

# Identifying the Right Opportunities for Your Organization

## **RFID**

RADIO

FREQUENCY

IDENTIFICATION

### CONTENTS:

EXECUTIVE SUMMARY

THE RFID ADVANTAGE

MAKING THE CASE FOR RFID

SELECTING YOUR OPTIONS

UNDERSTANDING THE STANDARDS

DEPLOYING RFID

DRAWING CONCLUSIONS

**EXECUTIVE SUMMARY:** Getting a clear signal on RFID

Radio frequency identification (RFID) has arrived, attracting a great deal of attention and with it, an unfortunate amount of confusion and misinformation. At Ryzex, we want to help our customers and contacts make informed decisions about data collection technologies, including their practical requirements and potential capabilities.

This paper separates the signal from the static, offering insights on the most important areas of concern:

- The RFID Advantage – a discussion of the technologies and potential benefits especially in comparison to familiar bar code systems.
- Making the Case for RFID – a look at two principal reasons for adapting the technology: mandatory compliance and improved business performance.
- Selecting Your Options – an overview of the key questions that must be asked when choosing an RFID application.
- Understanding the Standards – a brief guide to the prevailing technical standards and what they mean.
- Deploying RFID – a streamlined checklist for a successful pilot program.
- Drawing Conclusions – a summary of the thinking you must apply when you're considering.

## THE RFID ADVANTAGE

Not long ago, the now ubiquitous bar code scanner seemed alien and even unwelcome, an expensive investment with an uncertain future. Today, of course, it's impossible to imagine contemporary business – from procurement, operations and inventory management to wholesale distribution and retail sales – without it.

Like the bar code systems that preceded it, RFID adoption is being driven by a handful of important sectors, including retail and government contracting. And like bar coding, RFID is an automated method of collecting information. Both hold data that are accessed by an interrogator.

The key difference is that bar code is an optical technology and RFID relies on radio. This distinction in the way they transmit and receive data determines their respective advantages:

### **Bar Code**

Optical  
Requires line-of-sight  
Reads one at a time  
Limited memory capability  
Write-once tags  
Not subject to radio interference

### **RFID**

Radio Signal  
Can be read through many materials  
Reads multiple tags simultaneously  
More expansive memory sizes  
Write new information/data to tags on demand  
Subject to radio interference

The principal advantage of RFID is that it can read multiple tags in a field with no line-of-sight requirements. End users can apply RFID technology to create identification and distribution systems that operate with greatly reduced or zero human intervention. These characteristics are especially valuable in high-volume shipping & receiving operations, high-value asset tracking and access control applications, and in any organization with high labor costs and costly human error.

In addition, RFID's read/write capabilities may be especially valuable in maintenance and service functions, or in managing products/items involving time, temperature or shock-sensitive materials.

Yet RFID will not replace bar code technology; it simply offers an enhancement to bar code-based data collection systems. First-person validation, readable information and bar coded data will still be required for many years. That's why it's important to carefully evaluate the business case for RFID before making any investment in specific RFID technologies.

## MAKING THE CASE FOR RFID

There are two major reasons for adopting RFID:

- **Mandated compliance or**
- **Business case justification**

### **Mandated Compliance**

Wal\*Mart, Target, the Department of Defense (DoD), Albertson's, Metro, Marks and Spencer, Tesco and many others have announced their use of RFID technology to enhance product visibility. To participate in these supply chains, partners and vendors are obligated to apply a RFID system consistent with their clients' standards.

### **Business Case Justification**

RFID offers an evolutionary leap forward with its potential to improve several areas of operations including process efficiencies, greater asset protection and visibility, supply chain management, error reductions and overall competitive posture.

### **Turn a mandate into an opportunity**

If your organization sees RFID as a matter of compliance, consider seizing the issue as an opportunity for improved performance. After all, mere compliance burdens you with additional shipping expenses without giving you all of the new technology benefits. The same printers, readers, tags and systems needed to satisfy mandates may be applied to a variety of other applications. Now is the time to consider using RFID to improve inventory, warehousing, distribution, logistics and security.

RFID technology can greatly benefit supply chain management, asset tracking, access control, authentication, maintenance recording and work-in-process applications. To determine whether RFID is advantageous to your organization, examine those areas where the technology would provide a direct quantifiable return on investment, including:

- Non-revenue generating activities
- Throughput and process efficiencies
- Environments with high levels of shrinkage

## **GET OBJECTIVE ADVICE**

In many instances, it makes sense to consult with experts in business process and RFID applications to objectively identify where efficiencies can be gained in real-world applications. Outside agents give you an important advantage: freedom from bias, an ability to match technological capabilities with process optimization across multiple business verticals. Their independent recommendations can help you optimize return on investment and company-wide efficiencies and, at the same time, eliminate silo applications that represent a drain on profitability (e.g. slap and ship practices).

## SELECTING YOUR OPTIONS

Many companies begin evaluating RFID applications through the use of site evaluations, application analysis and pilot programs. These three initiatives determine the ability of RFID technology to effect positive change to a particular business process, in a specific physical environment within a specific application. Determining the standards and protocols that apply will greatly reduce risk and misdirected capital investment for companies concerned with interoperability and mandate compliance.

Throughout the RFID evaluation process, keep in mind that RFID is not a “one-size-fits-all” technology. The following questions can help predict which solutions will provide the greatest return on investment (ROI):

- Is mandate compliance the driving adoption factor?
- Is the application and business case an Open or Closed Loop system (see next section for definitions)?
- What are the performance requirements of the application and business process?
- What is the physical environment – temperature, precipitation, interference?
- Is the information and data recorded and transmitted static or phased?
- Is the current data infrastructure capable of integrating more data and delivering actionable reports?

Remember that it is the ability to customize RFID solutions that offers the greatest benefit while simultaneously representing the greatest risk. That’s why it’s essential for all companies considering RFID to understand the performance characteristics of each frequency and class, as each application will exhibit unique attributes, limitations, costs and benefits.

## UNDERSTANDING THE STANDARDS

### Open Loop System for Mandate Standards, Protocols and Regulations

Many retailers, businesses and organizations are actively adopting the specifications and standards developed by EPCglobal and other governing bodies indigenous to geographic locations. To understand standards, protocols and regulations, EPCglobal suggests a system model that:

- Defines data structures for producing unique ID numbers
- Defines the technical specifications for reader to tag interfaces and tag/reader performance characteristics
- Assigns every tag a unique ID number
- Applies a code with a serial number that can be used to distinguish an individual item irrespective of its duplication in a particular manufacturing process (e.g. a can of soda within a six pack can be uniquely identified)
- Provides a unique identifier for databases holding specific product information
- Uses specifications unique to each operating frequency, tag performance (class), and communication protocol

The world's largest retailers and government agencies are specifying that their suppliers use the UHF (Ultra High Frequency) band (860-930 MHz) versions of EPC Class 0, Class 1 and/or Class 1 Generation 2 tags on every box, case and pallet.

The characteristics of these tags differ in read and write capabilities, range and consumer costs. Adherence to standards will be a requirement for companies seeking mandate compliance. However, companies deploying "closed-loop" applications or seeking proprietary performance upgrades may choose to deploy solutions currently outside recognized EPCglobal standards such as ISO18000 protocols, other frequencies, and Surface Acoustic Wave (SAW) technology.

### Surveying the Shifting Landscape – C0, C1, C1G2 and ISO Standards

EPCglobal and the companies responsible for driving RFID mandates recognized the first generation comprised of Class 0 and Class 1 UHF technologies as viable and suitable RFID systems for case and pallet tagging for use in supply chain management (SCM) and asset tracking (AT) systems.

The desire to develop a more robust tag and reader architecture with enhanced features then spawned the creation of the Class 1 Generation 2 specification (C1G2). C1G2 tags incorporate the following elements that are designed to enhance RFID system security and performance over existing C1 and C0 standards:

- C1G2 has created a single specification for UHF systems – reigning in C1, C0 and ISO standards
- 16 bit pseudo random number handshake – an effort to utilize a one-time-pad security system
- 32 bit password – divided into two 16 bit portions
- 32 bit "kill code" – divided into two 16 bit portions – enables user to deactivate RFID tags
- Enhanced read speeds – 880 reads per second up from 230 in US systems, 450 reads per second up from 115 in European standards
- Powerful anti-collision properties or "Q" protocol – enables a dense reader environment and better tag performance in multiple tag use cases
- Extensibility to higher function tags and systems – up to 512 bit item ID up from 96 bits
- Extensions into unlimited user memory, in anticipation of Class 2 and Class 3 systems

**Which should you use?**

Your choice of system class is less daunting than it might appear. For mandate compliance drivers such as Wal\*Mart and the DoD, the existing C1 and C0 systems meet their current application requirements. The existing standards will continue to provide the performance necessary throughout 2007, or as long as compliant tags are available at a reasonable cost. Due to the rapid decrease in cost and increase in availability of the C1G2 tag, most early adopters have upgraded their systems to support C1G2.

Today, Class 1 Generation 2 has emerged as the current preferred choice by virtue of offering the highest performance at the lowest cost. Several recent breakthroughs in antenna design have also created a significantly smaller UHF tag than previously available. These small tags are enabling the development of new UHF applications in pharmaceutical, point of sale, and small item tagging.

**Closed Loop RFID systems**

In addition to the mandate (Open Loop System) driven RFID technologies and solutions, there is a broad selection of Closed Loop RFID technologies using UHF and alternate frequencies to serve other industries. A Closed Loop solution does not require adherence to any mandates or compliance standards.

Some Closed Loop applications include:

- LF (low frequency) systems for animal tagging
- HF (high frequency) systems for tool tracking
- Solutions using RFID tags encapsulated in resins and ceramics to resolve extreme temperature or environmental issues
- Solutions for tagging books, totes, containers, pallets, and other reusable assets
- Solutions with active tags (featuring little batteries inside) that can be read from helicopters, to track animals in the wild
- Solutions for tracking children on school busses and in amusement parks
- Solutions for tracking patients in a hospital

The list is only limited by the imagination of the solution designer. In fact, many people use some aspect of RFID in their everyday lives, as when they start their cars (with a smart key and a reader in the ignition), or open the office door (with the familiar plastic ID card).

## DEPLOYING RFID

After weighing the benefits of RFID, analyzing your business case and evaluating your technology options, you have one more step to go before a full rollout: a limited pilot program. Consider the pilot and its tests as a way to replicate a “real-world” application environment to determine the performance requirements, physical characteristics and limitations of each application considered. If done properly, the pilot process will positively affect the implementation timeline and capital investment necessary to deploy the optimal RFID solution for a given business case.

Typical considerations include:

- Necessary read range for given application
- Number of items to be read within the determined read range
- Write performance requirements
- Noise and substance signal degradation
- Location and affixation of tag for process/application optimization
- Optimal speed of items through the reading field
- Cost/benefit of tags and readers for a given business case – class & frequency specific
- Mandate compliance and adherence
- Environmental considerations – i.e. humidity, temperature

RFID systems should be tested in a myriad of subtle environmental variations to ensure the best implementation results. Pilot programs and testing may not discover every obstacle, but they can mitigate the great majority of physical and performance inhibitors prior to full implementation.

## DRAWING CONCLUSIONS

RFID represents an important advance in the evolution of automated data collection technology. As a complement to bar code and first person validation, RFID offers a number of important benefits that may streamline operations, reduce costs, improve security and make logistics more efficient.

Is RFID right for your organization? Before drawing conclusions, you and your colleagues should consider the following questions:

- Do the advantages of RFID technology (no line-of-sight requirement, simultaneous multiple reads, read/write capabilities, etc.) offer your organization a meaningful benefit?
- Are you mandated to comply with a RFID standard? If so, can you use the mandate as an opportunity to leverage the benefits of RFID to improve your processes?
- Can you make a business case for RFID with a reasonable expectation of a return on your investment?
- Have you reviewed the available standards and understand which may be most applicable to your situation?
- Do you have access to a vendor-neutral, third-party advisor who can give you objective guidance on competing standards, applications and products?
- Can you complete a vigorous pilot and testing program before full RFID implementation?

If you can answer “yes” to most of the above questions, your organization may indeed be ready to benefit from RFID technology.

Of course, you probably have additional questions. Or you might appreciate greater insight into some of the topics discussed in this white paper. To continue the discussion, feel free to contact a Ryzex expert at 1-800-735-2845 or by e-mail at [rfid@ryzex.com](mailto:rfid@ryzex.com). We look forward to helping you.