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RFID Monthly – Apparel Supplement

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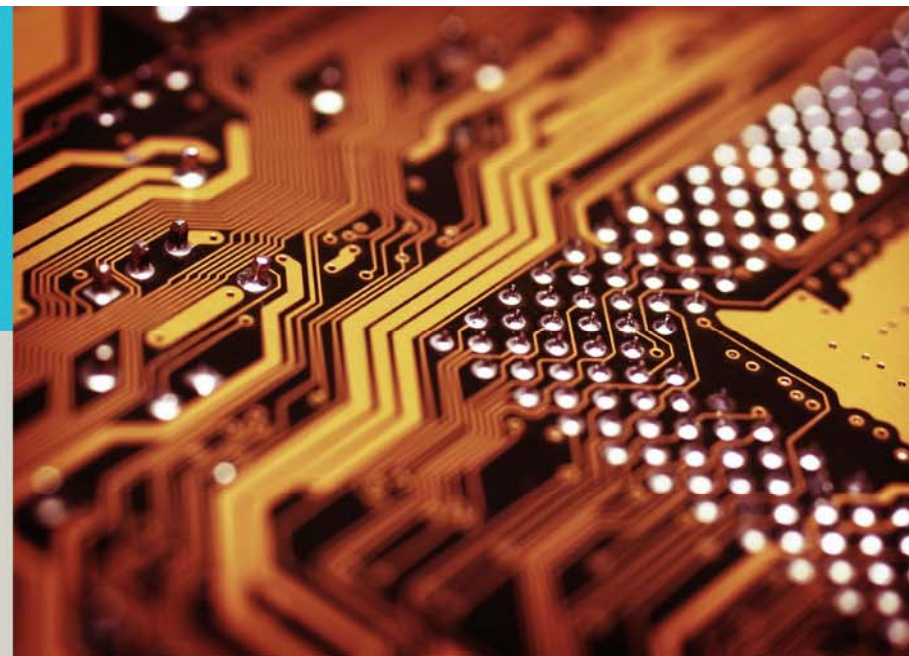


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RFID Apparel Supplement

Given the clear traction of RFID in apparel, including a recent article in the *Wall Street Journal*, we wanted to provide you with the RFID Monthly Apparel Supplement. We expect that with the increased attention and progress, more industry players, suppliers and investors will be interested in key background. This supplement provides an update on the current status of the RFID apparel market as well as offers a reprint of key apparel-related articles we have posted in the last several months, which includes the following:

- **Market Traction Continues to Increase - New.** As we noted in the April and February editions of RFID Monthly, Wal-Mart has been installing RFID infrastructure and driving towards tagging apparel items. Given the program traction, we now anticipate that our April prediction of 40% Gen 2 market growth is conservative, and see inlay volumes growing 125%-150% this year. It appears to us that Wal-Mart is driving the vast majority of the incremental volume.
- **Gen 2 Market Accelerating; Apparel and Asset Management Are Key Drivers – April 2010 Edition.** We provided a more in-depth look at the size of the apparel markets. At the time, we maintained our expectations for the overall Gen 2 market to experience 40% growth or better. Given the missed expectations in the past, we think this is a significant statement. To be sure, we did not see growth equally among all players, and we think those with more exposure to apparel and asset management will drive the majority of the outsized growth.
- **RFID as a Revenue Enhancement Tool – January 2010.** More CEOs should be aware that RFID can help drive incremental revenue in a wide number of industries. Today, most executives likely consider RFID to be an operational efficiency tool. Nonetheless, we now see examples where RFID enables revenue enhancement by improving customer facing tasks, offering a differentiated service, providing business intelligence or through offering better billing practices.
- **Retail Item Level Discussions at NRF Show – January 2010 Edition.** We attended the National Retail Federation show in New York and wanted to provide a few thoughts on the progression of RFID. In general, the show was much more well attended than last year, and we were particularly interested to see a number of retail senior executives looking at a wide variety of new technologies – this level has been absent from the show in the past several years

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Market Traction Continues to Increase, Driven by Wal-Mart

As we noted in the April and January editions of RFID Monthly, Wal-Mart has been installing RFID infrastructure and driving towards tagging apparel items. Given the program traction, we now anticipate that our April prediction of 40% Gen 2 market growth is conservative, and see inlay volumes growing 125%-150% this year. It appears to us that Wal-Mart is driving the vast majority of the incremental volume. While other large players have programs, most are still in the modest growth stage (note, we continue to see increases in asset management activity, which is accounting for part of the incremental volume). Tag volume appears meaningfully constrained and all of the inlay providers appear to be adding capacity (not just additional shifts, but investment in equipment). We are somewhat concerned that continued shortages in the semiconductor space could also constrain RFID chip capacity in the coming months.

In addition to tags being constrained, RFID mobile readers are also in short supply. We would note that all types of mobile products are in short supply given component shortages, but we understand that the Motorola MC-9000 and MC-3000 series are the most challenged. This is exacerbated by what we understand to be a 20,000 unit order from Wal-Mart that is currently be fulfilled. More broadly, we believe mobile readers, which offer good operational flexibility and thus can help improve payback (consider that Container Centralen is asking over 23,000 customers to equip themselves with mobile readers as part of their container authentication program), are in high demand for RFID application beyond retail. We believe mobile readers are outselling fixed readers by 3x-4x.

Wal-Mart's September tagging requirement has been taken seriously by suppliers given that Wal-Mart is has been working with suppliers to help develop benefits, including data sharing and possible faster payment for RFID tagged receipts; they are also absorbing some of the early tag costs and helping to establish volume pricing. This is different than 2003, when minimal standards were in place, tag prices exceeded \$0.30, no real value was offered, and Wal-Mart IT was driving the program. Now, Wal-Mart operations is the driving force and we expect suppliers feel more compelled to be involved and are now looking much more closely at how RFID can add value to their own operations. From Wal-Mart's perspective, we understand that store managers,

once the system is in and employees are trained, are very happy with results of how quickly physical inventory can be taken; most are inquiring when more goods can be tagged.

The major challenge from here will be for suppliers to take increased ownership of the process and do more non-exception based source tagging to gain value. Today, Wal-Mart is involved in ordering the tags and they are applied at either source of manufacture or at a distribution center. This process needs to be more integrated into existing operations to lower costs and ensure proper tagging, which also includes mapping tag identifiers to item specific item data. Also, it will be more valuable to suppliers to tag all items, not just on an exception basis for Wal-Mart. Suppliers are in their very early stages and it will be interesting to see how they move forward from here to develop a set of RFID best practices.

Apparel Retailers in a Position to Invest in RFID – June 2010

In past editions of RFID Monthly, we have highlighted the value of leveraging RFID in apparel to generate labor savings and boost revenue by reducing out-of-stocks. We estimated the total value potential of this market to be \$800M (see the April 2010 edition of RFID Monthly for the detailed analysis). Our expectation is that current programs at Wal-Mart, JC Penny, Dillard's, Bloomingdale's, Banana Republic and others will act as a catalyst for additional participation by mid-tier retailers in 2011. Importantly, we see evidence that apparel retailers, particularly department stores, are also in a position to invest despite an uncertain environment, where growth still remains volatile. Of particular focus is the status of relatively leaner inventory levels, which enables improved cash flow, thus allowing CFOs with some comfort in investing in new application platforms, such as RFID.

We are looking at inventory in two ways. First, against the last recession to evaluate the relative level of investment potential at low points in the business cycle. Second, the level of recent improvement to evaluate the current trend in investment potential. We view inventory turns as the best method to evaluate relative investment in inventory.

With respect to the most recent recession versus early 2001-02, we see an improved inventory position. Average inventory turns at the low point in early 2002 were 3.3x* on a trailing bases versus 4.1x at the low of the current downturn in late-2009. Importantly, retailers were in a position to rapidly respond to the weakening conditions through improved inventory management. This can be seen in the improving trends, even in the depths of the recession as average inventory turns begin to see a meaningful climb in early 2009 and have now reached 4.7x.

To provide some perspective on the cash flow impact, every 0.1x improvement in inventory turns can mean just over \$50M in improved cash flow at larger stores such as Gap and Limited, or around \$10M at more mid-tier players such as Urban Outfitters or Liz Claiborne. This substantial improvement places retailers in a much better position to invest given the resulting improvement in cash flows and relative stability.

Further, we view most of the inventory management as either labor intensive or not having sufficient levels and thus costing revenue. We see the automated features of RFID and the proven value proposition as having appeal to future inventory management programs.

*We included a variety of large and small retailers as well as specialty and department stores to arrive at a general overview. Our list includes Coach, Gap, Limited, J. Crew, Chico's, Urban Outfitters, Liz Claiborne, Jones, VF Group, JC Penny, Kohls, and Nordstrom. Raw data courtesy of FactSet Data Systems.

Gen 2 Capacity Expansion Looks Likely – May 2010

It appears that capacity is starting to become constrained for Gen 2 inlays. We have heard from several sources that volumes were up substantially in 1Q10, which has continued into the mid-point of 2Q10, and we expect demand levels will increase further into 3Q10. Most of the cause seems to be related to the boost in apparel, primarily from Wal-Mart, but also JC Penney and others. We believe Conair's deployment and several returnable asset initiatives are also likely eating up capacity.

We expect some incremental capacity investments are already being planned by all of the major inlay providers to meet the boost in demand. At this point, we expect the incremental investments will be limited to a modest amount of new equipment. If more apparel programs begin to kick in, which we expect will happen in 2011, and if more returnable programs and a few industrial programs gain traction, we'd expect to see more meaningful incremental investment, likely happening in late 2010. We continue to see the Gen 2 market as growing 50% this year.

Gen 2 Market Accelerating; Apparel and Asset Management Are Key Drivers – April 2010 Edition

Following the RFID Live show in Orlando, we maintain our expectations for the overall Gen 2 market to experience 40% growth or better. Given the missed expectations in the past, we think this is a significant statement on our part. To be sure, we do not see growth equally among all players, and we think those with more exposure to apparel and asset management will drive the majority of the outsized growth. Governmental exposure will also enable growth prospects to outperform the average as most of these programs tend to be in the asset management area. We see most players in the industry growing between 20% and 30% this year.

Apparel

The area with the most excitement is apparel, where we see revenue beginning to accelerate. For some industry participants this is understood, but we are surprised that most are unaware of the meaningful progress in this segment. To us, this news carries a great deal of importance as it demonstrates that RFID is a usable technology that can add real-world value, and we expect players in a wide number of industries will take note of the progress. This should foster incremental interest.

It is clear that tag volumes are ramping up with some initiatives tagging at the source in Asia, while others are done at the distribution center or at the store in the U.S. or European domestic markets. Wal-Mart, JC Penny's, Bloomingdale's and Banana Republic are the leading large players at this point.

As we noted in January, Wal-Mart has been rolling-out infrastructure in several distribution centers and stores (we do not know the full status in terms of number of stores, but have heard 25% of DCs are fitted), and has asked select apparel suppliers to begin tagging no later than September 2010. We are not aware of any push-back; instead we hear orders for tagging this inventory are already being placed. Estimates suggest that Wal-Mart sells in total between 2.0B and 2.5B apparel articles annually, which seems reasonable given \$40B in annual revenue from worldwide apparel.

JC Penny is moving forward with two separate apparel lines in a small number of its 1,108 total department stores. One line is footwear and, based on University of Arkansas research, we believe the second is women's intimate apparel; we estimate the total between the two lines as about 10%-15% of total revenue. Given the number of stores and the two lines, we estimate about \$50M-\$75M in total goods is being tagged today. Penny's indicates the biggest challenge will be to get suppliers to begin source tagging. Their approach to entice suppliers is to provide data that illustrates how tagging is leading to sales-lift, thus providing value. As a side note, we see in-store labor reductions and sales-lift from reducing out of stocks as the key drivers of value. We also see some suppliers as believers of the benefits of RFID and are tagging to improve merchandising visibility, or to redeploy labor or lower labor costs. Levi's, Nike and Roca Lewi's are examples in this area. Many suppliers, however, are slow to source tag.

Below this level, we understand about 20-25 apparel players are evaluating or deploying RFID. We have discussed American Apparel, which is now at 15 stores. We expect further deployment will continue at a measured pace and will largely be governed by financial considerations. We see this area as being a good target market, particularly given many of these specialty players are more closed loop in nature. We see the pace of this group will be measured as some are moving forward, such as Jones, but most are taking a wait and see approach in the U.S. with more traction in Europe and Asia.

This segment alone represents a substantial opportunity, with over 22,000 locations from the following specialty apparel players (note the list is not exhaustive, but does provide some perspective on the size):

Gen 2 Market Accelerating; Apparel and Asset Management Are Key Drivers – April 2010 Edition (continued)

<u>Brand</u>	<u>Locations</u>
Gap stores	3,465
Limited Brands	2,681
Sunglass Hut	2,286
Dress Barn	2,025
Hugo Boss	1,330
Chicos	1,074
Liz Claiborne	1,024
Ann Taylor	935
Gymboree	900
Jones Apparel Group	800
VF Brands	757
Van Heusen	700
Nike	675
Talbots	587
Eddie Bauer	550
Rue 21	500
Max Azria	480
Polo	326
Coach	300
Urban Outfitters	293
Brooks Brothers	280
J Crew	263
Reebok	150
St. John	133
Adidas	126
Jockey	99
Saks	54
North Face	36
Columbia	32
Total	22,861

Note: Only Jones and Gap's Banana Republic are doing anything meaningful here.

Source: company websites, SEC Filings and Robert W. Baird.

On average, we estimate a total per store cost of \$23,000 to outfit each store with 2-3 fixed readers, 3-4 mobile readers, support infrastructure, software and services, which results in a total market opportunity of over \$500M. Note, today's outfitting cost is higher, but we assume it will come down meaningfully to the \$23,000 level. For tags, we assume 40,000 items per store that turn 4x per year and a per tag cost of \$0.09, resulting in a total inlay opportunity of over \$300M, annually. Also, please note that our analysis does not include supply chain infrastructure, including distribution center readers or printer / encoders. We are also likely understating the tag volume by only including store level, not supply chain.

Asset Management

We see lots of activity in asset management in a wide number of industries. The only discernible pattern we see in asset management is the increased level of usage in the healthcare industry. This is largely focused on improving utilization of basic hospital items (wheel chairs, beds, IV pumps, etc.) in an effort to reduce capital expenditures by purchasing fewer assets, and improving labor efficiency by lowering search times.

For the asset management opportunity in general, many of these programs feature active technology, but we are also seeing an increased use of Gen 2. Most of the Gen 2 products are specialized, durable tags that can cost between \$3 and \$20. We see the downturn as a key driver as CFOs are seeking to be much stingier with capital deployment and are seeking ways to reduce operational costs. We see these asset management programs as clearly identifiable, closed-loop programs that are relatively easy to deploy and yield strong returns.

Aerospace continues to see increased activity at several different organizations, particularly in the area of tooling. Airbus, for example, identified a current pilot project in the UK for tracking to manage not only the checkout process, but also the calibration process. Airbus plans to roll this out to all of its facilities during this

Gen 2 Market Accelerating; Apparel and Asset Management Are Key Drivers – April 2010 Edition (continued)

year; in total Airbus has over 500,000 tools. NASA continues to leverage RFID for several tooling applications. Note, we see more of the large system integrators as becoming increasingly interested in RFID deployment and project management in the Aerospace segment, including CSC, SRA and BAE.

Government is seeing increased deployments in a number of areas, including tracking of physical assets on military bases, vehicle fleet management (both the DoD and in state and local governments), parts management, and IT asset management (DoD and State). Budget pressures are actually helping these deployments given asset acquisition is becoming more difficult and organizations are therefore seeking to improve asset efficiency.

Commercially, we see a large array of applications, including management of returnables, particularly pooling assets (pallets, cages, totes), IT data center assets and commercial fleet management in the auto and transportation industries. With respect to the data center, much of the focus has been on the financial services industry, which does seem to still have opportunity. Wells and Bank of America are the best publicized and are still seeing activity, but we are aware of expansion into several other players as well. However, we see opportunity more broadly than financial services, including corporate data centers, internet service providers and IT outsourcers. Importantly, it appears both Sun and HP are increasing their source tagging programs.

Gen 2 Market Perspective – March 2010 Edition

We wanted to provide some overall perspective on the state of the industry with respect to growth prospects, equipment and solution status, and some thoughts on key vertical markets for Gen 2 based technology. In our view, market growth exceeding 40% should be possible in 2010. We see apparel and asset management applications as key drivers, but we also expect meaningful contribution from retail. We expect all geographies will see traction.

As background, recall that the first part of 2009 was very weak as the market contracted in the face of meaningful economic uncertainty and the newness of RFID. We saw improvement beginning in the May/June timeframe and with 4Q09 we believe the industry was likely back to peak revenue. Much of the recovery was led by Asia, most notably South Korea, Japan and China. We also saw apparel pilots jump in numbers, which also contributed to the improved growth. Overall for 2009, we estimate the industry was flat, with about 450M-500M tags used for Gen 2 applications. We did see a meaningful jump in software revenue, albeit off of a small base. Many companies reported seeing good sequential growth in both 3Q09 and 4Q09. By most accounts, expectations are that 1Q010 will also show sequential growth. We expect this sequential growth will build throughout the remaining quarters of 2010.

Equipment and Solution Status

By and large, end users see current hardware as having good quality and providing sufficient read rates; they are also encouraged with continued declines in pricing, primarily for readers. The key challenge is that equipment configuration is generally customized by application. We expect improvements in reader functionality and third party software will make this configuration process more automated and less costly. Beyond the reader, there remains a good bit of learning that is necessary in terms of designing processes and tag placement.

There is very good tag capability with Monza-3 and Higgs-3 silicon in terms of read performance and a reasonable level of location accuracy. We expect continued improvements in tag technology will reduce the tag placement problem. Tego has enabled meaningful extended memory capability that is now available. We see a wide variety of

product offerings designed for specific applications for basic inlays as well as significantly ruggedized versions.

We see the best development having come from full solution capability aimed at a wide number of applications, including medical cabinets and inventory tracking, laundry tracking, steel fabrication, apparel inventory, timber inventory management, and many others. These solutions are in use today, generating a good ROI and can be ported to similar applications. We see meaningful investment in this area, and we are encouraged that end customers are allowing solutions to be developed in live environments. This leads to rapid updates and improved offerings.

Select Vertical Market Comment

Apparel/Retail – Apparel clearly seeing strong traction in Europe and North America with the number of pilots substantially higher than a year ago. These pilots are item level and seem to have the most value in the last 250 feet (i.e., receipt to shelf to POS), which is improving the fulfillment process and enabling better shelf-level visibility. The most successful programs seem to have some common characteristics, including executive buy-in, a general willingness to change business processes (may initially implement with minimal changes, but more meaningful changes over time are expected), a plan to manage people through the transition and the ability and willingness to deploy capital. The overall solution development is mixed with some players leveraging external software and integration help, while others, such as JC Penny, are internalizing the development.

Much of the external work to date has been done at a meaningful discount, which has obviously served to increase piloting. But, more importantly, we view the associated software and integration activity as a meaningful learning experience that has aided in creating more fully productized offerings. This process included more robust requirements development and subsequent testing. With these offerings, we expect fewer discounts and somewhat faster pilot activity. We remain somewhat concerned on the level of scalability (mostly due to people related issues), but expect 2010 will provide some insight as projects expand. We expect total solutions revenue will more than double in

Gen 2 Market Perspective – March 2010 Edition (continued)

2010 in apparel. We expect the software component will nearly triple.

Several pilots are turning into rollouts, with most of the pace measured. We see a group of players that seem to be the key leaders. In most cases, they have established a business case and are evaluating how best to proceed. The group includes JC Penny, Bloomingdales, Charles Voegelé, GAP, American Apparel, Levi's, Rica Lewis and Jones. We have heard about one-third of the programs have a payback of one year or less. Key learning: type of tag and tag placement need to be fundamentally understood and the near-term bias is towards using existing systems for data exchange between supply chain partners as opposed to a new common platform, such as EPCIS.

In retail, we continue to hear that Wal-Mart is moving forward with a number of programs to tag 13 different categories and is seeing increased activity. We see the value coming from multiple vendors participating so that information can be extracted, not by product, but by category. We expect increased visibility will illustrate potential process defects. Wal-Mart continues to engage vendors to articulate value in terms of visibility through Retail Link, and potentially better payment terms given increased product visibility (i.e., automated receipt at a pay point acts as a trigger for payment). We do not expect to hear much in the way of public announcements from Wal-Mart.

Aerospace and Defense – We see several examples of using higher-cost specialty Gen 2 tags in this segment. These tags may have a wide array of attributes, including significant ruggedization, ability to work on metallic surfaces, extended memory. In many cases there is a high degree of engineering applied to a specific application. Some of these tags can be over \$20 dollars each, even at volume. Applications include assembly verification/inventory management, tool tracking, maintenance history. Some orders are reaching 25,000-30,000 units as several system integrators (large and small) develop these types of solutions.

In defense, logistical related programs continue to gain traction, with perhaps \$15M of total business generated in 2010. We see this expanding to above \$30M in 2011.

Healthcare / Pharma – Healthcare in general is showing some signs of traction, with increasing orthopedic and cabinet solutions. We have seen good evidence of ROI for the tracking of large ticket items (in addition to Gen 2, we have seen reasonable HF solutions in this area), which has provided increased inventory visibility. Improved outcomes include avoiding unintentionally discarding valuable operating room equipment, fewer inventory discrepancies, and improved billing practices. These billing practices are for hospitals and vendors alike as a good amount of inventory is on consignment. As a side note, hospitals also seem to be increasingly willing to invest in active RFID solutions for large scale asset management applications. The point here is that RFID across the board, seems to be gaining some reasonable attention.

With respect to pharma, we see trends towards using more 2D bar coding for drug serialization. From our conversations with pharma companies, this appears to be based on the view that 2D covers the informational needs, the security is a bit tighter, the upfront costs are smaller and less disruptive and the technological risk is lower. We don't disagree with these points, but we expect the added labor of having to scan 2D bar codes, considering the large volumes of products, particularly downstream will create additional costs that will outweigh some of the near-term capital avoidance.

Transportation – We are not hearing of much activity here other than previously reported gains with vehicle tolling, primarily in Latin America.

Pricing

As a follow-up to UPM and Avery putting forward announcements of a 10% price increase, we have a few observations and a comment. With respect to our observation, we have heard of several instances where existing customers have been told that their pricing won't change, potentially undermining the cost increase effort. Our view is that this is a natural phenomenon as customers place significant resistance to the increase and individual salesmen seek to protect their relationships. Our view is that it is too early to truly understand to what extent the price increase will take hold. Our comment is this – the companies should be absolutely focused on pricing the tags appropriately to make

Gen 2 Market Perspective – March 2010 Edition (continued)

a profit. It is time to focus on customers that will gain appropriate value from RFID and are willing to pay accordingly. And, it is sure not time for one vendor to play price games to gain share. It is an emerging market that needs to realize value to progress, playing a share game is not helpful.

RFID as a Revenue Enhancement Tool – January 2010

More CEOs should be aware that RFID can help drive incremental revenue in a wide number of industries. Today, most executives likely consider RFID to be an operational efficiency tool. Nonetheless, we now see examples where RFID enables revenue enhancement by improving customer facing tasks, offering a differentiated service, providing business intelligence or through offering better billing practices.

Customer Facing Tasks

We see several examples of retailers and suppliers improving revenue through leveraging RFID to improve customer facing tasks. The most high-profile use of RFID here has been to reduce out-of-stocks. Examples include American Apparel and Charles Voegelé. Less discussed is that store sales associates have more time to spend with customers, which generally leads to increased revenue.

Improved receipt, faster cycle counts and greater inventory visibility have freed up over 175 labor hours per month at each of the 10 RFID-enabled American Apparel stores. The analysis suggests that American Apparel could save \$27,000 annually per store through reduced labor. However, we expect at least a portion of labor savings can, and should, be redeployed to help drive revenue through increased customer interaction. Let's assume that 25% of this labor savings was reoriented to spend with customers (525 hours per year), which generated 1% additional revenue. That would mean giving up \$6,750 of savings in favor of \$12,000 incremental gross margin dollars generated from \$18,200 in additional revenue for the average store.

Further, we see apparel providers being able to generate additional revenue as we recently highlighted with European Jeans manufacturer Rica Lewis. Historically, Rica Lewis' 40 sales representatives spend significant amounts of time at each of their retail customers scanning inventory, which is adding no sales value. With RFID, the scanning process time is reduced by 80%, and frees up about 10-15 hours per week per sales rep. As a result, more time can be devoted to merchandising decisions, in-store layout and advertising, and managing store personnel relationships. Also, Rica

Lewis also plans to increase the number of stores each sales rep covers, thus increasing the amount of retail coverage with the same team of 40 sales reps. This system began to ramp in November 2009 and will be fully operational by the end of 2010.

We also see examples in healthcare using real-time locating systems (RTLS). The San Joaquin Community Hospital, which has 285 beds, provided data illustrating the hospital conducted over 5,400 searches for various types of equipment (patient beds, wheelchairs, IV Pumps, etc) between August and September 2009. Historically, the hospital indicated the average search time took about 23 minutes, which was driven down to about 5 minutes using RTLS. The resulting savings was just over 1,660 staff hours during this two month period, which was redeployed to spend with patients. While there is no data to show increased nurse time leads directly to greater revenue, consider the following:

- First, hospitals are ranked on the basis of quality patient care, and more nurse time clearly elevates the perceived quality. Higher rankings help to drive higher revenue.
- Second, the hospital can now use this as a recruiting tool as the hospital can show how nurses at San Joaquin spend more time with patients. Better recruiting suggests a higher quality of nurses and likely equates to better care.

Offer a Differentiated Service

We see the entertainment and hospitality industry as providing great examples of offering a differentiated service. We have regularly written about using NFC-based payment options as a source of revenue drivers at amusement or water parks, or at resorts. It is well documented that the convenient payment options drive incremental revenue at food and beverage venues. We further believe such an offering provides strong differentiation that drives more traffic. Sea Villas Resorts, Qwest Field (Seahawks), and Grand Millennium Sukhumvit are all examples that are providing a differentiated offering.

Ski resorts are another example. Today Vail is using RFID for annual passes to provide convenience for regular customers and to

RFID as a Revenue Enhancement Tool – January 2010 (continued)

reduce fraud. Having this infrastructure in place could provide incremental sales opportunities. Employees carrying around handheld devices enable quick access to guest profiles, providing the chance for perhaps extra-special treatment in the lift line, “Good Morning Mr. Smith, looks like good powder on the Upper Ramshorn.” Since each lift is also enabled with a reader, it would be possible for the resort to provide skiers with a daily or weekly report on their activities, perhaps number of runs or a summary of vertical distance traveled. These are differentiated offerings that cement relationships.

Providing Business Intelligence

Consider our Vail example above with respect to creating specific guest experiences or marketing programs. Skier activity is recorded as each lift is equipped with RFID readers, and if this is combined with business intelligence software, the resort could create targeted campaigns, “We noticed you spend a lot of time on ‘Swingsville,’ please come and enjoy 15% off at ‘Henry’s Hut’ on your next visit at the top of the ‘Swingsville’ run.” Or, “We noticed you especially enjoyed ‘Swingsville’ on your last visit, other guests who liked that venue have also enjoyed ‘The Skipper’ and ‘Tourist Trap.’”

Another type of example is Coke’s new Freestyle machine, which offers one of the more powerful methods of leveraging RFID to provide granular-level marketing data previously unseen. Freestyle is the next generation of soda fountain product that allows up to 122 different drink types to be dispensed in a restaurant. The machine uses cartridges of highly concentrated formula instead of large five-gallon bags of syrup, which are used by most fountain dispensers today. An RFID tag is affixed to each of the 24 cartridges in the machine, which provides the ability for the machine to track usage.

As product is dispensed, the RFID reader within the unit rewrites to each tag the respective consumption levels. At set intervals, the data is read by the Freestyle machine and wirelessly sent to Coca-Cola’s SAP system to update used quantities. Given Coke understands item-level shipping to each location, the specific cartridges inserted into each machine and consumption of those cartridges, it is developing significant business intelligence on customer order patterns. This would include better understanding consumption variations during key

product times, and the ability to test new drink concepts real-time. This varies by geography. Importantly, Coke can not only use this data for restaurant promotions, but also leverage the information to adjust its merchandising mix at convenience stores and gas stations that may be in close proximity to the restaurant.

Note the RFID system is also being used to help with shipment verification, refilling and safety. Please see the July 2009 edition of RFID Monthly to learn more.

Better Billing Practices

One strong example of improved billing from RFID is from the cath lab at Tennessee Memorial Hospital. The cath lab has over 5,000 different items in seven different locations to serve over 13,000 procedures annually. Some items have very high value, such as pacemakers which cost over \$35,000 each; the total inventory value is about \$2.2M.

Given this lab serves cardiac patients, much of the activity is frantic and is difficult to schedule. As a result, it is often challenging to track the path of inventory. The year-end physical count prior to implementing RFID showed that actual inventory \$500,000 below what was on the books. The following year, with the RFID system in place that offered increased visibility, the discrepancy decreased to \$12,000. Our view is that a meaningful portion of the \$500,000 discrepancy was simply lost revenue since it was not assigned and, therefore unbilled.

With numbers like this, CEOs and CFOs will likely begin to ask how quickly such solutions can be installed in other departments.

RFID Solution at Rica Lewis Looks Compelling – February 2010 Edition

Rica Lewis, a European provider of Jeans, has implemented item-level tracking RFID tracking to improve inventory management and merchandising. Our basic analysis suggests a compelling revenue enhancement benefit that well exceeds the incremental costs of deployment once fully implemented. The company sells roughly 5M pair of Jeans to retailers such as Carrefour, Auchan, Kiabi and Casino, and began its Gen 2 based RFID rollout in November 2009. Today, only a few hundred thousand items are tagged, but Rica Lewis expects to be tagging all items by the end of 2010.

Increased Sales Efficiency

Today, the primary use of RFID is to enable Rica Lewis sales representatives to more rapidly understand inventory positions at each of the retail stores in their respective regions. Sales reps are responsible for between 20 and 40 stores in their region, and they must understand inventory levels in order to make proper merchandising decisions and ensure sufficient product availability. Today, this process is conducted by conducting a manually intensive in-store inventory count, which is done by scanning the product bar code or through manual notation. This can take between 60 and 80 minutes per store. The average rep visits 10-15 stores per week, which equates to between 12 and 18 hours per week of sales time devoted to the task of scanning inventory. The data from these inventory counts are uploaded to Rica Lewis' ERP system to track inventory positions, and to enable shipping instructions out of the company's main distribution center in Fossano, Italy.

With RFID, the scanning process takes about 10 minutes per store, freeing up about 10-15 hours per week per sales rep. As a result, more time can be devoted to merchandising decisions, in store layout and advertising, and managing store personnel relationships. Also, Rica Lewis also plans to increase the number of stores each sales rep covers, thus increasing the amount of retail coverage with the same team of 40 sales reps.

Process Not Disruptive

The RFID tagging process is not significantly different for Rica Lewis versus existing processes. The company has historically printed

barcode based tickets at its Fossano distribution center that are sent to be affixed to its jean products at the point of manufacture, which may occur in multiple countries, including China and India. The only change in the process is that embedded RFID inlays are added to tickets, which are then encoded with RFID enabled printers.

Once jean products are tagged at the source, they are shipped to the Fossano facility, and from there, are sent to respective retail customers. At retail, there is no significant difference except that the sales reps are using RFID handhelds instead of barcode scanners. The upload process to the host ERP is bridged by middleware. Tagsys provided the overall "RFID for Fashion" solution, including hardware and its e-connectware middleware platform.

In addition to using RFID at retail, Rica Lewis is also leveraging the technology at its distribution center to reduce mis-shipments. Products are picked and delivered to one of 20 preparation stations for packing. Each station table has a fixed reader that confirms the correct items are being loaded in the box. Workers receive instant feedback through a monitor, and only close and seal the box once the contents are 100% confirmed. Once packed, boxes are placed on transport for delivery at the retailer. By June, Rica Lewis plans to add tunnel scanners for receipt verification into the Fossano facility, which should help expedite the receiving process.

Compelling Benefit

While Rica Lewis has not released any data on benefits, we undertook a basic analysis and found the ROI, driven by revenue enhancement, to be compelling. Consider the following:

Rica Lewis sells about 5M pair of Jeans annually, and according to industry statistics, the price of a pair of Jean's ranges from \$40 to \$150, with the average price for designer jeans at about \$75. Therefore, we estimate Rica Lewis' revenue to be between \$325M and \$375M annually. To enable RFID, we estimate the following

RFID Solution at Rica Lewis Looks Compelling – February 2010 Edition (continued)

costs:

Incremental tagging at \$0.10 per item	\$500,000
Six RFID enabled printers	24,000
Fifty handheld readers	125,000
Twenty tabletop readers and antenna	50,000
Software	150,000
Integration costs	250,000
Annual maintenance	100,000
Unanticipated costs	<u>250,000</u>
Total	\$1,449,000

Assuming 10-15 more hours per week per sales rep increases in-store revenue by 1%, and enables each rep to add one more store to his coverage, or about 3% more stores, then the resulting revenue boost should be about \$13M-\$15M (4% of the total revenue). Assuming a 60% gross margin, Rica Lewis would add \$7.8M-\$9.0M in incremental gross profit. To be conservative, cut this estimate in half and assume \$3.9-\$4.5M in incremental gross profit against \$1.45M in costs, which includes a conservative \$250,000 in unanticipated costs. This analysis does not include any net benefit from receipt or shipment verification. We view adding nearly incremental profit of nearly three-fold of incremental cost as a compelling ROI.

Retail Item Level Discussions at NRF Show – January 2010 Edition

We attended the National Retail Federation show in New York and wanted to provide a few thoughts on the progression of RFID. In general, the show was much more well attended than last year, and we were particularly interested to see a number of retail senior executives looking at a wide variety of new technologies – this level has been absent from the show in the past several years.

We see item level RFID gaining more traction than we appreciated. We have discussed in the past the increased activity surrounding item level apparel, which has many pilots that are showing strong returns. We see modest expansion of those programs in 2010. In addition, we are seeing expansion of activity beyond the pure apparel players that include more of the broadline retailers, including both department stores and big box players. Our understanding is that most of the key players are getting behind RFID. The only significant player not participating appears to be Target, which has generally not been supportive of RFID after its initial analysis in 2004.

Most of these players have been developing and piloting solutions, with most of the attention on better inventory visibility to enhance sales-lift, reduce inventory costs and increase payment. It is very clear from our perspective that the ROI is there, and that these projects need executive sponsorship, which we discussed in October 2009, “Item Level Source Tagging – It Makes Sense, but Getting Executive Buy-In Will Be Critical”) and improved prioritization of resources. According to our sources, more senior-level executives are becoming involved in RFID initiatives.

One important new thrust has been Wal-Mart/Sam’s Club, which has now outfitted RFID at approximately 25% of its distribution centers and several hundred stores. We now understand that they have approached all key vendors in 13 key categories (the categories are unknown) to tag at the item level, which we understand includes shelf-cartons (not necessarily individual product within the carton). Wal-Mart sees value in being able to better understand information at the category level to not only aid in replenishment, but to also lead to improved merchandising decisions.

We understand Wal-Mart’s approach with the vendors contains two benefits of compliance. First, with infrastructure now in at key DCs and stores, Wal-Mart is in a much better position to share information. We alluded to this in our piece regarding Conair, where that company indicated it was gaining visibility through RFID into its sales at Wal-Mart and Sam’s Club, which has resulted in evidence of sales lift. Second, with an improved receipt process which enables better visibility, Wal-Mart is apparently suggesting that vendors may be able to get paid faster. These are hugely important points as we know that compliance with no benefit tends not to work. Also, vendors that don’t tag will be faced with a charge for Wal-Mart to do the tagging for them. We expect this process will begin in February.

Item Level Source Tagging – It Makes Sense, but Getting Executive Buy-In Will Be Critical – October 2009 Edition

GS1 EPCglobal has published a [strategic overview](#) and a [technical implementation guide](#) for creating Gen 2 RFID-based electronic article surveillance (EAS). We view positively many aspects of this approach as we profiled in the January 2009 edition of RFID Monthly, where we discussed the [worldwide problem of annual shrink](#) approaching \$130B. While about 40% of the shrink problems are related to organized and impulse theft, the larger portion of shrink (60%) has to do with vendor disputes, employee theft and internal errors. In our view, most of these problems can be solved with improved inventory visibility. Not included in these numbers are the lost sales due to unrecognized out-of-stocks created by theft (i.e., because an item is stolen, the perpetual inventory system is not updated for reduced stock, and will not properly reorder). From this, it is clear that retailers face a large expensive problem, and RFID, while requiring investment, can provide a long-term solution to reduce the magnitude of these costs, while also improving revenue opportunity.

Source Tagging Is Key to Meaningful Benefit

Key to this RFID based approach is item level tagging at the source to achieve value throughout the supply chain as well as in-store. This approach may not be that costly to implement and will likely reduce complexity versus current processes. The EPCglobal strategic overview points out that multiple sets of source tagging occur today, including swing tickets/price tags and EAS. Further, the EAS technology has multiple technology/protocol sets, which creates changeovers during the tagging process. EPCglobal is advocating a consolidated single standardized RFID tag at the source. This approach might prove to lower overall application cost given source tagging is already done, but multiple times. Further, inventory of tags could be reduced in the long run.

In terms of incremental value from RFID source tagging, consider that within the supply chain contents can easily be scanned before shipment. These can then be compared to a valid purchase order to confirm that the correct contents have been packaged, and are being placed on the correct transport. This avoids mis-shipments and creates well-documented advance ship notices (ASN). During receipt at any

point in the supply chain, including distribution centers, warehouses, and stores, contents can be scanned and compared to the ASN. In addition, cross docking at distribution centers will have substantially more visibility. Discrepancies in both of these processes will be immediately apparent, which will improve searches for missing contents, and accountability will be enhanced enabling faster resolution of billing disputes.

The In-store receipt process, like at preceding supply chain points, can be automated and discrepancies can be quickly identified and resolved. Shelf inventory can be quickly counted with handheld readers or possibly with real-time locating technology. Door readers can act as an EAS system to detect items leaving, and can send an alert when removed items have no record of being scanned at point of sale (POS). Customers will be given the opportunity to remove the RFID tag at POS. Tags that are removed help ensure privacy, while those that are kept can facilitate the returns process. We advocate keeping the tag on the item, but enabling the technology to have an encrypted or hibernation mode after point of sale to protect privacy.

Challenges (Mostly Human Inertia) Need to Be Addressed

With respect to EAS capabilities, we remain concerned that RFID can still be disrupted by the environment as well as metals and liquids, but new equipment is beginning to mitigate the problem. Further, standards will need to be developed for tag placement by item type to both enhance readability and security. Nonetheless, RFIDs mere presence can still act as a deterrent, and can more easily be scanned in the store at regular intervals versus EAS or bar codes that offer limited scanning capability. This will certainly help reduce out-of-stocks, which based on our American Apparel case study and based on recent comments by executives at Conair, clearly leads to revenue lift. In addition, the increased in-store visibility can be fed into business intelligence systems more effectively to help determine improved layout and theft patterns. We view the possibility of using directional technology or RTLS as particularly useful.

Item Level Source Tagging – It Makes Sense, but Getting Executive Buy-In Will Be Critical – October 2009 Edition (continued)

The biggest challenge will be convincing retailers to replace existing EAS equipment with RFID equipment and developing the required database structure. Consider that by “retailer,” we mean individuals within the operations department, the IT department and the loss prevention department. This will be a significant challenge to get these players aligned. In our view, this type of change needs to come from the office of the CEO, otherwise it risks going nowhere. CEOs who are presented with a strong cost/benefit analysis are likely to push ahead. Once retailers buy-in and have adequate infrastructure, they can push requirements on to their supply chains.

EPCglobal Requirements

In terms of in-store implementation guidelines, EPCglobal recommends a serialized Global Trade Item Number (SGTIN). The structure and encoding of the SGTIN can be found in the [EPCglobal Tag Data Standard](#). To build the in-store data base of SGTINs, the guide recommends completing an in-store audit, and subsequently add to the data base as new items are received. Once inventory is completely turned, the SGTIN database should be fully populated without causing significant migration issues. The following are key considerations for maintaining SGTINs, recoding transactions and dealing with exceptions during the entry/exit process (PoE).

- Read tags at receipt, unidentified SGTINs need to be added to the database. Use the ASN or Dispatch Advice to identify the SGTIN.
- After completion of payment transaction, the associated SGTIN should be removed and decremented from the inventory database.
- PoE readers must access the SGTIN database. Items leaving the store that have not been removed from the database require a store alert.
- When foreign tags enter the store, they must be identified, and an exception made so that no alarm sounds.

Key Requirements

- Existing information system and local area network
- System memory must be able to support all items, not just item groups (SKUs).
- The speed of updating the database after point of sale needs to be faster than it takes for the customer to reach the exit. Otherwise an alert will be generated. Readers need to communicate with a central database.
- Networking equipment must be able to host an application to communicate with readers and needs to be IEEE (physical layer) IETF (protocol) compliant for networking.

Participants in the requirements group include Accenture, American Apparel & Footwear Association, Auto-ID Labs – Japan, Avery Dennison, AXWAY, Best Buy, C & A Europe SCS, Carrefour, Certus Warensichenrung-Sys, Checkpoint Systems, Cisc Semiconductor Design and Consulting, Conair, Electronics & Telecommunications Research Institute, Gerry Webber International, Innovation Research & Technology, Intellident, Invengo Information Technology, Johnson & Johnson, MET Labs, METRO Group, Motorola, Nedap, NXP Semiconductors, Packaging Corporation of America, RF_IT Solutions, Sirit, STS Emniyet ve Bilisim Sistemleri, Tailorit, Sensormatic / ADT, University of Arkansas, UPM Raflatac, Walmart and GS1 and associated member nations from a wide number of geographies.

Table of Key RFID Providers

Company Name	Ticker	Semi-Conductors	Inlays/Tags	Readers	Printers/Encoders	Networking	Software	Integration Services
3M Company	MMM		X	X			X	X
AbeTech	Private							X
Accenture	ACN							X
Accsis	Private						X	X
Aeroscout	Private		X	X			X	X
Alien	Private	X	X	X				X
Ambient ID	Private							X
AssetPulse	Private						X	X
Atmel	ATML	X						
austriamicrosystems	Private	X						
Avery Dennison	AVY		X		X			
AWID	Private			X				
Access	AXSI		X	X			X	
Bentonville Int'l Group	Private						X	X
BlueBean	Private							X
BlueStar	Private							X
BOS	BOSC							X
BT Global Services	BT						X	X
Checkpoint Systems	CKP		X	X			X	
CIM Bar Code	Private							X
Cisco	CSCO					X		
Computer Sciences	CSC							X
Confidex	Private		X					
Danaher (Accu-Sort)	DHR							X
Datalogic	DAL		X	X				
Dover (Datamax)	DOV				X			
Digital Angel	DOC		X	X				
Domino-ISG	Private							X
Ekahau	Private		X	X		X	X	X
EM Microelectronic	UHR.DE	X						
Entigral Systems*	Private						X	X
Feig Electronic	Private		X	X				
Fluensee	Private						X	X
Franwell	Private						X	X
General Electric (Agility)	GE						X	X
George Schmitt & Co.	Private		X		X			
Globe Ranger	Private						X	X
Goliath Solutions	Private		X	X				
Hewlett-Packard	HPQ							X
ASSA-ABLOY (HID)	ASSA		X	X				
HK Systems	Private							X
IBM	IBM						X	X
ID Systems	IDSY		X	X			X	
Identec Solutions	Private		X	X			X	X
Identive	INVE		X	X			X	X
Intelligent InSites	Private		X	X			X	X
Impinj Inc.	Private	X		X				
Infineon	IFX	X						
Intellex	Private	X	X	X				
Intermec	IN		X	X	X			X
IPICO	RFD.TSX	X	X	X				
Lexmark	LXK				X			
Lyngsoe Systems	Private							X
Lowry Computer	Private		X		X		X	X
Kennedy Group	Private		X		X		X	X
Magellan Technology	Private		X	X			X	
MARKEM	Private		X					X
MIKOH	Astrl:MIK		X	X				X
Miles Technologies	Private							X

Company Name	Ticker	Semi-Conductors	Inlays/Tags	Readers	Printers/Encoders	Networking	Software	Integration Services
Mojix	Private			X			X	
Moore Wallace	RHD		X					
Motorola (Symbol)	MOT			X				X
Nashua	NSHA		X					
noFilis	Private					X	X	
NXP	NXP	X						
Odin	Private							X
Omni - ID	Private		X					X
Omnitrol	Private					X	X	
Omron Corporation	OMRNF.PK		X	X				
Oracle	ORCL					X	X	X
PINC	Private		X	X			X	X
Power ID	Private	X	X					X
Precision Dynamics	Private		X	X				
Printronic	Private				X			
Red Prairie	Private						X	X
Reva Systems	Private					X		
RF Code	Private		X	X			X	
RF Controls	Private			X				
RF Technologies	Private		X	X			X	
RFID Global Solution	Private						X	X
Rush Tracking Systems	Private							X
S3 Edge	Private						X	
SAP	SAP						X	X
Sato	Japan		X		X			
SAVR Communications	Private		X					
Lockheed (Savi)	LMT		X	X		X	X	X
ScanSource Inc.	SCSC							X
Schmidt Electronics	Private		X					X
Sealed Air	SEE		X	X			X	X
Seonix	Private					X	X	X
Siemens	SI		X	X		X		X
Federal Signal (Sirit)	FSS		X	X			X	X
Sovereign Tracking Sys.	Private		X	X			X	X
SpaceCode	Private		X	X				
STM microelectronics	STM	X						
Stratum Global	Private						X	X
Tagsys	Private	X	X	X			X	X
Texas Instruments	TXN	X	X					
ThingMagic	Private			X				
Toppan Printing	7911		X	X	X			
Toshiba TEC	Japan		X		X			
Roper (TransCore)	ROP		X	X				X
Tyco (Sensormatic/Vue)	TYC		X	X			X	X
Ubisense	Private		X	X			X	
Unitech	Private			X				
UPM Rafalac	UPM		X					
USA ID (Conair)	Private		X		X			
Venture Research, Inc	Private				X		X	X
Verichip	CHIP	X	X					
Verisign	VRSN					X	X	X
Vuance LTD	VUNC		X	X			X	X
Vue Technology	TYC						X	X
Wavetrend	Private		X	X			X	X
Xterprise	Private						X	X
Zebra Technologies	ZBRA		X	X	X		X	X

Source: Company Information and Robert W. Baird & Co.

Glossary of RFID Terms

Active RFID Tag – The tag has an internal power source (i.e., a battery), which allows for significantly longer read ranges. Primarily used to track large, high-value assets such as intermodal shipping containers. Active tags are significantly larger and more expensive (\$25-\$250 per unit) than passive tags.

Air Interface – The communication protocol between the tag and reader. Passive tags at UHF are standardized around the Generation 2 protocol; HF is seeking a similar standard. Some active tags are increasingly communicating with standardized Wi-Fi networks (IEEE 802.11x), however, active continues to see several proprietary air interface protocols.

Antenna – Attached to chips on tags and an integral part of a reader; antennas are devices that send and receive radio frequency (electromagnetic) energy.

Anti-Collision – A component of the air-interface protocol that prevents tag data from multiple tags in the read area from interfering (colliding) with each other. Also prevents multiple readers in close proximity from interfering with each other. This is a key component to the Generation 2 standard.

Battery Assisted Passive (also semi-passive) – Passive tags that offer a small battery to boost signal strength, or improve tag sensor capability. The battery generally goes into sleep mode until required. Referred to as Class 3 products; a standard is expected in early 2008.

Class 0 – Class 0 refers to a proprietary air interface protocol for passive UHF tags. Class 0 is read only, while a subsequent protocol, Class 0 Plus, offers read/write capability. This protocol is largely obsolete with Gen 2.

Class 1 – Class 1 refers to a proprietary air interface protocol for passive UHF tags. Class 1 offers read/write capability. Class This protocol is largely obsolete with Gen 2.

Closed Loop Solution – Set of readers and tags intended for a particular application having specific, well defined start and end point. Generally seen in tracking work in process or reverse logistics operations.

DoD Mandate – A mandate to all 43,000+ DoD suppliers, announced in June of 2003, to employ RFID. The DoD issued a timetable specifying when RFID will be required (by products into specified DoD depots). The timetable has been somewhat fluid given DoD budget dollars are focused on existing operations in Iraq and Afghanistan.

Dual Di-Pole – A tag that essentially has two antennas, reducing the sensitivity to orientation and increasing read capability.

Electronic Product Codes (EPC) – The code that resides on an RFID tag that is unique to each product. The code contains manufacturer and product information as well as an individualized serial number. EPCs are maintained by EPCglobal.

Encode and Apply – A step up from “Slap and Ship,” where labels are encoded and applied on a more automated basis. Slightly more capital intensive, but more operationally efficient than slap and ship.

Encoder – Device that transmits and writes data on to an RFID tag. Used extensively in printers and label applicators for product shipments. Encoders are generally RFID reader modules developed for a printing or other encoding application.

Environmental Factors – Typically discussed with respect to UHF products, which can be affected by many factors including the presence of metal, liquids, significant reader activity, other RF “noise,” etc. These factors require process controls in terms of tag and reader placement. Readers also need proper adjustment for a given environment.

EPC Global – The body responsible for RFID standards creation; formed originally as a joint venture between the Uniform Code Council (UCC) and the Electronic Article Numbering Association (EAN). EPC Global is responsible for RFID standards development and for promoting vertical RFID solution development.

EPC Network – Developed by the Auto-ID center, this Internet-based system allows supply chain participants to retrieve data associated with an EPC through the Internet. The network remains in an emerging phase, and is administered by EPC Global.

Glossary of RFID Terms

Fluidic Self Assembly (FSA) – A proprietary process developed to rapidly attach chips to straps. The process uses a fluid bath to place small chips on a substrate for strap attachment. This process continues to be developed.

Generation 2 – The RFID air interface standard for supply chain shipments using UHF. The Gen 2 standard was approved in December 2004 by EPC Global, and has since received international approval by ISO as 18000-6C. EPCglobal is working to create a similar standard for HF.

High Frequency (HF) RFID – RFID products that use the 13.56MHz band, which is not regulated by any government. This frequency generally allows read ranges of 4-8 feet, and is not affected by environmental factors such as liquid due to magnetic coupling. The existing ISO 15963 standard is different from the Gen 2 protocol. We expect a new EPC-based standard by the end of 2007. HF has historically been used in contactless payment and item level tracking applications.

Hybrid (semi-active) RFID Tag – Tag that incorporates a smaller internal power supply, which is triggered by reader action. After interrogation, the tag resumes a passive stance.

ISO – International Organization for Standardization is a network of the national standards institutes of 148 countries, on the basis of one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system. ISO is not government affiliated. EPC Global is an ISO member and has received ISO approval for the Generation 2 standard.

Kill Command – A code within the RFID tag that once activated will permanently disable the tag. Intended to limit consumer tracking after purchase for privacy protection.

Low Frequency (LF) RFID – RFID products that use the 125Kz band. Products that use this frequency are generally smaller and cheaper as read ranges are short, typically less than 12 inches. Security access and control and contactless payment are typical applications.

Mandate Requirements – Primarily refers to an edict put in place by retailers, most notably Metro, Wal-Mart and the DoD, requiring that

certain types of shipments (mostly deliveries at the case and pallet level) use RFID for tracking purposes. The Metro mandate is the only one that imposes a charge for non-compliance.

Metro Mandate – German based retailer that is piloting Gen 2 based RFID at 229 German based stores. Suppliers are required to tag all pallets by October 1, 2007 or face a charge of approximately 2 euros per pallet. Case level tagging is expected in 2008. Metro, the worlds 5th largest retailer, operates roughly 2,400 stores in Europe and Asia.

Middleware – A specific class of software that offers several levels of functionality. Middleware acts as a data filter, eliminating duplicate reads so that the host system maintains accurate records and is not inundated with excessive data. Middleware also ensures that the RFID data formatting “maps up” with the host system data structure.

Optional User Memory – Additional bits memory available on a tag that can be used by any member of the supply chain as they see fit (i.e., routing information). Intended to allow for increased tracking efficiency.

Parallel Integrated Chip Assembly (PICA) – A proprietary process developed by Symbol (Motorola) to rapidly assemble chips to tags. The process uses small punches to extract a chip from the wafer and attach the chip to the tag antenna using a single motion. The process remains in test stages, and Motorola no longer produces tags.

Passive RFID Tag – A tag that receives its power supply from the reader upon interrogation. Used primarily in supply chain applications, these tags tend to be small in size and relatively inexpensive compared to active tags.

Pilots – Testing done by companies seeking RFID solutions, primarily for supply chain applications. Consumer product companies under mandate requirements are seeking ways to increase the value add to themselves in addition to meeting mandate compliance, which requires evaluation of equipment and internal business processes.

Portal – A door or other point in a facility surrounded by fixed RFID readers to identify and track the flow of product. Dock doors are a typical example.

Glossary of RFID Terms

Reader – Also known as an interrogator. Typically a network-based device and antenna configuration, which reads the information contained on an RFID tag. In passive operations, the reader supplies the tag with power. Readers can be fixed position for dock door or other portal applications, or embedded into mobile computing devices for in store or exception reporting requirements.

Rollout – When pilots provide sufficient evidence of a strong return on investment, companies are expected to deploy (rollout) the technology into greater parts of their internal operations or external supply chain partners. This process is expected to result in significant growth for the RFID industry.

Slap and Ship – Refers to placing an RFID tagged bar code label on products immediately before shipment. The process is typically done on an exception basis for products requiring compliance labeling. Slap and Ship is not labor efficient and allows virtually no incremental value add to the supplier; however, the up-front capital investment is small.

Strap – Component of a tag or inlay that connects the microchip to the antenna. The purpose of the strap is largely to make the manufacturing process of antenna attachment easier and faster.

Tag – Also referred to as transponder or transponder tag, which is typically affixed to an item for tracking purposes. Composed of a semiconductor chip and antenna held together in a substrate. Each tag has a manufacturer installed unique identification number as well as additional few bits to many kilobits of incremental memory. Passive tags receive energy from the reader, while active tags have an internal power supply.

UID – Unique Identification is a DoD based numbering scheme to identify a broad range of high-value assets. RFID is not necessarily required, but is preferred in many UID applications. UID applications typically require more than 256 bits of memory.

Ultra High Frequency (UHF) RFID – RFID products that use the 868MHz to 950MHz frequency band, which is regulated by governments. This frequency allows read ranges of 8-30 feet (2x-4x of HF), but can be heavily affected by environmental factors, including liquids and metals.

Wal-Mart Mandate – Wal-Mart mandated that its top 600 suppliers ship products with Gen 2 RFID tags identifying each pallet and case to up to 1,400 stores by the end of 2007. As part of this program, Wal-Mart continues to conduct pilots to determine ROI.

Write Once Read Many (WORM) – Used to describe an RFID tag that allows only one set of data to be written on to it. Typically used in applications where security is a concern.

Appendix – Important Disclosures and Analyst Certification

Robert W. Baird & Co. and/or its affiliates expect to receive or intend to seek investment-banking related compensation from the company or companies mentioned in this report within the next three months.

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