RFID

BY **MARTY WEIL**

CONFUSION and Possibility

The meaning of the Wal-Mart mandate

The retail world as we know it changed last summer when Wal-Mart announced that its top 100 suppliers would have to deliver cases and pallets with radio frequency identification (RFID) chips by January 2005, and that all Wal-Mart suppliers would have to meet this requirement by 2006.

At-a-Glance

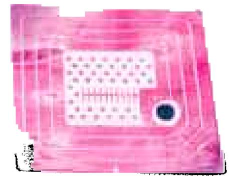
- The adoption of RFID technology will mean greater speed and efficiency across supply chains, but Wal-Mart's aggressive approach has many of its suppliers scrambling to achieve compliance.
- Points of debate in the RFID world center around things like mixed pallets, the 96-bit ePC standard, and conflicting information about advance ship notice (ASN).
- Some industry analysts have genuine concerns about suppliers' abilities to meet the Jan. 1, 2005 deadline imposed by Wal-Mart.

According to Wal-Mart spokesman Tom Williams, the goal of the Bentonville, Arkansas-based market leader is straightforward: to replace bar coding and scanners with RFID readers and tags throughout the retail giant's supply chain.

According to Kara Romanow, consumer product goods (CPG) analyst at AMR Research, that description hardly does justice to the Wal-Mart decision: "They're basically pushing the burden of their logistics back on their suppliers," she says. "It's brilliant."

However brilliant the strategy is for Wal-Mart, its impact on those manufacturers supplying Wal-Mart remains a subject of ongoing debate. The picture was supposed to clear up somewhat last November when Wal-Mart gathered its top 100 suppliers, plus an additional 26 who have queued up to meet the January 2005 deadline, for an RFID meeting in Springdale, Arkansas. But according to AMR, nothing new was revealed at this much ballyhooed session, which AMR describes as "an RFID pep rally without much substance."

The fact that Williams has a much different take on the meeting is not surprising—he calls it a hands-on learning experience that the suppliers engaged in enthusiastically—but it does underscore a situation in which perceptions are clearly



[Romanow's] issue with Wal-Mart has to do with the force of the impetus provided when the technology isn't yet ready for production.

rolling this out is going to force suppliers to do things in a way that will not provide the information back as expected," continues Romanow. "I agree that if they improve the in-stock performance it will benefit the suppliers as well as Wal-Mart, but I don't think this initiative gets us there."

Romanow contends that very few CPG manufacturers have pilots going deep enough to even understand impediments to compliance with the Wal-Mart mandate. In a recent AMR Outlook report, Romanow details some of the conflicts evident at the Springdale meeting that manufacturers will need to resolve as they move towards RFID implementation:

- Mixed pallets cause confusion and present unique problems. To accommodate multiple products on a pallet, tags must be capable of storing more than one electronic product code (ePC). Therefore, the tags require either a bigger capacity chip, or something akin to an object name service (ONS) infrastructure in which additional information is accessible elsewhere.
- Wal-Mart has stated its commitment to the 96-bit ePC standard, which many vendors interpreted to mean that a 96-bit chip was required. This is not correct. Implementation will require at least a 128-bit chip. To accommodate a 96-bit code, 8 bits to 16 bits are still required for the protocol overhead—which means a chip with a total of 128 bits is needed, and a 256-bit or 512-bit capacity is potentially needed to accommodate mixed pallets.
- Conflicting messages about advance ship notice (ASN): The ePC will be required on the ASN, yet Wal-Mart said it will accept this data in alternate ways until the standard electronic data interchange (EDI) extensible markup language (XML) schema can be changed to accommodate the additional data. The Uniform Code Council (UCC) will need to resolve the ePC ASN issue—something AMR expects to happen in months, though, not years.
- Tags must be readable both visually and by RFID, which will likely increase the cost of implementation and even require some redesign of cases.

Romanow does credit Wal-Mart with taking a somewhat more pragmatic approach in the November gathering. Among the positive moves she cites are narrowing the initial requirement to a single geographic region; eliminating the initial implementation requirement of 100 percent carton-level identification at the pallet intake level; acceptance of class 0 and class 1 protocols; doing away with the store-level tagging requirement; and dropping the ONS as part of the mandate.

According to Williams, Wal-Mart will start implementation with three distribution centers in Texas, and move it across the country incrementally throughout the year. "We will also expand incrementally by product," he adds.

as the tag provider will supply these new tags when they are available.

RFID reader types: Because of the need to move to a new version of the EPC UHF tag (C1V2), and also to insure that suppliers protect their technology investment, Wal-Mart recommends purchasing "agile" readers with respect to communication protocols. This way, when a new version of the tag becomes available anytime in the future, the supplier will be able to read those tags with a software update to the reader. If a protocol specific reader is purchased, either a hardware upgrade will be needed, or it will be necessary to replace the readers when a new version of the tag becomes available.

RFID reader antenna: A circular polarized antenna is better to use if the orientation of the tag within the RF field is unknown. A linear polarized antenna generally provides greater RF penetration and usually greater read ranges.

TAG antenna design: The antenna design on a passive tag is probably the most important feature of the tag. Different antennas can be used for different products (depending upon the makeup of the product). Generally, multi-directional tags are less orientation specific and therefore perform better. However, because of the material cost of the antenna, these tags are generally more expensive than simple single-directional antennas.

Supplier snapshot

According to Romanow, CPG manufacturers are understandably anxious about this push into RFID. A good number note that "we've just got bar coding right."

"Those who haven't started are very, very concerned," she says. "They're working with their warehouse management vendors or enterprise resources planning (ERP) vendors, though I think warehouse management is well ahead of ERP on this." Virtually all are treating the mandate as a two-phased project: one, comply with the Wal-Mart imperative; and two, then leverage the technology internally.

"These manufacturers really need to focus on what they can control," continues Romanow. "First, they need to assess the impact on their own physical infrastructure. Can they do this in the plant? Can they do this as part of their packaging line? Can they automate part of this process? What will that take? It may well take longer than the 13 months allotted by Wal-Mart."

Chris Hook, director of RFID market development at Vernon Hills, Illinois-based Zebra Technologies, says that supplier reaction to the mandate is fairly typical of new technology adoption. "If we use 100 as the number of vendors, I'd say we see a characteristic 20-50-30 response," he says. "Twenty vendors are deeply engaged, fully committed, and have their heads around the business case for RFID. These are the classic early adopters. Fifty vendors are watching these market leaders to see what steps they take. The latter 30 are somewhat agnostic. They haven't budgeted for the technology."

What Hook doesn't say, but what seems apparent, is that this latter group faces the greatest risk in not moving adequately to Wal-Mart's drumbeat for change. Hook mirrors Romanow in noting the importance of leveraging the technology internally, what he calls internal business justification. "This is a business opportunity, and Wal-Mart has laid down the requirements," he says. "It's not just the cost of compliance, but the value it will bring to suppliers." He cites a major unnamed soda manufacturer who has looked beyond the barriers to compliance and discovered an incredible opportunity to improve the accuracy of their own business processes and control of their supply chain.

Where the work Is

Hook says that Zebra's focus is on the "first ten feet of connectivity"—tagging cartons, cases, and pallets. "Wal-Mart wants operational benefits from RFID standardized and applied at the pallet-case-carton level, and captured with the highest degree of automation possible," continues Hook. "This is a situation in which the incremental infrastructure is all about delivering smart labels on demand, delivered and coded at the point of application. From the delivery point of view—data capture, reader infrastructure—it's necessary to equip nodal points of delivery with reader hardware that will allow automated data capture."

UHF RFID can capture all data in aggregate in the process of movement with no human intervention (e.g., compose an electronic manifest). "The important work that needs to be done is in software in the middleware space to provide data and event aggregation that is presented in meaningful, logical ways," Hook says. "That's the key component that has to be put in place."

A lot has to be done to optimize these systems. With barcode, what is inside the box doesn't matter. With RFID, what is inside the box does matter. As such, components, tags, and subsystems comprise the principle areas in which there is much work to be done.

Confusion and possibility

Romanow says that the Wal-Mart mandate is an absolute boon for RFID vendors, but that these vendors are promoting conflicting messages about hardware, software, readers, and tags that have resulted in mass confusion among CPG manufacturers. "They're not all going to make it," she says. Those that will be successful have come to an understanding of where this technology is leading—companies like Proctor & Gamble. "While all suppliers have to put forward a very good public face, P&G is vocal," says Romanow. "The P&G initiative for a consumer-driven supply chain, which reacts to a demand signal, shows an understanding of how this technology can be applied."

So, too, does the Wal-Mart mandate in an even more driving manner. "If there isn't a market maker, there isn't a market," says Romanow. "If Wal-Mart hadn't done this, no one would move forward."

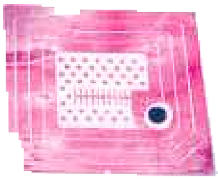
She notes that Wal-Mart has a history of doing this—in data synchronization, for example. Her issue with Wal-Mart has to do with the force of the impetus provided when the technology isn't yet ready for production. "I have a problem with that," she says. "Wal-Mart is forcing manufacturers to eat that cost."

Hook's perception of the mandate is more forgiving, if not one of unabashed admiration. "I've spent 20 years in RFID, and what I see now in terms of activity, the intent to move forward, and the commitment of the users is more like an alignment of the stars," he says. "As barcode revolutionized data capture, this will be a rebirth or revolution of the retail industry. There will be radical changes and improvements in processes and practices. Consider today's supermarket and think of what it was before barcode—the queues and the inaccuracies. Just as barcode revolutionized data capture, RFID will also be a revolution of the retail industry, and the results will be more profound," he concludes.

Romanow appears to agree with Hook's assessment of the potential. "When the CPG supply chain adopts RFID, the impact will be unbelievable," she says.

And what of Wal-Mart? What happens if their suppliers don't meet the mandate's requirements on time? "Oh, they will," says Williams. "It's going to happen." ◆

Marty Weil is an independent journalist based in Charlotte, North Carolina. He can be reached via e-mail at marty@weilmarcom.



different about what the RFID mandate really means.

Why RFID?

Wal-Mart sees two principal benefits to RFID technology: speed and efficiency across the supply chain. "In terms of speed and efficiency, going from barcodes and scanners to RFID readers and tags is like going from the telegraph to the Internet," says Williams. "It allows us to track inventory with much greater detail and speed in distribution centers, in the supply chain, and in the backrooms of stores."

Of particular importance to Wal-Mart is how RFID will improve its in-stock performance. "We never want to have a product out of stock," Williams continues. "It's a constant struggle to be 100 percent in stock."

This might not seem to be problematic for a company whose in-stock levels are 99.3 percent, but improving that to 100 percent would mean between $1 billion to $2 billion in additional and highly profitable sales for a company of Wal-Mart's size.

At Wal-Mart, the delivery process is very defined, and many times when a product is out of stock on the floor, it is still in the store. An RFID reader will direct store personnel right to the case in stock. "This will increase our sales and the sales of our suppliers, but it will also ensure that customers are satisfied," Williams states.

Last year Wal-Mart moved 2.5 billion boxes through it 's distribution centers, and Williams says that RFID will dramatically improve the tracking of this inventory. "In many cases, products arrive at a distribution center and are out the door in the same day," he says. "RFID will deliver new information in terms of spikes and movement of products throughout the supply chain—and deliver that information in real time or near real time. As a result, RFID allows us to gain greater insight into market dynamics and to be more responsive to them."

> "RFID will deliver new information in terms of spikes and movement of products throughout the supply chain—and deliver that information in real time or near real time."

The path to compliance

When asked what concerns about meeting the mandate were expressed at the Springdale meeting that might slow supplier compliance, Williams asserts he detected nothing that would impede full compliance with the RFID mandate. "Many of our top suppliers are already involved on their own initiative," he continues. "There's really nothing other than the fear of change holding anyone back, but with the technology developing so rapidly, we're compelled to embrace it."

Romanow agrees—and disagrees. "Ultimately this is a revolutionary opportunity for the manufacturer, but based on what is available now, where the technology is now, and the cost that's going to be involved in becoming compliant with the Wal-Mart requirements in 13 months—there is no ROI in 13 months," she says. "It's just cost." She agrees with Wal-Mart's focus on achieving 100 percent in-stock status, but questions the taxing pace of the mandate. "The pace at which they're

What SAM Is Saying

While all involved agree that RFID technology is far from mature, Wal-Mart has noted several key elements that their suppliers should look for from the technology community. This summary includes RFID issues that were presented in the technology session at the Springdale RFID meeting with suppliers.

EPC frequency: The case and pallet tags are both UHF tags. They transmit in the range of 868 MHz to 956 MHz depending upon the regulatory region where the readers are located. Wal-Mart is focusing on this frequency for the foreseeable future. Suppliers must be mindful of other devices working at this same frequency in their facilities, as there may be performance issues with these devices, or with the readers.

RFID tag type: Currently there are two different protocols approved for EPC UHF tags. We will accept either of these protocols. The tag class (or functionality) is up to the supplier to determine based upon their business needs. The currently approved protocols are the Class 0 and Class 1 protocols. We need to arrive at one globally accepted standard communication protocol for reader to tag communication. Wal-Mart is helping to drive the technology community through EPCglobal to deliver this higher performing, globally accepted EPC UHF tag. The current name for this tag is Class 1 Version 2 or C1V2. This is a new protocol, so it doesn't matter which of the current two protocols that a vendor chooses as long

- Identify the pilot product group (it is usually convenient to select a new product group, ideally during the launch phase).
- Identify the postponement level for the pilot product group. This is easily the most important activity.
- Classify the products into the CTO/MTS fulfillment buckets. Use the methods mentioned in this article to identify the fulfillment strategy for each SKU.
- Define the valid options possible for the CTO fulfillment model. It is critical to this upfront to avoid implementation snafus.
- Develop the aggregate level planning process. This includes developing and maintaining the planning BOMs, defining the right forecast consumption strategy, and training the planning organization to re-align its planning processes.

Key phase 2 activities. This phase focuses on working through the operational issues of translating the CTO vision into reality. It largely emphasizes developing a robust fulfillment process, both in the areas of order maintenance and the shop floor fulfillment processes.

Key issues to consider during this phase include the following.

- Fulfillment processes need to be defined, especially in the final assembly process. For example, supporting the ability to maintain a link between a sales order and production order is important, since each final assembly production order will be in response to a sales order. This includes covering the exception scenarios like order cancellation and modification processes.
- Safety stocks (for the postponement level sub-assemblies) and the corresponding metrics should be developed.

Key phase 3 activities. This phase focuses on putting the order management processes in place and involves a full pilot for the prototype product group.

Key issues to consider during this phase include the following.

- Create the sales BOMs for the prototype product group. This includes developing the options that would be offered with each CTO model and the valid sellable option combinations.
- Develop the pricing strategy since, in an option driven environment, pricing should be done at an option level, which normally introduces a greater level of detail compared to product level pricing. This normally presents significant opportunities to develop the right pricing combinations—and if done the right way, could be a major contributor to the business case for the entire CTO project.
- Last but not least, this phase involves the piloting of the prototype product group. This provides opportunities to assess the entire process and to fine tune the process before it is rolled across a broader set of products.

A look at the phases and their requirements makes it clear that transitioning to a hybrid CTO model is by no means easy. However, considerable gains are possible, especially by eliminating the waste of overproduction and the guesswork that comes with a forecast-driven MTS fulfillment strategy. In the longer run, greater flexibility results in better market sensitivity and reaction speeds, which translate to improved product portfolio profitability.

The electronics industry is probably closest to realizing the hybrid CTO model. The approach is highly relevant for consumer electronics manufacturers as they service several distribution channels, ranging from the consumer-direct channel (e.g. online retail business) to the store-direct channel (e.g. retail chains), often with the same products. As the automotive tier one manufacturers graduate to from being manufacturers to system integrators for the original equipment manufacturers, they could take a cue from the electronics industry and transition towards a hybrid CTO model.

This is a route few manufacturers can choose to avoid altogether. Armed with a solid implementation plan, perseverance, and a good communication and change management strategy, most companies can make the leap. ◆

Krishna Rupanagunta is part of the management consulting practice at Cap Gemini Ernst & Young LLC, in Chicago. His focus area is supply chain processes. He may be reached via e-mail at srikrishna.rupanagunta@cgey.com.