



Analysts expect RFID to continue to evolve and increase in use, which has many converters wondering to what extent, if any, they should get involved.

By Michelle Sartor

Radio frequency identification, commonly referred to as RFID, is a hot topic in a number of industries. Some changes have occurred in the past year with the technology, and many analysts predict that the RFID market will continue to grow in the coming year. In the narrow web industry, there is hesitation on the part of some converters to get involved with the technology. Differing opinions exist about if and how converters should get involved. In the end, however, individual converters need to assess the pros and cons of adopting RFID and make decisions for themselves.

Several changes have taken place with RFID in the past year. The biggest development on the technology side has been the release of Gen 2 tags. These tags are meant to be more reliable and globally accepted than Gen 1 tags. Gen 1 includes three types of tags: Class 0, Class 0+ and Class 1. Class 0 tags are read-only, Class 0+ are fully re-writable and Class 1 tags are one-time programmable. Because these tags were part of the first generation, they did not perform as successfully as users would have liked. Their data functionality did not meet user requirements and they did not meet geographic RF emission requirements worldwide. Therefore, Gen 2 tags are the next generation developed to address the problems that arose with Gen 1 tags.

Mandates are helping the adoption of Gen 2. Mark Davenport, president of Mid South Graphics, Nashville, TN, USA, says, “Wal-Mart is trying to get as many of their

customers into the Gen 2 platform as fast as they can so they can all be reading the same chip.” The retailer has set June 2006 as the end date for Gen 1 RFID technology.

Davenport explains that Gen 2 tags perform better than their older counterparts. In the past, he says, “We’ve dealt with fallout [tag failure] anywhere from 10 percent to 50 percent.” With Gen 2, he sees fallout in the single digits. This is promising, he believes, because “yield is extremely high, which lowers the labor cost of replacing labels. It also increases our throughput in terms of the amount of labels we can ship out.”

According to Rick Bauer, director of RFID global program development at Paxar Corporation, White Plains, NY, USA, “The advent of Gen 2 has seen improvement in performance in read rates.”

Gerard Kelly, vice president of MPI Label Systems, Sebring, OH, USA, agrees that the quality of RFID products has improved in the past year. He says that failure rates are lower today than they were one year ago. “We feel the technology has matured a bit,” he says.

Because RFID technology is going through a transformation, all the components have had to be upgraded, including readers and printers. Rick Shea, national accounts manager at The Kennedy Group, Willoughby, OH, says, “New readers are coming into the market. We have to do a full scale R&D before we sell it to our clients. It’s in a constant improvement or constant analysis basically of what’s available out there.”

Cost

Price has been another big change. Kelly says, “The biggest impact on us is the price of the inlay that has dropped about a third. And that has had a huge impact on our selling price.” The price of an inlay can be as low as 7.9 cents and up to 75 cents, depending on the quantity ordered, according to Davenport. He adds, however, “Pricing has been coming down drastically.”

Jan Svoboda, business development director of RFID business at UPM Raflatac, Fletcher, NC, USA, says that even recently, the price has fallen a significant amount. He says, “Prices for some RFID inlays and labels are nearly one-third of what they would have been 10 months ago.” UPM Raflatac designs and manufactures passive HF and UHF RFID inlays and tags.

When inlay prices drop, the cost of the final RFID label decreases as well. It is difficult to pinpoint the price of an RFID label today because the price depends on the quantity and the type of label ordered. RFID labels can cost anywhere from 15 cents to \$1. The more labels that are ordered, the lower the price. For large quantities of RFID labels, the price is usually below 25 cents. The highest prices (those close to \$1 per label) are for small quantities (under 200 labels).

Part of the reason for such a large price range is the fact that the technology is too new

for standards. Bauer says, “There is not one standard price for every one of these labels. This is not one size fits all.” There are also several types of RFID labels; these range from standard, blank labels to special read performance and orientation insensitivity labels (where placement of the tag does not matter). Those that are more complex cost more than the simpler types.

Tony Sabetti, director of UHF/retail supply chain, Texas Instruments RFid Systems, Dallas, TX, USA, points out that inlays of different frequencies vary in price. He says UHF tags are the only low cost tags on the market today. He continues, “By far, unequivocally, no matter how you count it, more high frequency tags are sold today than UHF tags.” Therefore, the cost may be higher than anticipated if basing estimates on UHF costs. (Texas Instruments provides the RFID core technology found inside smart label tags.)

Four main frequencies are used with RFID: low frequency (LF), high frequency (HF), ultra high frequency (UHF), and microwave. These frequencies have different read ranges as well as different bandwidths. LF is 125 to 134 KHz with a read range of up to 18 inches. HF is 13.553 to 13.567 MHz with a range of 3 to 10 feet. UHF is 400 to 1,000 MHz with a range of 10 to 30 feet (though most UHF RFID systems operate between 860 and 930 MHz). Microwave is 2.45 GHz with a range of more than 10 feet.

Not everyone agrees about where RFID prices are going. Dimitri Desmons, vice president of RFID marketing at Impinj Inc., Seattle, WA, USA, says, “We believe the prices will come down for the small form factors used in very high volumes for case and item level tagging.” Impinj makes RFID chips to ship to inlay manufacturers.

Tom Hartmann, RFID manager at Topflight Corporation, Glen Rock, PA, USA, believes pricing may have reached a plateau for now. He says, “I think it will reach a stability point for a short timeframe because of volume pricing. The volume needs to catch up to the pricing point.”

Sabetti does not expect RFID prices to come down at all. He says, “I think the intention of the people who have priced that aggressively is to get business, and they don’t have any room for reducing prices.”

Svoboda does not have a specific prediction about the future of RFID pricing. He explains, “The future of pricing greatly depends on the volumes generated by customer demand and new innovations.”

Demand and growth



Photo courtesy of Topflight Corporation

According to Raghu Das, CEO of IDTechEx, Cambridge, UK, total sales of RFID globally in 2005 was \$1.97 billion. About 600 million RFID tags were sold in 2005, 53 percent of which were for labels. The company, which organizes conferences on RFID and other subjects, had predicted that 900 million tags would be sold. Das says there are several reasons for the discrepancy. He says the take-up of pallet tagging and the emergence of Gen 2 was slower than expected. He also says there were issues with read rates with UHF around metal and water.

Converters have seen less-than-expected demand for RFID labels. According to Rob Ryckman, sales VP of the Healthcare Group at CCL Label, Farmington, MA, USA, “I think that like all people who have been in the industry for a while, we expected the adoption to be more widespread than it was by the end of 2005.”

Bauer agrees. “We thought by now there would be more pervasive use of the technology from a compliance standpoint than we’ve seen,” he says. Bauer believes the issue is not tag and label availability. He says, “There’s no impediments from us to deliver high quality performing Gen 2 labels and tags to those that have to comply and use the technology. There are really no limitations why things are not moving forward from a Gen 2 standpoint.” Bauer says people may be waiting for the mandated requirements to expand before investing.

Antony Sloan, senior communications manager of Avery Dennison’s RFID division, Pasadena, CA, USA, says, “The rate of RFID adoption in the marketplace has not been as fast as we would like. RFID is a complex technology (more complex than straightforward pressure sensitive labels), and the value proposition for many end users remains uncertain.” Avery Dennison RFID makes inlays, which it supplies to label converters who insert them into finished RFID tags.

Kelly believes that the demand is light because Wal-Mart has slowed its mandates. Since most of the RFID orders are related to the Wal-Mart requirements, overall demand has decreased. Kelly points out, however, that there was greater activity in the pharmaceutical industry in 2005.

Although demand was less than expected, the RFID market is growing. Das estimates that the number of tags sold in 2005 was double the number of the previous year.

Ryckman says, “We have seen double-digit percentage of growth year over year since we started our program, and I expect that to continue through 2010.”



Photo courtesy of Topflight Corporation

Desmons believes the RFID market will grow at a rate similar to last year's, which he says roughly doubled. He adds, “We anticipate some consolidation in the industry at various levels, including the integration of the inlay assembly and label conversion operations, as well as changes in the software/middleware industry, as end users redefine their business processes around RFID.”

Svoboda is optimistic about the growth of RFID. He says, “The RFID market has grown in excess of 30 percent CAGR [compound annual growth rate]. RFID is expected to sustain or exceed the current growth rate.” The reason for sustained growth? “Availability of products under a unified standard, competitive environment, lower prices all contribute to increased adoption of industries already interested in RFID as well as interest in RFID in new markets and applications,” Svoboda says.

“We're anticipating a lot of growth in contactless payment, asset tagging and retail supply casing,” notes Tony Sabetti of Texas Instruments. He cautions, however, that “like any other industry, the longer they've been around, the smaller the growth rate.”

IDTechEx predicts that 1.3 billion RFID tags will be sold in 2006 and that the RFID market will be \$2.71 billion. Total RFID sales in 2010 are expected to be \$12.35 billion. The company expects that in 2016, over one-half trillion tags will be sold and the market will reach \$26 billion. In 2016, Das expects that 99.5 percent of the RFID market will be for labels.

More specifically, IDTechEx researched the growth of active RFID, which means that the tag contains a power source. The company predicts that the value of sales of active systems will be \$0.55 billion in 2006. They expect that number to grow to \$6.78 billion in 2016.

These numbers may seem hard to believe at present. Das explains, however, that as the volume of RFID tags increases, the technology will have to adapt to meet the market's needs. Das says this can make it more difficult for converters to know in which area to invest. “I recommend that companies look at how they can add value to RFID,” he says, “not necessarily follow trends.”

Uses of RFID

RFID has a variety of applications in today's world. Livestock tagging, automotive security, contactless payments, asset tagging, retail supply chain, transit ticketing (such as subway and bus passes), toll tags, and access control (such as employee badges) are all using RFID in some form. According to Sabetti, the most popular use of RFID is not to track products but to control security access.

Inventory management is another increasingly popular use of RFID. Das says studies have been conducted with RFID to monitor out-of-stock levels in stores. He explains that by using RFID, retailers can know about a lack of certain inventory quickly and replace items in a timely fashion. He gives the example of DVDs. Because these items are expensive, stores often do not put many on the shelf at a time. Without efficient inventory management, customers might not find the DVD they want to purchase even though more are being stored in stock rooms. Das says, "Customers don't ask about it; they walk away and don't buy it."

That situation can be costly for retailers if it happens often. Das says that in one pilot program by Tesco, that company saw DVD sales increase by 4 percent when DVDs were equipped with RFID tags. Das says sales increased because the company was able to refill its shelves faster.

Return on investment

In any business prospect a basic question is, "When will I make back the money I put in?" With RFID, this question is usually top of mind to converters. It is also a difficult question to answer because it depends on several factors, including the price of inlays, customer demand and technology changes.

Barry Brown, marketing manager at Argent Tape & Label, Troy, MI, USA, says that for asset tracking, returns can be as short as six months, but probably average one year. He says, "On the supply chain side, if you just apply RFID in a slap and ship approach, you can never show a return, I don't think. If you can, it will take two to three years to get."

Das says, "A lot of paybacks have complete ROI in 12 to 18 months." He explains, however, that ROI depends on the type of tags and labels companies are producing. For example, if a company makes electronic passports, the RFID inlay lasts the life of the passport so price is not as much of an issue as it would be in the retail industry.

CCL Label has been manufacturing RFID labels for six years. Ryckman says, "ROI for us has been lower than expected because of the market lagging behind forecasts, but it is still in a comfortable level."

MPI Label Systems began manufacturing RFID labels four years ago. Kelly says ROI is poor because of the lack of volume. The year 2005 started off well with "a lot of hype," he says, but adds that "As the year went on, business trickled off a bit." He estimates that the company is running only at around 20 percent of its RFID capacity.

Shea says, "ROI is not there yet. There are significant investments. It's a startup business and we understand that." The Kennedy Group has been involved in RFID for more than seven years, starting with the 13.56 MHz frequency tags (HF) and switching to 900 MHz (UHF) with the Wal-Mart announcement three years ago. (In 2003, Wal-Mart decided to use UHF RFID for tracking cases and pallets.)

Mark Davenport is optimistic about ROI. He says, "It's looking very promising with new Gen 2 products coming into the market this year." Mid South Graphics started producing RFID labels two and a half years ago, assisting with a pilot program for an airline.

Challenges

A range of challenges exists with respect to RFID. Ryckman says, "Common problems may be as simple as static management and as complex as three or four layer designs to enhance tag performance and durability to suit the enjoyment of the end application."

One of the reasons RFID is challenging is because it is a new technology. Bauer explains that there are a lot of learning steps and it is not something that works perfectly the first time. He equates it with the emergence of PCs, which had bugs that needed to be worked out before their use became widespread. He says, "There's a technology cycle, and what's interesting about RFID is that the technology cycle is escalating fast." Bauer believes the biggest challenge moving forward is being able to continually improve and provide customers with long term solutions that will not quickly become obsolete.

More basically, Sabetti says, "I think that in the awareness phase, when people are thinking about using it, the biggest challenge is to understand what the technology can and cannot do. Like anything else, it has its limitations, and it's important for people to understand the limitations."

Desmons says, "One of the main challenges we faced was the initial immature state of the RFID industry, where growth was hindered by a collection of incompatible standards collectively called Generation 1 and solutions that were not meeting the end user expectations from a performance standpoint." He believes the emerging Gen 2 standard will help remedy the situation.

When the technology changes, however, converters have to upgrade their inspection equipment. Kelly explains, "From our manufacturing point of view, we've been left to our own devices for inspection." He continues, "We're always caught in the middle. Inlay manufacturers come out with new products, but the devices they have to work in lag behind."

Svoboda sees expansion as somewhat difficult. He says, "RFID expertise and vision necessary to take RFID adopters beyond the presented supply chain mandate compliance has been one of the great challenges."

Failure rates of tags cause frustration, especially for end users. Kelly says, "Everything

affects the ability to read.” He points out that currently, only a few products are equipped with RFID because Wal-Mart is requiring only a few SKUs to have the technology. With fewer products, it is easier to read the tags successfully. He says, “When it goes full-blown, then they’re going to have more issues.”

Item level RFID

RFID at the item level is already a reality in certain areas, such as the pharmaceutical industry, where the products being tagged are expensive or security is a great concern. Ryckman says CCL Label primarily manufactures item level RFID products daily. He says, “More and more applications for item level are coming to commercialization each year.”

Certain industries are participating in pilot programs to determine if item level RFID is worthwhile. Brown, of Argent Tape & Label, says pilot programs are occurring with CDs and DVDs, and that some chains will be using the technology throughout stores this year.



Photo courtesy of Texas Instruments

Svoboda says item level tagging is an attractive application for RFID and has benefits for the consumer. “The actual adoption will greatly vary on the types of items being tagged and the benefits RFID needs to present,” he says.

The higher cost of RFID labels is a barrier to acceptance at the item level for all industries. Using a 15-cent RFID label on an item that costs \$5 or less does not seem to make much sense. Bauer believes that in order for item level tagging to become a reality for all products, the makeup of RFID will have to evolve. He says, “The current silicon-based technology will eventually give way to something lower cost and high performance.”

Das agrees that the technology will change before item level RFID becomes a reality in all areas. He says, “The market for RFID tags will reduce because people won’t be using a tag with a silicon chip. They will print the silicon chip with ink onto a product like bar codes. By 2016, almost half of the tags supplied will use technology like plastic electronics.”

Shea predicts that lower level items will be equipped with RFID within the next two years. Brown believes everyday items will not have RFID tags for at least another five years. Most others say the market in this area is unpredictable, but believe item level

tagging in all areas is a number of years away.

Sloan of Avery Dennison believes that RFID use at the item level is inevitable, but acknowledges that it will take time. “RFID at the item level introduces greater challenges, including pricing issues and consumer privacy concerns,” he says. “And because you would need infinitely more tags for a given application, there is a lot more price sensitivity. The industry needs to solve these two main problems (plus many others) before widespread item level adoption will be feasible.”

What converters need to know

Because RFID technology is complex, some converters may wonder exactly how much they need to know about it. Desmons says, “Label converters who get a start in RFID need to understand that this technology is not trivial and that many ingredients are necessary to ensure a high volume, high quality RFID label.”

UPM Raflatac’s Jan Svoboda agrees that RFID technology is not something that can be taken lightly and quickly adopted. “RFID is an electronics manufacturing business. It is a fast developing technology, which requires new skills and expertise.”

Sabetti has a few suggestions to help converters be successful with RFID. He says they should choose machinery that is proven and established, explaining, “The techniques and machinery required to put smart inlays into smart labels have been in use for 10 years.” Similarly, he believes converters should research suppliers to ensure they are receiving products of high quality and reliability. “Some of the smaller companies that have tried to get in have had some quality problems.”

Stan Drobac, vice president of RFID applications in Avery Dennison’s RFID division, says converters need to understand that RFID labels cannot necessarily be made in the same way as traditional labels. He says, “The mechanical pressure from rollers and the electrostatic charges developed by moving plastic films can wreak havoc on RFID labels. Therefore, material handling processes, both during and post-manufacturing, will typically need to be modified to ensure high yields and consistent reliability.”

Drobac also points out that converters should learn enough about the technology to be able to communicate with novice as well as knowledgeable buyers of RFID. “Converters will be expected to support and troubleshoot customers’ problems that will inevitably arise in customer implementations,” he says. This capability, he adds, will show customers that converters are adding value instead of acting as a middleman for chip makers and inlay providers.

Sabetti says converters should not be scared or intimidated by RFID. “It’s not that difficult a technology,” he says. “It’s actually rather easy to work with.” Support is available to converters, he adds, such as companies that conduct training, and facilities that test samples for functionality.

Is it worth it?

Not that many converters are currently in the RFID market. Hartmann of Topflight estimates that about 20 to 30 converters are involved. He believes that number triples when talking about converters who are seriously looking into RFID. MPI's Kelly agrees that there are only a few big players in the market right now, and Desmons of Impinj estimates that fewer than 50 converters have become proficient at high quality RFID label conversion.

So the big question remains: Should converters get involved with this new and seemingly increasingly popular technology? The answer is not a simple yes or no. Converters trying to decide must look at all aspects of the market, as well as at their own businesses.



Photo courtesy of Avery Dennison RFID

Ryckman says, “RFID converting is clearly not for all converters. There is a significant investment required to be able to provide a high quality product and changes in the technology require a continuous upgrade strategy to stay on top of this.”

Bauer agrees that the decision needs to be made by individual converters. He says, “As converters look at requirements by customers, they have to make a decision: Is there payback or value for them to invest in the technology? We saw a payback and value proposition so we moved forward with it.”

Initial investment is significant with RFID, which might serve as a deterrent for some converters. Kelly says, “It’s going to take at least \$1 million. You have to have a reserve of capital. There are less than a dozen companies that can afford that.” He says that there are “poor man versions” of production equipment, but the quality is not known. He also points out that making up costs through selling RFID labels can be problematic. “If everything is 30 cents a label, you could make up cost there. But when it’s down to 12 to 13 cents a label, it’s a tough thing to do.”

Davenport believes that RFID is for “converters that have the time to invest in new technology and are patient about paying their dues, because it’s not something you can get into overnight.”

Not only is the initial cost high, but maintaining an RFID program continues to be expensive. Shea believes that high-end converters are more likely to be involved in RFID because they are the ones that can afford to sustain the technology in their businesses.

Brown understands the hesitations and cautions, “It’s not a good time to make an investment unless they have a captive client who comes to them with a project.” He

believes converters should watch the RFID market, however. "Right now, everybody who is anybody in the label business should at least keep themselves informed even if they don't make an investment," he says. Brown advises converters to establish relationships with RFID suppliers and keep an eye on the market for new developments. He also believes suppliers should communicate closely with customers so they know if an interest in RFID emerges. That way, customers will talk to their current converter first instead of simply taking their business elsewhere.

Drobac says getting into RFID is worthwhile for converters who are involved with pharmaceutical manufacturers and companies affected by RFID mandates. He adds, however, "If a converter is not serving customers who need to move into RFID now, it may make sense to wait a while longer. RFID is maturing at a rapid rate, and it will certainly be easier to get started in six, 12 or 18 months than it is now. Equipment will be more mature and readily available, processes will be better understood, test gear will become more usable, and expertise will be more widespread and available."

Das thinks it is worthwhile for converters to involve themselves in RFID because the uses of the technology are extensive. He says, "People just have to work out what markets they can genuinely add value to."

Svoboda says, "RFID technology is here to stay, grow and create new opportunities. It is up to individual companies to define and understand the areas of opportunities."

Eventually, there may be no choice for converters to become involved. Desmons says, "RFID has taken a foothold in the industry and is poised to become as ubiquitous as the common bar code is today. As RFID performance improves while costs decrease, we will see more and more labels become smart labels, or RFID enabled, both in supply chains worldwide and in different industries. It will be fundamental for converters to have a strategy that takes RFID into account, or they may be unable to respond to their customers' needs."

Sabetti believes RFID will be an integral part of the labeling industry. He says, "This is going to be a common technology, widely used in the labeling industry in the next five to 10 years. I think label converters owe it to themselves to take a look at the technology and get involved because it is the future of the labeling industry."

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