Investments in RFID Automation Deliver Significant Business Value

The coming transition from manual offline supply chain compliance applications to high-speed / high-volume automation applications will deliver extraordinary improvements in inventory tracking and supply management and, in turn, streamline operations, reduce costs and increase sales.

Increased Volumes Will Drive Automation of RFID Processes

Industry analysts and media pundits all seem to agree that the use of RFID in global supply chains is rapidly expanding and will continue its growth trajectory over the coming years. One report from Venture Development Corp. (VDC) estimated that the global market for RFID systems would grow by approximately 36 percent annually through 2008 and that the leading market segment for this growth would be in supply chain management, with retail point-of-sale and manufacturing also coming in among the top five industry segments. A recent survey by Aberdeen Group revealed that the primary objective of 68 percent of the 300 organizations surveyed in adopting the technology is to improve supply chain business processes and visibility.

For many manufacturers, RFID initiatives can be tied in effectively with the increasing movement towards 'lean manufacturing' – a demand-driven supply chain network management strategy that relies on a 'pull' rather then 'push' philosophy to increase production efficiency and reduce inventory costs while improving customer service.

However, analyst opinions vary on how quickly automated RFID applications will reach critical mass – that point at which end users automate and extend deployment into related business processes and begin to realize the technology's inherent ability to increase efficiency, productivity and visibility across the enterprise.

In this paper, we will take a closer look at the factors driving RFID automation today, and discuss how the eventual transition from manual offline supply chain compliance applications to high-speed / high-volume applications will deliver measurable business value and return on investment. We will also discuss current manufacturing and supply chain applications, as well as the challenges related to expanding RFID deployment to gain process improvements and operational and financial benefits.

Early Adopters Driven by Major Retailers and the DoD

Although RFID technology has existed for some time, the primary drivers of its widespread commercialization were mandates for RFID tagging of cases and pallets by leading retailers worldwide. Wal-Mart and other industry leaders, such as Best Buy and Target, began the trend by establishing deadlines for their Top Tier suppliers to comply with RFID labeling of shipments to the retailers' centralized distribution centers. Over the course of three years, second and third tier suppliers were also included in the case and pallet 'smart label' mandates. On the global retail scene, major players such as The Metro Group, Tesco, and Marks & Spencer were also rolling out demand-driven supply chain RFID initiatives.

Initially, the phased mandates caused a great deal of confusion as manufacturers scrambled to learn about RFID and comply with their retail customers' demands. Companies hired or contracted RFID experts, purchased the requisite minimal equipment, and conducted intensive testing and pilot programs to ensure timely compliance.

Hardware, software and label media vendors were also challenged to gain the expertise and develop the products required to meet the demand. In the end, most of the top tier global suppliers – and other early adopters – were able to meet their compliance deadlines, typically by implementing manual, standalone applications in warehouses and other points of distribution.

Initial ROI Went to Retailers

Most of the financial and operational benefits of these early implementations fell to the giant retailers rather than to the manufacturers who had to invest time and resources to develop a technology they had not sought and knew little about. In late 2005, a study conducted by the University of Arkansas revealed that Wal-Mart achieved a 16 percent reduction in merchandise out-of-stocks through faster replenishment of items at stores using RFID-enabled Electronic Product Codes (EPC) rather than traditional bar codes alone.

Concurrent with the retail industry's discovery of RFID's advantages in the supply chain, another vast supply chain infrastructure – the U.S. Department of Defense and its Defense Logistics Agency – was also exploring the technology's potential. In this arena, adoption lagged somewhat because of the complexity of the DoD's annual contract structure and other logistical regulations, as well as the fact that its mandates were unfunded – which meant that funds to cover RFID equipment and systems had to come out of each service branch's annual operating budget.

Nevertheless, the DoD began its RFID pilot testing in 2006 and this year portends significant growth, with AIDC (Automatic Identification & Data Capture) technology experts in the U.S. Army, Navy, Marine Corps and Air Force and their integration partners now actively engaged in designing and implementing RFID solutions to increase the efficiency, visibility and security of their massive global military supply chains. However, even though the DoD is providing compensation incentives for suppliers to comply, it will likely take a few more years before RFID becomes universal in this vast and complex supply chain.

Increased Volumes Will Drive Automation

Gen 2 improvements, combined with increasing volumes of products entering the pipeline to comply with retailer RFID mandates, are already leading some manufacturers and distributors to also consider making the transition from labor-intensive offline labeling to automated, in-line, apply or 'print-and-apply' processes, either at the packaging phase or distribution/shipping phase. While this trend is not yet widespread, it is showing signs of having a positive impact on internal efficiency, supply chain visibility and cost reduction.

Companies that are still on the fence about whether or not to automate their RFID-enabled operations need to look at the single most compelling reason for automation – and that driver is *increased volume*.

A key factor driving increased volume of RFID-encoded goods is the retail sector itself. Wal-Mart, for one, is poised to expand its RFID mandate requirements this year. The retailer announced that it expects to have 1,000 stores RFID-enabled by the end of first quarter 2007, with as many as 2,000 stores up and running on RFID by year's end. Assuming other major retail chains such as Best Buy, Target and JCPenney follow suit, higher volumes will result. The expansion of RFID beyond North America to

suppliers located across Europe, Asia/Pacific, Central and South America is also expected to increase, pushing volumes even higher.

Ultimately, to retain their retail customers, manufacturers will need to comply with RFID encoding of larger volumes of goods – whether within specified SKUs (stock keeping units) or cross a wide range of SKUs. And, just as manufacturing became increasingly more automated when volumes rose beyond the ability of manual methods to handle, so will RFID automation increase in response to market trends and customer demand.

Challenges of Automating RFID Labeling

As many early adopters have discovered, making the leap from manual offline RFID label application to a fully automated "print-and-apply" process is not without challenges. It can be especially problematic for manufacturers and distributors running high-speed packaging and shipping operations for cross-docking and just-in-time delivery from their warehouses to retail distribution centers and stores.

For higher volume operations, achieving desired efficiency rates of 99.9 percent may well be essential to maintaining delivery rates and customer satisfaction. For example, if a labeling error causes a promotional product shipment to be delayed, it will miss the truck, miss the promised delivery date and fail to be stocked on the retailer's shelf in a timely manner. The likely result is consumer disappointment, customer dissatisfaction – and more than likely, a hefty fine on the supplier.

Since most high volume suppliers serve a variety of retail customers – some requiring RFID label compliance, others not – some degree of process flexibility and re-engineering will be required to satisfy diverse customer demands. In the end, automation is all about performance and reliability. The more automated the operation, the more critical the performance requirements in terms of capacity, yield and throughput – which can be measured by the number of cartons per minute successfully processed and shipped.

Achieving the desired level of high-volume performance with an automated RFID process involves several levels of complexity. Organizations need to apply due diligence in learning about the requisite components: the RFID printer/encoders, readers, printer applicator systems and software, and RFID smart labels. Even the type of inlays and labels selected, as well as the positioning and orientation of the inlay and reader antenna, can have an effect on the accuracy and throughput of automated RFID systems. Conducting intensive pilot testing and validation is an essential step to ensuring that all the components are compatible and will operate effectively within the automated print-and-apply operation.

RFID Automation and Integration: The Key to ROI is Closed Loop Applications

Once case-and-pallet volumes increase, organizations will be hard pressed to achieve any significant return on investment using time-consuming, error-prone manual RFID label application methods. This is partly due to the additional labor required, but mainly because a standalone process will not allow them to leverage the value of the data encoded and captured. On this very important point, virtually all the industry analysts and experts agree:

To achieve real business value and ROI requires RFID data points to be integrally linked with multiple business processes and the data integrated with related processes up and down the entire supply chain.

Gen 2 improvements also may drive companies to look at closed loop applications for an internal ROI.

Optimizing the IT infrastructure to integrate RFID data automatically in a closed-loop system with back-office and related supply chain processes – and using that data for decision support – are the next big RFID challenges. Many progressive manufacturers, distributors and retailers with well-oiled global supply chains are already doing this with positive results. For example, they are deploying RFID to:

- Track incoming materials and supplies and outgoing shipments
- Improve inventory control and reduce related costs
- Streamline pick-and-place and order fulfillment operations at warehouses and distribution centers by integrating RFID with Warehouse Management System (WMS), and other business applications
- Improve material handling to speed up routing and reduce inefficient handling
- Reduce loss by tracking and tracing physical assets, such as containers, tools, parts, PCs, etc.
- Track production and monitor work-in-process
- Streamline warehouse, logistics and transportation operations
- Maintain oversight of when cases and pallets of merchandise are actually opened at retail stores and put on the shelves
- Increase chain-of-custody integrity for brand protection, theft prevention and anti-counterfeiting

Although, for many companies, these applications may demand a certain amount of process reengineering and restructuring of workflow, the results in terms of visibility, cost reduction and control can be well worth the effort.

Another technical challenge for some manufacturers is that achieving high levels of performance and reliability with automated systems can be difficult, and the problem is exacerbated when tagging certain product categories. Fortunately, the Gen 2 Standard has helped considerably. Both RFID printer/encoders and readers are now readily available, offering flexibility (Gen 1 and Gen 2), automatic validation of encoded RFID tags, and downloadable software to enable upgrades for expanded RFID feature sets.

On the RFID Gen 2 media side, inlays and labels have not only grown more affordable, but are now available in a much broader range of inlay/antenna designs, label materials and form factors designed to accommodate different kinds of products – including metals, liquids and cold goods, which had presented serious problems for early adopters of RFID technology. In addition, improvements are constantly being made to improve the silicon chips that power RFID, especially in the areas of handling silicon sensitivity and interference rejection.

The key to finding RFID's true value proposition is for each organization to examine its supply chain-related business processes and analyze how the extension of RFID beyond mere compliance can deliver competitive advantage and ROI. To assist in this assessment and analysis, the wisest course is to seek out experienced business consultants and systems integrators who maintain relationships with best-of-breed RFID equipment, component and media suppliers. Working together in a practical and cost-effective manner, they can help companies discover additional value-based RFID applications and advise them on how best to invest the requisite resources to test for proof-of-concept, operational improvements, and return on investment.

Automation: The Ultimate Driver of RFID Growth

As with any other technology, as RFID technology and standards continue to evolve, standardized systems will continue to be developed, volumes will increase, and global competition will continue to reduce the cost of RFID equipment and implementation. As a result, industry leaders and innovators will

ensure that automated RFID systems will find their way into the areas described here and many other areas as yet unexplored.

Consider, for example, the evolution of cellular phones over the past decade. Once surrounded by the same combination of media 'hype and hope' now focused on RFID, cell phones have become much more than simply a means of convenient mobile communication. Who would have thought a decade ago that one day you would also be able to use a miniscule electronic device to take on-the-fly photographs, check stock quotes on the Web, send email messages and photos, play music and video games, and locate the nearest Starbucks?

This is the kind of growth trajectory many are predicting for automated RFID technology. Which is why forward-thinking companies would do well to learn more about its capabilities as they lay the groundwork, plan initiatives, and prepare to reap the rewards.

Emerging Applications

In addition to retail compliance and other manufacturing-related and demand-driven supply chain applications, automated RFID technology is also gaining momentum in diverse applications across a host of other industries. Although few have reached the real-world implementation stage yet, the implications for future RFID development and value delivery are huge. These include:

- **Asset Track-and-Trace** – The DoD is exploring the value of track-and-trace applications for the security of high value overseas shipments. Similarly, corporate enterprises are testing the viability of tracking high value and returnable items such as laptop computers, tools and equipment, and returnable pallets in supermarket distribution.

- **Pharmaceutical and Life Sciences –** While this market has been pragmatic in its implemention, testing is being done and is expected to lead to effective use of high-volume RFID labeling by pharmaceutical manufacturers for drug authentication (ePedigree initiatives), patient safety and brand protection (anti-counterfeiting). Other emerging applications include tracking and tracing the location and usage of medical diagnostic equipment in hospitals, clinics and other patient care facilities.

- **Healthcare and Medical** – Applications include RFID-enabled wristbands, document and medical chart applications, and laboratory sample handling and diagnostics for patient safety and positive identification.

- **Travel and Transportation Security** – RFID is now being used in passports; and will likely increase in automated baggage handling; and AIDC applications related to over-the-road trucking, cargo and port security.

- **Item-Level Tagging** – Representing the latest 'buzz' in RFID media coverage since Gen 2 ratification, this involves ramping up RFID tracking and tracing from the case and pallet level to the item level. Cost and complexity will likely limit this trend in the short term to high-value items such as TVs, refrigerators and laptop computers. However, research on item-level tagging is already being conducted by leading apparel and consumer goods producers and retailers, pharmaceutical companies, industrial tool manufacturers, equipment rental firms, and others.

Clearly, the future will bring a growing need for fully scalable automated systems to keep up with the ever-increasing volume of goods that will eventually incorporate RFID technology.

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