

# White Paper

## Profiting from Process: Using EPC/RFID to Create New Business Value

Executive Summary: RFID – Drive or Be Driven

Like bar code shipment labeling and EDI communications before it, compliance EPC/RFID tagging initiatives will bring lasting changes to business. Opportunity and risk accompany any change, and each must be considered when planning a successful implementation strategy. The goals and processes your company creates for managing EPC/RFID adoption will determine if you drive change or are driven by it.

This white paper presents a strategy for you to take advantage of the opportunities created by Electronic Product Code (EPC) tagging initiatives. The paper will:

- Present guidelines for defining an EPC project and goals by clearly specifying compliance requirements;
- Identify ways manufacturers can leverage EPC tagging to improve their own inventory, distribution, asset management and security operations;
- Introduce a method for planning, testing and managing EPC implementations;
- Describe basic EPC/RFID performance characteristics and how they relate to tagging, packaging and reading requirements;
- Identify the most important elements of pilot planning, system testing, data management, integration with legacy systems and system deployment; and
- Provide specific tips and guidance for managing these tasks.

The opportunities EPC/RFID adoption creates are to reduce storage, handling and distribution expenses, increase sales through reduced stock outs and reduced shrink, and to improve cash flow through increased inventory turns and improved asset utilization. Unfortunately, too many companies focus on the cost of adoption without giving enough consideration to its value. Manufacturers who create processes to take advantage of EPC/RFID tagging programs to satisfy customer requests can cut working capital requirements between two percent and eight percent, according to a study of EPC technology by Accenture, which found the savings are produced because inventories of raw material, work-in-process and finished goods can all be reduced.<sup>1</sup>

### Early Adopters Take the Lead

An AMR Research study<sup>2</sup> found early EPC/RFID adopters in the retail and consumer packaged goods (CPG) industries have lowered their supply chain costs between three and five percent. These findings and other research presented in this paper clearly show that by narrowly focusing on the capital outlay required for compliance, companies risk missing opportunities to leverage the investment to improve their own profitability. Instead of asking “What is it going to cost us to comply?” consider asking – and investigating – “Can we afford not to fully exploit this technology?”

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<sup>1</sup> Accenture, Auto-ID Center “Auto-ID on the Line,” (2003).

<sup>2</sup> AMR Research, “ePC/RFID and Its Imminent Effect on the Supply Chain,” (2002)

Companies profiting from EPC/RFID are doing so because they created new processes that take advantage of RFID's special capabilities. The best applications complement, enhance, and leverage legacy systems. Whatever the eventual price points, RFID tags and equipment will cost roughly the same for all companies within an industry segment. The processes used for evaluating, implementing, and exploiting RFID will separate the companies who profit from their investment from those who merely comply.

### **History Teaches Us About the Future**

Consider a historical example. Ford Motor Company was one of 88 automobile manufacturers in the U.S. alone when Henry Ford began building cars 100 years ago. His focus on creating new production processes and capitalizing on them drove Ford to dominate the industry. The dominance waned as competitors began to imitate Ford's processes, but not before the company had profited greatly and established itself as an enduring leader. Today, new EPC-driven business processes present very similar opportunities for companies to innovate through process, lower their cost structure and gain sustainable competitive advantage.

The proven techniques, guidelines and experience reflected in this paper will help you plan a tightly focused EPC pilot and implementation without incurring unnecessary costs or disruption to your business. Experience matters in EPC/RFID implementations. We trust you'll find this paper helpful, providing you with a step-by-step strategy to help drive change and add value to your business.

### **Project Definition**

The first step is to conduct a needs analysis that plainly specifies what the organization needs from its RFID system. If you are implementing EPC tagging in response to requirements from one of the many retailers who have issued mandates such as Wal-Mart in the US or Metro and Tesco in the UK or from the Department of Defense (DoD) or other customers, the program guidelines you receive from your customer will form the minimum requirements of the project definition. The program guidelines will specify what items need to be tagged, acceptable EPC/RFID technologies and required performance functionality.

For example, both Wal-Mart and DoD have stated their suppliers must apply EPC-compliant tags to shipments. Wal-Mart asked its top 100 suppliers to present their RFID tagging plans by February 2004 and apply RFID to all cases and pallets by January 2005. All suppliers will have to comply by January 2006.

### **Leaders Lead with EPC**

Wal-Mart is currently allowing suppliers to conduct pilot projects with RFID technology that complies with any of the Electronic Product Code specifications maintained by EPCglobal Inc. (The original EPC system was developed by the Auto-ID Center at the Massachusetts Institute of Technology and transferred to EPCglobal, which now has responsibility for maintaining, managing and promoting the system, and most importantly, for developing a framework for business value.) There are several classes of technology defined in the EPC system. Companies can conduct pilot projects using EPC Class 0 and Class 1 tags, but Wal-Mart is expected to require Class 1 Version 2 (C1V2, also called Class 1 Generation 2) tags when systems go live on Jan. 1, 2005. When this white paper was drafted in February 2004 the C1V2 standards had not been ratified, but the EPCglobal Software Action Group (SAG) and Hardware Action Group (HAG) had been formed to iron out the details.

The DoD is requiring the use of EPC technology, but currently allows for some flexibility. Pilots conducted during 2004 may use any currently available EPC tags. A narrower, more specific compliance requirement is being developed and will be issued some time in 2004. Suppliers will need to comply with the official specification requirement by January 2005.

The compliance specification you receive from your customer should make requirements clear. Unfortunately, it will not make planning the tagging process simple. This is a good point to engage a firm with EPC and tagging expertise to help assess how compliance requirements will impact your company and help prepare you for compliance. A solutions provider with specific prior experience with tagging, product identification and EPC issues can help develop and guide a plan that will enable you to efficiently meet requirements and identify areas where EPC/RFID can have the biggest impact on internal operations to produce the strongest return on investment.

### **The Profit Payoff**

Research by A.T. Kearney and others finds the case for EPC compelling because manufacturers can leverage investments in compliance tagging to simultaneously reduce operating costs and improve revenue. Wal-Mart's primary goal for its EPC/RFID initiative is to improve sales by improving stock availability. Wal-Mart has concluded that by gaining better inventory visibility through EPC/RFID it will reduce stock outs and sell more products. Of course, manufacturers also benefit when more product is sold. The Kearney study<sup>3</sup> attempted to measure this impact and conservatively estimated that manufacturers can expect a sales gain of 0.07 percent based on improved product availability attributed to EPC/RFID. A similar study by Accenture<sup>4</sup> predicted sales gains between one and two percent. These incremental sales are much more profitable than revenues gained from efforts to improve sales through new promotions, channels or product introductions. The higher the incidence of stock outs, the more value EPC/RFID tagging can provide.

EPC/RFID systems can reduce costs by reducing labor, data latency and errors associated with product handling. It's noteworthy that the DoD has created a compliance-tagging program very similar to Wal-Mart — the most notable difference is the DoD doesn't sell anything. The DoD's costs from implementing RFID around the world will be offset and the benefits gained will be purely through reduced labor and efficiency improvements in receiving, storage, inventory control and distribution operations. Manufacturers conduct these same activities, and can derive similar benefits from EPC. Accenture<sup>5</sup> investigated the impact EPC/RFID tagging could have on manufacturers' operations and concluded that improved visibility could enable safety stock inventory to be reduced 10 to 30 percent throughout the supply chain. As a result, manufacturers could enjoy a one to five percent reduction in fixed assets through better utilization of space and equipment, and reduce working capital needs by two to eight percent.

EPC/RFID systems deliver these benefits by reducing labor for receiving, put away, warehousing and distribution operations, providing accurate, real-time inventory data, facilitating improved management of pallets and other returnable shipping containers, preventing shrink and diversion, supporting improved product traceability and authentication

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<sup>3</sup> A.T. Kearney "Meeting the Retail RFID Mandate," (2003).

<sup>4</sup> Accenture "Auto-ID on Demand: The Value of Auto-ID Technology in Consumer Packaged Goods Demand Planning," (2003)

<sup>5</sup> Ibid

and many other ways that are unique to each business. These are the reasons it is important to work with a solutions provider who is aware of all that EPC/RFID technology can do, and can put that knowledge to work to design a program that goes beyond slapping tags on boxes to meet minimum compliance requirements. After working through the needs analysis and identifying improvement opportunities, the solutions provider should deliver a comprehensive pilot project proposal to guide further efforts.

### Pilot Planning & Implementation

The pilot provides the opportunity to find the optimal way to meet requirements for applying and reading EPC/RFID tags. Manufacturers who participate in customer-requested EPC/RFID programs will often find that program specifications are clear, but do not go far enough to cover all the variables. Companies are left to their own devices to determine the best tag type, size and placement location for their products, and may even have to choose among several EPC/RFID technical specifications. Solution providers with compliance testing facilities are invaluable resources for this process.

### The Five Characteristics of Successful Pilots

From years of experience conducting RF business pilots and providing systems that deliver real, proven return on investment for retail and manufacturing clients, Checkpoint Systems has determined that there are five characteristics of a successful pilot. The best RF pilot projects are:

**1. Supported from the top of the organization**

The most successful pilots have an intra-company project team with a business vision of success and are supported with a high-level champion.

**2. Structured to validate a specific business premise**

Structure brings focus to the project, making it easier to evaluate performance and success. Ideally, the structure of the pilot not only engages the business, but also its trading partners.

**3. Designed to achieve specific, measurable and verifiable goals**

It's imperative to benchmark the current process and define the criteria for a successful pilot. Determine the methodology for evaluation before you begin and be sure it can answer whether or not the EPC/RFID system creates a better process.

**4. Phased to mitigate the impact on the organization**

Successful pilot designs also minimize the impact on the current production environment but still replicate real-world conditions. The pilot should be conducted in phases, culminating in a live trial followed by a phased rollout.

**5. Designed to be scalable**

**Scalability goes beyond the IT equipment to include processes and the complete solution – including hardware, software, employees and the solution providers. One way to measure**

The pilot will begin to provide proof-of-concept for the internal applications and benefits that are envisioned, and will provide insight as to how information will need to be integrated with legacy systems and the infrastructure needed to support it. The following sections provide a suggested process for designing and managing a pilot project to yield this insight and guidance.

## Planning, Design & Simulation

Many of the important functions and performance levels the EPC/RFID system needs to provide can be planned and validated before the pilot project is implemented. At this stage, the most important variables to measure and plan for are interference and impact on legacy systems. These conditions can be replicated, measured and tested in a lab environment, saving users the time and trouble of a lengthy trial-and-error process after the pilot equipment has been installed.

As a radio technology, EPC/RFID is susceptible to interference, especially from metals, liquids, static electricity and EM/RFI generated from motors and the power system. Variables that affect interference include the antenna size, power output from the reader, frequency utilized, composition of the tagged object and other sources of RF emissions. Each frequency range is sensitive to different types of interference. For example, 13.56 MHz technology has much less read range than UHF options (858-959 MHz), but is less prone to interference from liquids. In general, the thinner the liquid, the greater potential it has to cause interference, so tagging cases of motor oil may require a different technique than tagging cases of windshield wiper fluid. The upper range of the UHF band is also susceptible to interference from older-generation wireless local area networks. Note that 802.11-standard wireless networks and Bluetooth technology each use the 2.45 GHz band and are less likely to pose interference threats to UHF or 13.56 MHz EPC/RFID technologies.

Interference can be mitigated by adjusting the position and angle of the RFID antennas, changing the location of the tag on the item, using a buffer between the tag and the object, and even by configuring the facility to position reading locations away from major interference sources. An experienced EPC/RFID solutions provider will be able to specify the optimum types of tag mounts, readers and location options after visiting your facility.

The type of read/write device used to encode and access EPC/RFID tag information is another major variable in system performance. The range at which data can be written to and read from tags is actually a function of the entire system, not the individual tag and reader components. Range is dependent on how well the components work with each other, the physical environment, and the skill of the integrator designing and installing the system.

Readers may be stationary, hand-held or integrated into mobile computers, forklifts or other devices. The reader (also called an interrogator) typically consists of an antenna to send and receive the RFID signals, a processor to decode them, and input and output ports to communicate the data to the host system. A common configuration is to use a pair of fixed-position antennas to form a gate to cover dock doors or other entry/exit points.

### Testing for Success

Sophisticated, purpose-built EPC/RFID test facilities can closely imitate your actual environment, using a variety of techniques to emulate the many potential sources of electrostatic discharge and interference, including metal racks, shelves and equipment, conveyors and industrial control systems plus actual packaging materials and shipping containers. Isolating and measuring these variables enables EPC/RFID systems to be optimized in the lab much more quickly than they could be in the field.

Testing and lab work can save a tremendous amount of time and effort required to find the best combination of reading devices and tag designs for your products and usage

environment. The test center should also verify that the tag encoding and application methods that are selected would maintain data integrity and meet necessary throughput requirements. Conducting these types of tests, using the results to make adjustments, and repeating as necessary will significantly reduce the time and expense of implementing an EPC/RFID system on-site.

### **Gaining the Information Advantage**

Tag and reader testing ensures you will be able to provide and access the data necessary for your specific business applications. Data integration planning is done to make sure data can be converted into useful information by interfacing with information systems. Work in the test center can also simulate the flow of data through your information system so you and your solutions provider can design the appropriate system architecture.

Data from the EPC/RFID system may be used to update material status records in an ERP system, report items locations to a warehouse management system (WMS), trigger automatic generation of a shipping manifest, or hundreds of other ways. Most applications and new business processes require EPC/RFID data to integrate with enterprise information systems. To ensure accurate, real-time data is available wherever and whenever it is needed, integration planning is required to map the flow of information. Legacy applications, data collection systems, wireless networks and other infrastructure components all play a role, as do EPC/RFID readers, networks and middleware.

EPC/RFID can be used to collect data in environments where there previously was no visibility, and can produce unprecedented volumes of real-time data. Most current software applications were not designed to take advantage of these capabilities. Merely using EPC/RFID as a straight replacement for bar code or another form of data collection will provide limited value, because EPC/RFID will not be powering any efficient process changes. Middleware can leverage and enhance legacy applications by making it convenient to integrate EPC/RFID data and to develop new functionality. The quality of the middleware, the communications capabilities of the EPC/RFID readers, ease of networking and ability to interface with control systems and software applications are extremely important considerations for system success and return on investment.

The planning, design and simulation phase will help determine how much your current data collection, networking and software applications can be used to facilitate new EPC/RFID applications and will reveal needs for middleware, integration and system architecture.

### **Conducting the Pilot**

The next step is to test these principles in a pilot project. Item tagging tests should be conducted separately from pilot tests, which encompass more aspects of the system. Tag tests determine the best way to get tags to work; pilot tests provide insight as to how all the system components work together. Initial pilot tests should be small, perhaps limited to a single facility, and expanded in phases as you gain experience and confidence in the system. Limited pilots make it easier to isolate the source of problems and to develop appropriate remedies.

As we've seen, many aspects of a system can be tested and refined in a test center prior to the actual pilot launch. The more work that is done in pre-testing, the smoother and more productive the pilot will be and the less impact there will be on production. One of the key

goals of the pilot is evaluating how the systems perform in your actual work environment. Therefore, the pre-pilot site survey is an extremely important task.

In a site survey, engineers from the solutions provider's services organization visit your facility to assess the environment and plan the placement of EPC/RFID reading and encoding equipment for optimal, most efficient performance. The visit may also yield new questions or conditions to test for that will be included in the pilot plan.

Once the engineering plans and business goals have been defined, the pilot plan is finalized and soon after, equipment will be installed and the pilot project will be up and running.

The second important role of the pilot is to prepare workers to use the system. Don't make the pilot the exclusive domain of business planners and the solutions provider; encourage personnel to work with the system and begin operator training. A very practical tactic is to observe how workers use the system, especially their interaction with equipment and software screens. Concurrently, review the impact the pilot is having on IT systems and office personnel who work with the data. These observations provide valuable guidance for making adjustments to procedures, equipment placement and user interfaces.

Repeat the steps of observation and adjustment as often as necessary. New applications or variables should be carefully introduced in phases so the pilot stays manageable and yields useful information.

Once the pilot has run successfully under a variety of conditions it will be time to transition from pilot phase to full implementation. The project will need to be scaled to support enterprise operations and additional sites may need to be prepared for implementation. Phased implementations are highly recommended to ensure you can commit all the attention and resources that are necessary to support each rollout. Implementation should be coordinated with the solution provider to ensure support is available, especially as the implementation is expanded to new facilities or applications. When the implementation begins, the solutions provider should continue to provide testing and may back its work by issuing a certificate of compliance to acknowledge that you have successfully met the requirements set forth in the customer's EPC/RFID tagging program. As in the planning phase, the skill and experience of your solutions provider will be a major factor in the time required and effectiveness of the rollout.

### **Conclusion**

EPC/RFID technology provides many opportunities to improve supply chain relationships and operations increase sales and cut costs. Companies can maximize these benefits by taking advantage of proven processes and partners to help identify and prioritize opportunities, plan applications and manage the project. Skillfully applied EPC/RFID technology can create tremendous value for business. The stakes are too high for you to partner with just any solutions provider.

**Checkpoint Systems, Inc.** is uniquely qualified to deliver the benefits of EPC/RFID. We were a founding member of the MIT Auto-ID Center and EPC Global, and now operate the Checkpoint EPC Compliance Center, a state-of-the-art design and testing facility dedicated to developing and validating EPC/RFID solutions for manufacturing and retail clients. Our

solution offerings go far beyond tagging to provide all you need to successfully plan, implement and manage EPC/RFID systems and processes. Checkpoint's EPC Network Management Platform combines our own powerful EPC/RFID software and data management tools with tags and readers jointly developed in conjunction with leading EPC/RFID technology providers – allowing Checkpoint to bring “best in class” options to our client. Our hardware and software provides distributed processing of EPC/RFID data to ensure smooth integration with your legacy ERP, warehouse management and supply chain applications.

Checkpoint also has developed the interactive design process for Agile RFID Systems Development. This process combines a variety of Six Sigma, lean manufacturing and unified software development best practices with EPC/RFID capabilities and our own extensive experience. The result is a highly effective process users can follow to plan, create and deliver successful EPC/RFID solutions.

As a leading integrator of RFID technology, Checkpoint has provided thousands of RF-based solutions to consumer-packaged goods manufacturers, retailers, commercial and industrial clients around the globe. Today, Checkpoint is the world's largest integrator of RF technology into consumer product packaging. The information presented in this white paper is drawn from our extensive experience in helping customers meet tagging, labeling and business improvement objectives. Checkpoint complements its unsurpassed RFID expertise with complete, end-to-end solutions for all levels of the supply chain. Checkpoint's technology solutions include digital RF/EAS and RFID systems, RF source tagging, barcode labeling systems, EAS, handheld labeling systems and retail merchandising systems. For additional information, visit Checkpoint Systems' Web site located at [www.CheckpointEurope.com](http://www.CheckpointEurope.com)

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