:

- The material of the asset being tracked (in some cases both the asset itself and any packaging that may be on it).
- Form Factor / Size (Physical or Memory)
- Environment exposures that may lead to tag failure. Physical Contact, Pressure, Weather, Chemicals, Temperature (High, Low, Rate of Change, Dwell), Electricity, and Radiation (UV and higher) must be accounted for.
- The life-cycle of the assets being tracked.
- Read Performance, Tag Placement and Tag Orientation to Read Field – usually a factor of the environment and infrastructure
- The assumed method of tag adherence along with the quantity and cost



What kinds of environmental conditions should be considered?

Like labels, RFID tags come in a large variety of materials, inlay, adhesives, etc. They come made for almost anything, including:

- Hot and Cold (Temp Range, Dwell Times, Rates of Change)
- Dry, Wet or Dirty Conditions
- Physical Contact, Chemical Exposure, Ultraviolet Light
- Indoor vs. Outdoor, and the immediate surroundings (Metal or Water vs. Non-metals)
- Signal frequency interference (Some types of proximity remote crane controllers may cause signal interference).
- Reader Interference. Where readers are in close proximity, they may need to be set to “Dense Reader Mode”.

Documenting the use cases for the product or surface where the tags will be applied and making note of the various conditions the tags will be subjected to during its life are important details to share with your provider when choosing the right tag. Like barcode labels, both the environment where it is APPLIED and where it is stored or used may differ, and will require an appropriate variety of tag.



Do RFID Solutions integrate with existing WMS, ERP, or other systems?

The short answer is that YES, your RFID solution SHOULD integrate with your existing systems. If you are looking at one that does not, it is probably worth investing more time into looking for another one. As a best practice, your RFID solution should be a complementary addition to your existing primary systems and serve as another tool that increases visibility.

But where does it start? The initial, most common process point for sharing information across systems should be during the item commissioning (when the RFID tag is being applied). Other information normally shared is the data generated whenever the system reads a location change. This event (Asset ID, Date, Time, Location Seen) is the minimum level of integration that must be shared by the RFID system with the primary business system.



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Q15

How will our current operational processes change?

Implementing a new technology like RFID almost always implies either a process change as an outcome or one that led to the decision to deploy it in the first place. Working with your RFID Specialist or another process analyst, current process maps should be updated based upon the impact of using RFID tracking technology its related software.

In all likelihood, macro processes will not be altered significantly, but the methods or procedures used within them may and will allow faster, more accurate execution. Other processes may be turn out to be automatically executed. For example, in Receiving, the old process may have required an operator to scan a barcode for each item coming into the facility. With the new RFID-enabled process, an RFID reader automatically scans received items into the facility.

Since RFID leads to more high-level information about item locations, tracking systems may be better automated to coordinate process starts, stops, and hand-offs, i.e. When an order that is being picked to staging is complete and ready for shipping.

Q16

Who are the primary users, where are they located, and how many are there?

The process analysis should include work to identify users and their responsibilities, needs, how they will interact with the system. Since fixed readers automate tracking, the roles and responsibilities of your team after the implementation will likely be very different than what it was before. Operators collecting RFID data using a mobile device or a PC workstation may find some of their processes unchanged, but only more efficient and accurate.

Is Success Measured Differently With RFID?

Before you can understand how to measure success, you need to define what success means and your solution's projected ROI first. Some examples of what you might be looking at are:

- Process Operations Efficiency Gains (Quantity, Cost, Time, Output, Complexity)
- Process Operations Accuracy Gains (Quality, Traceability, Identification)
- Process Operations Intelligence and Predictions Gains (BI, Measures, KPIs)
- Increased Sales

You should always ensure your measures align with the specific problem and improvement you looking to achieve and collect data that corresponds to each measure for success. It pays to start with your stakeholders and getting agreement on what data (KPIs) reflects these measures, how each will be quantified and collected, and what the priorities are for improvements.



Q18

What kind of reporting is available?

Your reporting requirements, as always, should be linked to the agreed measures and established KPIs. As RFID's primary mission is to increase visibility across the business, the data is available for use as a standalone set or integrated with other data points from your data warehouse, ERP, WMS or other systems to be used in analytics, alerts, standing reports, etc.

As part of your implementation, your process or RFID expert should help you consider and develop real-time information (Dashboards) vs. point in time information (Reports), along with permission hierarchies to determine who needs to see what information, when, and where. As part of the system design before implementation, determine what system will provide the reporting. The RFID system will likely feed the necessary data to your business system which will provide the reports.

Q19

What are the major components and costs of implementing a successful RFID solution?

Like many system solutions, there are four key pieces to consider to implement a comprehensive solution:

Expertise – internal or external, critical in the design stage, but also for deployment and support.

The help, advice, and professional services from experienced RFID specialists help maximize success and reduce the overall cost of implementation. Make sure the services provider are experts, especially with the RFID software platform. A “one-stop-shop” RFID provider is always best. IT and Facilities Management are also key players to ensure resources are available or consulted for server, network, wiring, and any hardware installations.



Hardware – RFID Readers and Antennae, and specialized printers

The range of RFID Readers, Antennas, and Printers available covers every potential environment and process possibility. Their features, form factors, cost, and capabilities vary for sensitivity, processing power, features, and several antenna ports. RFID Readers can start from \$500 on the low-end and run to over \$2,000 for higher end devices. RFID antennas will vary by size, gain, polarization, beam width, etc. and have a smaller price range all under \$1,000.

Software – a platform or plug-in that integrates with your systems, or a standalone app.

All the best hardware does not guarantee results without the foundation of a good software platform. A system with proven prebuilt components and applications make implementations simpler, faster, cheaper, and more reliable.

Media – The RFID tags that are what makes it all work

In its earliest days, the cost of tags was once considered a permanent barrier to RFID becoming mainstream. As costs have plummeted over the last ten years, that barrier has gone away and has been a big part of mainstream adoption. The cost of label tags and off-the-shelf inlays are somewhat dependent on volume (for reference, “high volumes” are in the millions, “low volumes” are in the thousands). Pre-encoded, serialized tags cost more than the un-encoded tag roles. The un-encoded roles must be encoded during the printing of the labels.

Label tag costs may range from < 10 cents (high volume) for unencoded, off-the-shelf, high volume inlays to 40 cents for pre-encoded, low volume, specialized inlays, while on-metal label tags range from around 50 cents to a dollar.

Q20

Who are the leading manufacturers and suppliers?

Many of the leading manufacturers you'll find in the RFID world are familiar names and some may be new to you because they specialize in this field. Leading manufacturers for RFID readers (fixed and handheld) include Zebra Technologies, Impinj, Honeywell, and JADAK (Thingmagic). Names you will commonly see for consumables like RFID tags include HID Global, Avery Dennison, Alien, SmarTrac, Confidex, Xerafy, Vizinex.

Q21

Can consumer devices be used within an RFID solution?

We have seen many implementations using consumer-grade devices, but they come with limitations that create more challenges not present in commercial-grade systems. Consumer devices are not built to endure the conditions of the warehouse and manufacturing floor and exhibit poor performance with high volume and extreme conditions like cold, damp, and heat. Since production operations count on the reliability, performance, and support infrastructure of Enterprise-Grade Systems, consumer devices will underperform from lesser support response and lower quality compared to the rugged design of commercial-grade devices.



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