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RFID Label Market

A look at the RFID label industry since Wal-Mart's well known mandate.

By Leah Genuario

In June 2004, Wal-Mart announced it would require its top 100 suppliers to begin using RFID at the case and pallet level by January 2005. The announcement was the beginning of a maelstrom of RFID talk, fueled further by additional mandate announcements. RFID was to be, according to many industry experts, the next big tidal wave of activity in packaging. Many predicted it was going to start at the case and pallet level and quickly move beyond that, into multiple industries and quite possibly into lucrative item-level tagging.

It's now 2008. Everyone is still waiting for the wave.

Growth since Wal-Mart

Currently, experts agree that "production capacity safely exceeds the demand that we are currently seeing," says Gene Korzeniewski, senior technical manager for Avery Dennison RFID in Flowery Branch, GA, USA.

"There were a lot of companies that took the forecast to heart and were putting in capacity to meet that hockey stick demand that everyone was anticipating. It is fair to say, however, that major manufacturers of inlays could probably handle the world demand as it is today," Korzeniewski adds.

"The view is RFID capacity in the label industry is plentiful," agrees Jan Svoboda, sales and marketing director, RFID business, UPM Raflatac, Fletcher, NC, USA.

There are multiple reasons that the rush of RFID label orders did not come in as predicted. The first is the issue of mandates. For example, while Wal-Mart boldly announced a deadline and sent its suppliers scurrying, the repercussions for not meeting the deadline proved innocuous. Delinquent suppliers, at worst, received a letter of rebuke, but there were no economic consequences attached.

The second issue involves technology and infrastructure challenges. "Initially, a lot of claims were made about the capabilities of the technology and the infrastructure impact that were not well founded. I think certainly people were making the assumption that because the bar code industry was fairly well established, RFID would be a simple substitute for bar codes," says Korzeniewski.

Some of the limiting factors included challenges reading RFID tags applied on or near metal and fluid-filled products. Also of concern was the "threadbare" infrastructure, as noted in *Forecasts, Players & Opportunities*, an RFID report published by research and analysis company IDTechEx.

To be fair, despite the disappointment of many in the industry, RFID growth has never stalled. It continues to grow. While supply does not currently match demand, improvements within the industry leave suppliers and converters hopeful that this will change soon.

Rob Ryckman, VP of sales and marketing for converter CCL Label, Inc. in Hightstown, NJ, USA, uses the analogy of a set of stairs to describe RFID growth to date. "There's something that happens in the industry where the volume goes up, then flat. Then something else happens, and it goes up, then it goes flat," he remarks.

Mark Davenport, president of Mid South RFID in Franklin, TN, USA, also sees orders as stop-and-go. "The challenges that I believe most of the RFID converters today are experiencing are the lack of orders and opportunities that they are accustomed to in their regular, everyday non-RFID label business," he says. "The



RFID business is still very much a project-oriented business.”

Perhaps this pattern will break soon. Growth over the past year has been promising. “One of our client label manufacturers using Omega converting systems reported sales of RFID labels to be typically 500,000 per week. The same manufacturer stated that this was twice the amount produced 12 months earlier and volume is continuing to rise steadily,” reports Al Spendlow, VP of label converting equipment supplier AB Graphic International, Ontario, CA, USA.

Some believe that converters will begin to see a more acceptable return on investment as early as this year, achieved because of growing demand over the next several.

“It will take this year to absorb the excess capacity out there,” predicts Gerald Steinwasser, general manager for Muhlbauer Inc., Newport News, VA, USA, “but in 2008, we are going to absorb the excess capacity.”

Others are a bit more cautious in their optimism, forecasting continued growth but seeing it occurring more slowly. “There is far more capacity than there is demand. It is growing, so it will catch up. But I’d say it will take at least five years,” says Ryckman.



RFID labels on cases to be shipped. Photo courtesy of Avery Dennison

Current Label Applications

Although announcements by Wal-Mart, the Department of Defense (DoD), and others led many to believe the RFID label boom would come from fulfilling mandates, this has not been the largest growth area for label converters involved in RFID.

“The greatest growth is coming from industries and applications other than the retail and DoD supply chains originally in the spotlight to deliver on lofty expectations,” says Svoboda.

Although not the largest segment at the moment, this may change as RFID labels are still the preferred format – as opposed to tags, tickets or other RFID constructions – for supply chain applications. And a recent mandate from Sam’s Club has many in the label industry hopeful that supply chain applications will accelerate soon.

“Last month, Wal-Mart said that all you’ve been hearing is not true. Sam’s Club will now penalize suppliers who aren’t using smart labels on pallets,” says Max Golter, VP sales, bielomatik jagenberg, Windsor, CT, USA, adding

that the penalty will be a fine.

“This mandate appears to be very serious with respect to all of their suppliers tagging their shipments with RFID labels,” agrees Davenport.

All that said, experts see the greatest current opportunities for label converters – who strictly print RFID labels – in closed loop applications: in which the technology is used only within the four walls of a company.

“The focus for most has clearly shifted from the mandate driven applications to search for closed loop opportunities where the added value is more attractive,” says Svoboda.

Closed loop applications often offer enough benefit to users that item-level tagging is warranted. This is an encouraging step, but closed loop applications, even with item-level applications, still offer limited volume.

One example of a closed-loop application could be an automotive manufacturer using it to identify parts internally, or a library for keeping track of books.

Fortunately, closed loop applications may be a precursor for larger volumes to come.

“We will indeed see more individuals taking the technology and focusing on it in their own application,” says Korzeniewski. “But that goes only so far. One of the things that will happen is that they will have to open their doors and incorporate suppliers. These closed loop applications are going to be a catalyst for more open loop.”

There are many other creative applications that RFID label converters uncover. “The converters that are successful are looking for special niche markets. They provide special labels with special materials,” says Steinwasser.

“There are many applications today where there is profit in RFID, but they are not the standard, blank-label-type opportunities. Label converters working on ROI-driven opportunities where they can add additional value – whether in the converting process, service, or support – should be making money,” says Svoboda.

Today’s RFID Converter

The RFID label industry is serviced by both large and small companies.

"In the recent past, typical label printers offering RFID were large corporations with ties to leading supermarkets. Recently, smaller label printers have entered the fold, supplying much lower volumes to niche markets," says Spendlow.

Converters' capabilities run the gamut. Their role varies from complex conversion of the inlay itself to simpler integration of a ready-made inlay and label substrates. Many converters have also taken on ancillary roles, acting both as consultant and educator to their customers.

When it comes to purchasing ready-made inlays for use in RFID labels, converters have two options. As Steinwasser explains, "Five years ago, when there was the early rush, the first converters bought heavy, expensive machinery starting with dry inlays," he says. "Today, converters are a bit more cautious. Small or mid-sized companies are buying the wet inlays. For an inserting machine, you are looking at an investment of less than \$200,000."

Both wet and dry inlays feature an antenna and chip on (typically) a PET layer. The difference between the two is an extra converting step: wet inlays are also laminated with adhesive, diecut and attached to a release liner.

Despite the extra steps involved in creating wet inlays, some inlay suppliers, such as UPM Raflatac, now offer each at identical prices.

The cost of machinery used for wet inlays is especially appealing for small companies. "Typically, these smaller opportunistic label manufacturers will utilize economical integrating machines such as an Omega Ti 150," says Spendlow.

Having control over more aspects of the conversion process is still necessary for some applications, however, which is why some converters forego the more economical equipment and choose instead to invest in more sophisticated equipment.

"When using dry inlays, label converters gain in some cases more flexibility from the perspective of meeting the end-use application requirements, such as special adhesives, specific diecut sizes for the inlay, or certain types of lamination," says Svoboda.

For converters who want even more control over the RFID conversion process, it is possible to be involved in the actual inlay construction. For these types of converters, bielomatik jagenberg has recently rolled out the RF Loop Tag.

The RF Loop Tag is composed of a miniature chip and loop antenna, which a converter would place on a secondary UHF dipole design antenna to create a finished transponder. According to Golter, its first major benefit is "millimeter forgiveness" placement enabled through inductive coupling. This forgiveness produces higher yield and also allows for a substrate to be placed in between the loop tag and antenna, he says.

The second benefit is cost. "Before the RF Loop Tag launch, our message was to buy a finished transponder, or better yet, buy a wet inlay. These inlays are going for approximately 8 cents. The RF Loop Tags enable you to make transponders for closer to 5-6 cents. It's 25 percent cheaper to produce smart labels with RF Loop Tags than to buy transponders," says Golter.

What about printed electronics?

It is possible for converters to become even more involved in RFID label construction, not just attaching components to make an inlay, but printing the antenna?

"Three to four years ago, when the RFID expectations were high, there were high hopes in the United States that you could print antennae," says Steinwasser.

In today's reality, however, printed electronics are not yet used in mainstream applications. Certain limitations have stalled its growth.

In addition to memory and processing speed limitations, the ink is "relatively expensive," states Steinwasser. "That was a setback for printers and the label community that they are not part of the manufacturing of the inlay," he adds.

Printed electronics are still seen as an excellent opportunity for label converters in the future, however. "The most promising area for narrow web is printed electronics. A workable HF RFID tag with adequate memory, printed with organic materials, may not be too far off – two to three years. Currently, memory capacity is limited, but advances are being made every year," says Bert Moore, director of communications and media relations for automatic ID association AIM Global, Warrendale, PA, USA.

"The current state of the technology and the economies make the existing approach of embedding an inlay

more viable. But this will most certainly change over time, especially as we venture into the world of item level tagging in enormous volumes," says Svoboda.

Technology improvements

Despite slow movement in printed electronics, the past several years have seen many technological improvements with respect to RFID labels. Many of the technological hurdles that once plagued the industry have now been eliminated or at least relieved.

Several years ago, the reliability of RFID inlays proved to be a challenge. Manufacturers couldn't always deliver high yield rates and the manufacturing process itself could also break the inlay.

"A couple of years back, the challenge was if you provide the label, it better work. Today, when we talk to converters, we see high 99 percent success rates from start to finish. The waste has come down dramatically," says Steinwasser.

Chip technology has also seen improvements. "From a technology perspective, one of the things that has happened, and not unexpectedly, is that the chip manufacturers have done an excellent job of putting more performance into smaller packages," says Korzeniewski.

Chips have gotten smaller, which have driven costs down. In addition to cost improvements, chips are also demonstrating benefits such as increased memory capacity and increased performance in challenging reading environments.

Memory capacity has been an area of increasing focus. "High frequency (HF) labels can carry a great deal more information than they could in the past, and ultra high frequency (UHF) has drastically improved its reliability and has become an effective way of tracking information. UHF labels also can carry up to 512 bits of information, whereas the first UHF tags on the market five years ago were only able to carry 64 bits of data," explains Davenport.

This additional memory capacity will likely open new markets, although it is too early to predict which ones. "The development of larger memory Gen2 UHF RFID tags and anticipated Gen2 HF tags will probably bring about additional demand in areas, where 96-bit memory UHF tags weren't adequate," says Moore.

Improvements in passive technology will also offer additional opportunities for narrow web converters. For narrow web converters today, passive RFID labels make up the majority of sales. Passive RFID gains power from the reader whereas active RFID includes its own power source.

Davenport says his company is "strictly focused" on passive tags and is not currently involved in applications such as temperature sensing tags that traditionally fall in the active tag category. He says, however, "Be on the lookout in the not-too-distant future for passive tags that will have this feature."