

# TEN STEPS TO RFID SUCCESS

RFID is not about technology, it's about management, says **ALFIO GRASSO**, who recommends following these ten steps for a successful implementation.

An integrated circuit connected to an antenna receives RF (radio frequency) energy and transmits (or reflects) a response. That is radio frequency identification (RFID) – really just another way to capture data, and its technology and application are not difficult.

While there may be regulatory issues, fortunately, two frequency bands are almost universally acceptable: 13.56 MHz (HF) and 860-960 MHz (UHF), which are the two bands that EPCglobal has selected for specifications, known as Class 1 Generation 2 standards, at UHF (published) and HF (final stages of the development process).

When is the best time to start? Today. Because beginning your RFID deployment earlier gives you time to correct mistakes, retrain workers, and phase-in change. RFID is not about technology, it's about management! But before you start, it is worthwhile to remember that planning is a very important part of the process, and RFID is no different.

In general, I have found that successful RFID implementation projects are successful because the project management team has followed ten basic steps, which are described in the rest of this article (and are relevant to RFID products that comply with EPCglobal's specifications).

## 1. DEFINE WHAT YOU ARE DOING

It sounds simple, but you cannot plan a successful RFID implementation if you do not define the scope of your project. What exactly is the purpose of the RFID project? Is it simply for compliance with an external mandate, or is it to increase your bottom

line, for example by either reducing inventory, increasing stock visibility, reducing operating costs, increasing asset utilization, reducing shrinkage, or reducing shipping errors?

What existing infrastructure in your facilities can be exploited in the RFID project? What are your vendors doing in RFID projects? What are your clients doing, or plan to do? Are your vendors and clients using similar technology, for example UHF or HF? Do you undertake the project by implementing a pilot project, or can you undertake an extensive test plan?

As this stage proceeds, there is a tendency to increase the scope of your RFID project, but for a first project, try and resist the temptation and minimize scope creep. Form a cross-functional team, consisting of senior managers from all departments, e.g. Manufacturing, Operations, Packaging, Warehouse

Management, Security, Finance and IT. Educate the team on real RFID performance and expectations, and leverage any data collected internally amongst departments. Identify all the problems and opportunities, even if opportunities for RFID may mean a change to business processes. And talk to people on the factory floor, to check that the business processes your team identified are actually followed.

Define the scope of the RFID implementation, potentially narrowing the scope by region, or department, or area. Consider higher value projects first, for example pallet-level RFID rather than case level, or item level. Analyze the operation and itemize and quantify all business processes. Assess the financial impact of the project, not only capital expenditure on infrastructure, but also ongoing operating costs.



[ Industry exhibitions are one way of finding RFID suppliers and seeing what they have to offer. ]

Consider installation costs, wiring or power and communications for reader, upgrades to IT systems. Determine benefits of the RFID project, reduction in errors, reduction in staff time, etc. Perform a sensitivity analysis with respect to the cost of RFID hardware (readers, antennas, tags), as these are always reducing in cost, and many projects may become profitable as prices fall.

## 2. LOCATE SOLUTION PROVIDERS

There are numerous RFID solution providers around the globe, all with varying levels of expertise, product offerings and local presence. The one-stop shop does not really exist: it is unlikely that one vendor will be able to supply all of your RFID needs, as a project may need different vendors for tags, readers, antennas, IT solutions within the EPCglobal Network Stack ([www.epcglobalinc.org/standards](http://www.epcglobalinc.org/standards)), while other suppliers may be used locally to provide installation, commissioning, maintenance and upgrades.

Some vendors have specialized in vertical markets, such as FMCG, Healthcare, Consumer Electronics, etc. Many RFID reader vendors also embed EPCglobal Network Stack elements in their devices, and ERP providers have modules for various EPCglobal Network Stack elements, with preferred vendors. Some tag vendors offer test services, or applied tag performance tests, while others offer tag customization services.

## 3. USE APPROPRIATE ASSESSMENT CRITERIA

Can vendors supply your needs, volumes and schedules? Do they offer truly certified and compliant products? With what platforms has their equipment been tested? Do those vendors operate in your vertical industry? What range of IT solutions do they support? Have they integrated into a legacy system that you currently use? How do they handle privacy? Can they expand to your requirements: is the solution scalable? What services do they have?

Do they offer site inspection services? Do they offer design, installation, commissioning and maintenance services? Who have they partnered with in both hardware and software on past projects? What experience have they had in your industry?

What test methods do they use to test their products, ISO, EPCglobal or proprietary? Do they offer

customization services, for example in packaging, form factor, and who owns the IP of that customization: are you locked into them? How do they handle maintenance and upgrades.

Ensure that any products you purchase have been certified by EPCglobal, i.e. they have an EPCglobal compliance certification. Avoid companies that lock you into purchasing complete solutions, even if those solutions are based on EPCglobal products, always ensure that you can purchase tags and readers from any vendor with certified products.

It is ideal for suppliers to have both global and local presence; global so they have access to a wide range of resources and experience, but local so they can respond to your local needs quickly and efficiently.

## 4. ANALYZE IT & RF IMPACTS

Any new project is going to impact your IT system, and RFID has the potential to be a very disruptive technology, not only on your IT system, but also to the RF environment.

Is your IT system up to the challenge? When a human scans a barcode this manual operation takes a few seconds. However, when an RFID reader reads EPC tags, it can read hundreds per second. Can your IT system handle the data overload? Can your LAN cope with the increased traffic?

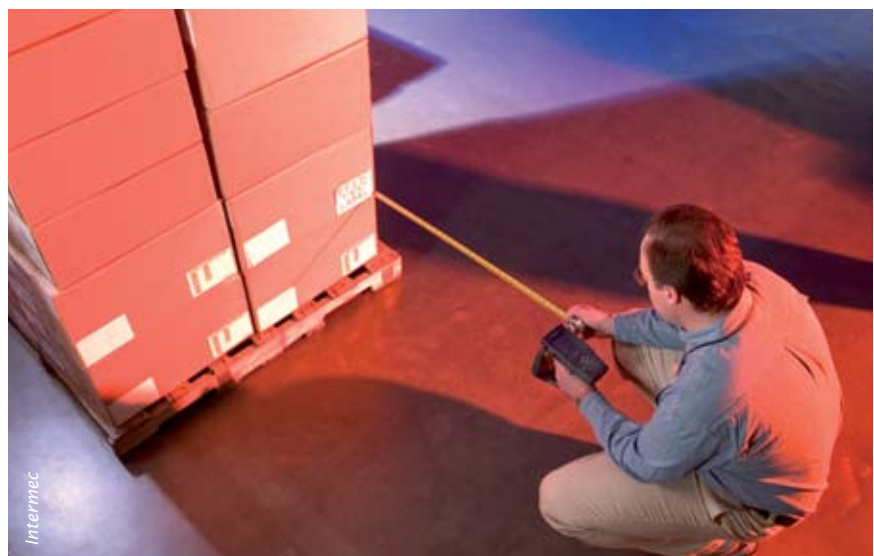
A human can also “see” the object being scanned and has the opportunity to correct erroneous

information, but the RFID reader just reads the EPC codes, hence your data needs to be accurate. How can you be sure that all your data in your system is correct?

RFID signals are reflected by conductive surfaces. Have you taken into account reflections from existing metal infrastructure? Will the walls of your building affect RFID performance through multi-path propagation? Will the reinforcing bars in the concrete floors affect performance? Will the metal stud work in the walls affect HF performance?

Moisture absorbs UHF energy, and so how will the presence of moisture affect your RFID performance? Is the environment a high humidity one? Do the products that you want to identify contain liquids? Do your wooden pallets get wet? What happens to your IT systems and the RF environment as you expand your RFID applications in the area?

Can you duplicate your RFID project in other areas? What works in one location may not work in another, even within the same organization. Different facilities are built at different times, to different building codes, with different building styles and different materials. Hence a site survey should be undertaken at each new proposed RFID location. You need to factor in these tests in your project plan. Even if you are not planning an RFID project, but you are undertaking an upgrade of your infrastructure, plan on using RF-friendly assets, for example, ensure that your conveyor system is modularized and can be altered



[ A site survey should be undertaken at each new proposed RFID location. ]



[ Location, location, location: optimum positioning of the tag on the item is a crucial determinant of RFID system performance. ]

for RFID use. Work with product designers and packaging experts to design products to be RFID-friendly. (The Gillette Fusion razor blade, released in 2006, was the first new product packaging to be designed to be EPC-friendly.)

## 5. CONSIDER READER/TAG ISSUES

If a tagged product is always presented to the reader in the same orientation, then a linearly polarized reader antenna can be used, but if the orientation can vary, then a circularly polarized reader antenna should be the choice. The type of reader deployed will also vary, such as fixed readers on portals around dock doors and on conveyors, to mobile readers on fork lifts and trucks, to handheld readers for personnel. To support easy maintenance, all readers should be capable of remote start, on board diagnostics and online upgrades.

As the number of readers increase in a facility, then interference from

one reader with another is highly likely, unless specific plans are put in place. The FCC regulations that employ frequency hopping spread spectrum (FHSS) techniques is one such way to mitigate such interference, another is the use of reader synchronizers, such as proposed in the European jurisdiction.

As they say in the real estate business: location, location, location! While the location of a reader is important, the location of a tag on an item is crucial. The optimal location for an RFID tag may not be the as that for a bar code or human readable information. Rather, it depends upon the object that needs to be identified, and the material with which the item is composed.

Simple things like moisture on wooden pallets can severely affect read range. If the tagged item contains lots of metal then look for gaps. Metal can sometimes increase performance. If a tag is placed  $\frac{1}{4}$  of a wavelength above a metal plane, then the tag receives the forward RF wave (from the reader to the tag). But the reverse RF wave (reflected with a phase change from the metal surface) will travel  $\frac{1}{2}$  wavelength more than the forward wave, and with its phase change at the reflection point, will arrive in-phase with the forward RF wave, and hence provide reinforcement, leading to increased performance.

Although most tag suppliers will provide 100 percent tested product, once applied to the object, you need to check the tag's functional performance. Slap and ship may not be the most prudent entry into RFID. You need time to understand these problems and address all the issues.

## 6. PRACTICAL PLANNING

Convenient access points for RFID readers usually do not have power or communication cables. Many of the products will not have EPC tags on them. The implementation plan needs to consider equipment lead times. Does your vendor have the products you need in stock? Do you need a tag customization service? Who owns the

IP relating to that tag customization? How much time is needed in your facility to prepare for the engineering work required to install the RFID systems? How can you effectively deploy the new RFID equipment? Does installation need to occur after hours, or do you need to shut down the facility for the installation process?

In what quantity and delivery schedule do you need tags? How are you going to initialize those tags, e.g. write the EPC and data? How do you update the database with this EPC information? How do you physically install the tags, and once installed verify that they are operational? When do you tag? The earlier you tag a product in the manufacturing cycle, the larger the potential benefits you may achieve. Just like WalMart, your suppliers may be able to supply you with tagged materials.

You need to factor in training of personnel, including all people using the technology, managers and IT support. Next, the RFID system needs to be integrated into the IT system: can the database accept this data? Is the implementation scalable as RFID use is expanded throughout the organization? What happens in exceptions, i.e. in the interim period when products without EPC tags are processed?

Plan to evaluate performance of the IT system throughout the commissioning stage and early use of the RFID system. Plan to make fine adjustments, orientation and location of readers, etc. Plan on future maintenance and upgrade events. What are your suppliers doing? What are your clients doing? What are your competitors doing?

After successful system roll-out, leverage the implemented infrastructure, to expand the RFID applications and duplicate across other sites and divisions.

## 7. PROCESS FLOW CHANGES

For all the benefits of RFID to be realized, a change to some of the business processes is inevitable. For example, it may be necessary to change how a package is handled, stored and stacked on a pallet, or to be RFID-friendly. Certainly, every time an RFID tag is attached to an item, its operation should be checked immediately after application, to ensure that the tag was not damaged, and that the item does not



[ Liquid and metal environments may require special tag solutions. ]



compromise RFID read reliability. Consider processes to assist in 100 percent readability, such as reading items when they are singulated, prior to being stacked on a pallet, and associating those items with a pallet tag, so that aggregation and association techniques can be used to increase identification rates.

Any RFID program also needs to consider the business process changes that are needed while transitioning from the current system, to the RFID system. The IT system needs to operate during this transitional period with RFID exceptions, for example, what happens if the object does not have an RFID tag?

### 8. SHOW ME THE DATA

For the supply chain to benefit from wide scale adoption of RFID, data collected by back end systems needs to be accurate. Legacy data, such as Vendor Master Files need to be verified for accuracy. An automated exchange of data between your organization and your trading partners should be considered, possibly using GSI's Global Data Synchronization Network.

Unlike a barcode system, which usually requires a human to press a trigger on a scanner to read a barcode, once an RFID system has been installed, there is no real additional cost to read a tag. And with RFID readers capable of processing hundreds of tags per second, this leads to massive amounts of data that has to be

stored, retrieved, and turned into information that the company can use to improve their business by the integration into existing IT systems.

Traditionally, IT systems have provided information to management so that they can make decisions. However, with nearly real-time information coming in from RFID readers, managers won't have time to react to all the information, and IT systems will change from providing information to incorporating business manager's intelligence, so that the system can react automatically, leaving managers to manage by exceptions and alarms.

### 9. THE HUMAN TOUCH

Human issues, such as privacy and employment, need to be considered. Customers may need to be educated and assured that personal information is not being collected. Employees need to be consulted and educated as early as possible; for example, rather than an automation process that may eliminate workers, RFID needs to be portrayed as an efficiency driver. Being able to produce/distribute goods more efficiently by the adoption of RFID may lead to lower prices, which means more affordability, possibly leading to higher demand and an increase in employment in more value-added jobs.

### 10. BE SURE TO HAVE A CHAMPION

This is actually the top item on the list. It is essential to have a company champion, who has the complete



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backing of management, right up to the CEO, pushing the RFID project. The champion will have realistic expectations; staring small but thinking big.

The Champion will also need to rethink the way operations are performed at the company and encourage experimentation to find new ways to benefit from RFID. And as with any IT program, the RFID deployment plan needs to have milestones and measurables, and have regular reassessments. ■

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