



# RFID and the Mainstream Supply Chain: Seven Steps to RFID Sanity



This white paper outlines the keys to investigating RFID in your supply chain applications, differentiators for RFID tags, steps to test tags in your unique applications and other ways to derive maximum benefits from this powerful advanced data capture technology. It also outlines seven steps that you can use to ensure a more successful RFID deployment.

## Executive summary

Excitement abounds regarding radio frequency identification (RFID), today's hottest technology. Early adopters are already realizing significant supply chain improvements with RFID, and the technology is rapidly evolving and growing, providing solutions to a wide array of logistics problems. With its increasing popularity, it's important to understand that all RFID tag inlays are not created equal.





## Introduction

The new excitement in RFID is about long-range, passive RFID tags that can achieve the needed pricing and performance levels for the maximum return on investment (ROI). Numerous articles detail the vision of a future where RFID tags are placed on everything from machine parts to cereal boxes, totally automating the supply chain process. It's clear that this level of deployment is an attainable future goal.

However, many companies are finding value in implementing RFID systems today, especially when it's applied to solve more realistic supply chain problems. The key factor, as with any new technology, is to understand the capabilities of RFID and evaluate how it can be useful to your operations today.

## Finding the ROI in RFID Technology

In recent years, expensive, battery driven active tags with a 100 ft. (30 m) read range and priced at \$10 to \$150 USD per tag and short-range passive tags with a 1-2 ft. (0.3-0.6 m) range and priced at \$1 USD per tag have achieved success in niche market applications. Both have demonstrated the value of providing enhanced visibility for items that include ocean containers, beer kegs, library books and more. Applications to date are tolerant of the active tag's expense and the limited performance of short-range passive tags, but even with these limitations, successful ROIs have been found. The new frontier associated with long-range passive RFID tag inlays gives users the best of both worlds — better read ranges (3-25 feet or 0.91 to 7.62 m) and lower prices. More realistic quantities generally price out from \$0.20 to \$0.50 per tag, largely depending upon the inlay/label size, performance and volumes.

The opportunities are endless for the supply chain. Pallets stacked full of RFID-tagged cases or cartons are easily read and re-read as they pass from location to location, both within a company's factory or by various partners throughout the distribution process. Multiple read points feed item and location data to various warehouse management systems (WMS) and enterprise resource planning (ERP) systems to provide real-time information about the location of products or other assets. Goods are received in seconds with exceptions noticed before the truck

leaves the dock door. Routing instructions, even for mixed goods loads, are seamlessly implemented and routinely checked to verify accuracy.

RFID continues to evolve and many companies are setting more realistic expectations for the technology. Advancements in ultra high frequency (UHF) RFID tag inlays have closed the gap between what supply chain firms require and what is technologically feasible.

End users now have a new technology that offers an optimal mix of price and performance, including increasingly affordable tag prices and superior performance for gaining comprehensive visibility of pallets, totes and cases. Most large companies view RFID as an important part of their overall enterprise mobility strategy. The key to a successful implementation is to determine the most appropriate places to adopt the technology.

## Today's Successful RFID Applications

RFID is able to solve many of your logistics problems now, even if tagging and identification at the item level remain challenging. The technology is currently available to track products at both the pallet and case level.

Forklift trucks carry pallet-loads of product through RFID-enabled portals at receiving/shipping internal check points that verify all movements of those items. The cost savings becomes very real. Returnable container tracking, often thought of as too complex to implement, is a reality as pallets and totes are easily identified when passing through the portal doors. Cross docking, work-in-process (WIP) tracking, pallet building and quality control are all good measurements for justifying RFID today.

Value is clearly the most important metric for a successful RFID implementation. To determine your value proposition, some key questions to ask include:

- Does the performance of the RFID technology satisfy your basic asset and inventory visibility needs?
- Does it provide the speed, range and reliability to track your product better than you can right now?
- What improvements can you gain for the money invested in RFID today?

## Implementation Issues

When investigating RFID for use as a supply chain application, look at all of the factors needed for a successful implementation. If you are not careful, you may end up buying a system that:

- Is very expensive to integrate into your enterprise system.
- Requires excessive coding and data management.
- Is hostile to current business processes and requires significant re-engineering.
- Interrupts instead of streamlines your physical operations.
- Requires you to act as a general contractor for RFID solutions, taking your focus away from your core business needs.

Before you start, clearly outline what you are trying to accomplish, the problem you are trying to fix and how you will determine if the project is a success.

## All RFID Tags Are Not Created Equal

Once identifying how and where you can integrate RFID into your operation, start evaluating the technology. New users to RFID often make the fundamental mistake of hearing performance claims from one vendor and assuming that this performance is standard across the industry. This assumption is dangerous. Different RFID technologies, such as tags that operate on the same frequency, often yield varying levels of performance. Some of the factors that dictate performance include:

- **Tag Sensitivity:** the ability of a chip to be energized and to maximize the signal strength to send its identifier back to the reader — the greater the chip sensitivity, the longer the read range.
- **Tag Size:** larger generally means longer range.
- **Tag Shape:** different tag antenna shapes provide remarkably different levels of performance.
- **Number of Tag Antennas:** two dipole antennas attached to a single chip results in tag performance that is less sensitive to orientation, which is important for random-reading environments.

- **Speed:** the rate at which a reader collects tag identifiers. Rapid read rates increase the reliability of tag reads and are less likely to impose burdens on business processes. The EPCglobal™ Gen 2, Class 1 specification for tags is 1,000 reads per second. However, the read rate is highly dependant upon the application, label placement and operating environment.
- **Interference:** well-designed tags and readers perform effectively in noisy RF environments. “Dense Reader Mode” (DRM) technology allows multiple readers to effectively singulate every tag response with a unique reader address, which increases the individual reader performance within environments where multiple readers are deployed.
- **Materials the tags are attached to:** Metal- and water-based materials are generally hostile to RFID, which negatively effects read range. However, this can and has been overcome. When a short buffer is made between the tag and the asset, the performance (range) improves dramatically. The friendliest materials are cardboard, clothing and plastic.

Because of the effects of harsh environments and materials on RF technologies, it’s important that your system is designed with extra margin that maximizes read range and collection speed. Some materials — waterbased products such as shampoo or beverages — can significantly diminish the strength of the RF signal, negatively impacting system performance. RFID systems designed with extra read range and speed result in better performance in tough environments. In addition, the tag readers, antennas and middleware are just as important to the overall system performance as the tags. During your RFID investigation, remember to ask the following questions:

- Can the reader read all of the tags in a pallet or tote regardless of orientation?
- What are the antenna options?
- Are handheld readers available? If yes, what are their capabilities?
- How will the reader interface with host or legacy systems?
- How are multiple read points managed? What networking tools are provided?

- What is the total cost of ownership (TCO), including tags, readers, antennas and integration to systems, sensor networks, locationing networks (for visibility into the location of a Wi-Fi enabled mobile device or asset with an RFID tag).

## Summary: Seven Steps to RFID Sanity

RFID clarity is best achieved through action. Once you have completed the analysis phase, the only way to learn the true value of RFID is to start testing the technology in a desired application. Follow these simple steps for a more successful implementation:

- Step 1:** Understand your visibility requirements. What items do you want to read? Where? How often? From what distance?
- Step 2:** Query other end users about recommendations for trials. What to do? How to do it? Recommended technologies? There are many experienced end users who are willing to share their knowledge.
- Step 3:** Move into the action phase in a real-world setting. Put tags on assets and inventory items, and set up readers at the points you seek enhanced visibility — outside of the lab environment.

**Step 4:** Evaluate technical performance. Do you get reliable reads? Does it properly update your application?

**Step 5:** Assess the economic benefits. Is it better than what you are currently doing?

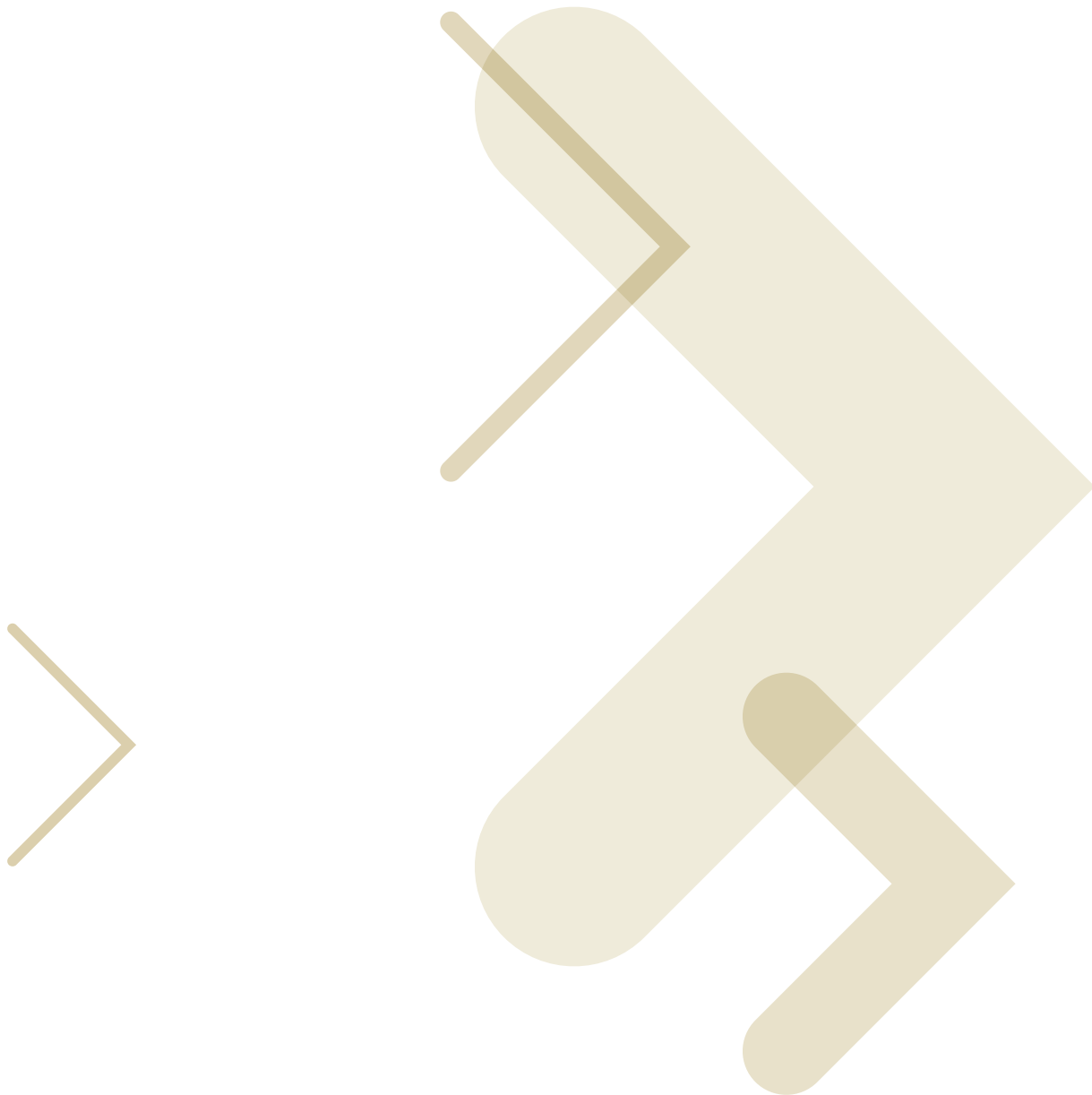
**Step 6:** Understand the impact. How does the technology affect business processes? Are there integration issues with enterprise systems?

**Step 7:** Make a decision. Decide whether or not to move forward with a larger scale implementation; refine the trial using different processes, technologies, items and/or read points; or cease activity.

A dedicated staff with the appropriate budgetary authority is paramount to a speedy and successful progression through the steps listed above. Or, there are services available from outside sources that can help you understand how RFID can be applied in your environment by analyzing the potential benefits and challenges of implementing RFID in your organization and by examining the specifics of your business needs, processes, existing technology infrastructure and environment.

The adoption of RFID into the mainstream supply chain is inevitable. A key to achieving success with RFID is found in clever implementations — know the capabilities and limitations of the technology, and make the best fit of these capabilities within your operation.





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