

New ISO guidelines explore the environmental impact of RFID tags, and how to employ them to facilitate product recycling; an EPA-funded project is studying the use of RFID to aid in the recycling of consumer electronics.

By Mary Catherine O'Connor

May 14, 2008—Most supply chain professionals involved in the RFID industry are focused on the endgame: widespread, item-level tagging of consumer goods with RFID tags that supply chain partners will be able to use to track products, and to ensure that store shelves are filled with the correct products at the proper time, in order to improve sales and consumers satisfaction.

But what impact will these billions of RFID tags have on the waste stream, and on the established recycling processes into which products and packaging are placed at the end of their life cycles? And how could RFID tags be utilized to improve current procedures for collecting and processing products when consumers are finished using them? These are questions at the forefront of two separate efforts within the RFID community.



Randy Stigal

The [International Standards Organization](#) (ISO) has recently published a set of implementation guidelines developed by the RFID Experts Group (REG), a committee hosted by auto-ID industry association [AIM Global](#). The guidelines propose steps supply chain partners should take both to maximize the benefits of utilizing RFID tags to improve and enable product recycling, and also to examine and mitigate any potential problems the tags could pose to established packaging recycling systems. The proposed steps include conducting collaborative studies involving trade groups and end users of RFID to determine the real impact and usefulness of RFID tags in recycling systems.

In addition, [EPCglobal](#)—a nonprofit organization set up by the Uniform Code Council (now known as [GS1 US](#)) and [EAN International](#) to commercialize Electronic Product Code (EPC) RFID technology—has received a grant from the [Environmental Protection Agency](#) (EPA) for a project dubbed "Promoting Understanding of RFID and the Environment" (PURE). This project will seek a means for employing RFID in the consumer electronics industry as part of a cradle-to-cradle life-cycle approach. Such an approach centers on taking a discarded electronic product and remaking it into the same or similar product, rather than putting it in a landfill.

The ISO publication, [ISO/IEC TR 24729-2](#), is one of three implementation guidelines the RFID Experts Group has been developing since 2006 (the others focus on RFID label placement and RFID interrogator and antenna installation best practices). Craig Harmon, chairman of the REG and president of the auto-ID consultancy [QED Systems](#), explains that ISO produces implementation guidelines for a number of reasons—either because a measure fails to receive enough votes to be made a standard;

implementation guidelines are created as a precursor to a standard; or the guidelines are developed as a means of compiling and publishing information unavailable in other areas. The latter, he says, is "what these [recycling] implementation guidelines are."

While RFID-tagging consumer products could lead to a lowering of carbon emissions through an optimized supply chain, the tagging of consumer products, particularly at the item level, would not be environmentally benign. The report calls this fact to the fore, stating: "Mandated RFID tagging by major retail and government entities creates a situation where massive amounts of RFID tags will be entering the waste stream of the container or item to which the tag is attached. This is especially true for corrugate and plastic containers, and to a lesser extent for steel and aluminum containers."

Randy Stigall, director of emerging applications for RFID tag manufacturer [UPM Raflatac](#) and a member of the REG, was the primary architect behind the implementation guidelines. "The REG has observed—and hopes—that there will be prolific and pervasive tagging in the retail supply chain, within the [Department of Defense](#), and so on," he says, "but even back in 2005, there were also already questions about what to do with those tags. Will they create a new problem? So we engaged people who had done thinking about this."

Explaining the motivation behind the implementation guidelines, Dan Mullen, president of AIM Global, says, "Any degree of social responsibility would suggest that we listen to concerns [regarding recycling and RFID tags], so let's reach out to industry and make certain that we know what the concerns are."

RFID tags contain small amounts of aluminum, copper, silver, polyethylene terephthalate (PET) and adhesives. The report suggests ways that recyclers—as well as trade groups supporting the recycling of fiber board/corrugate, paper, plastic, glass, steel and aluminum—should work to proactively identify and mitigate the possible negative impacts of huge numbers of passive RFID tags on the waste and recycle stream, as well as identify any uses of the tags that could improve existing recycling processes.



Craig Harmon

The packaging industry, Stigall says, has already conducted tests to evaluate the impact RFID tags have on corrugate recycling. The implementation guidelines suggest other sectors of that industry perform similar studies. However, he notes that some segments of the packaging industry will need to identify an incentive to conduct such testing, adding that the corrugate industry was vested with the mission of testing the impact of RFID tags on corrugate recycling because a number of corrugate manufacturers are interested in integrating RFID tags into their products—but, he adds, "they don't want to mess up their own recycle streams."

In contrast, makers of glass packaging are not as interested in integrating RFID into their products—in fact, Stigall says, that particular industry has resisted the use of RF-based electronic article surveillance tags due to concerns that they

could degrade the purity of the glass recycling stream. However, he notes, the REG hopes to work with trade groups involved in glass and plastic recycling to determine the exact impacts RFID tags would have on those recycle streams. "We are suggesting that REG work with various trade organizations in order to emerge with RFID tagging guidelines that are acceptable to all players," he says.

The ISO/IEC TR 24729-2 publication forecasts that potential negative impacts of RFID tags could be the contamination of a raw material being recycled, as well as the cost of filtering the tags to keep the recycle stream tag-free. The report points to the use of RFID in waste sortation to facilitate recycling as one positive use of RFID tags at the conclusion of a product's or packaging's life.

"We started talking about the effects of RFID in the waste stream, and it quickly became evident that we were only talking about the downside," Harmon says. "But there is also a positive spin to RF tags and recycling, and that is that the tags can aid in recycling. This has been one of the cornerstones of product life-cycle management. It's also one of the reasons we are concerned about the passage of any legislation that might require an RFID tag to be killed at the point of purchase, because this would negate the tag's usefulness in life-cycle management."

Additionally, the implementation guidelines call for using a segment of an RFID tag's user memory to carry a code that would direct waste collection agencies regarding how a tagged product should be recycled. The use of tag data to direct life-cycle management is also a major thrust of the EPCglobal EPA research grant for the PURE project.

PURE's goal is to help the consumer electronics industry develop a methodology for employing RFID tags to improve not only the tracking of the products but also their life-cycle management and end-of-life disposal, as well as the recycling of hazardous materials within the products, consistent with safe environmental guidelines. Independent technology consultant [Elliot Maxwell](#) initiated the PURE project and suggested that EPCglobal, through its consumer electronics working group, create a means of testing the viability of utilizing RFID tags to improve end-of-life management and the recycling of consumer electronic goods.

The EPA awarded EPCglobal a one-year grant for \$55,000 to explore the application because of its potential to reduce the environmental footprint of consumer electronic products by minimizing the need for materials, thereby facilitating reuse and improving the efficiency of recycling, while also providing benefits for those involved in the life cycle of electronics. PURE has a total operating budget of \$85,000, according to Elizabeth Board, executive director of the EPCglobal Public Policy Committee. EPCglobal contributed \$25,000 to the effort, with the balance donated by other organizations participating in the study. The project's participants include [Hewlett-Packard](#), [Wal-Mart](#), UPM Raflatac, an electronics recycler and a refurbishing company.



Elliot Maxwell

According to Maxwell, the group has held two daylong meetings and a number of conference calls; its next step, he says, will be to develop an architecture for a pilot program to test the use of RFID tags in end-of-life product management. This, he explains, will entail determining which types of data must be encoded to an RFID tag attached to a consumer electronic product, whether that information must be protected—and, if so, in what manner—and how that data can be accessed and utilized to guide product refurbishers and recyclers as they deconstruct products and rebuild or recycle them.

"There's a shared interest on the part of the people in the forward supply chain in reducing the costs associated with reusing and recycling," Maxwell says. "So if their partners in the end of the supply chain can be more efficient [in recycling/reusing products], it should help manufacturers. And it could also improve sustainability for those manufacturers."

The costs of collecting and sorting used consumer electronics is high, but many U.S. states, including Minnesota and California, require manufacturers to take back and recycle the products they sell in those states (or to pay for their take-back and recycling) when consumers are ready to dispose of them. In crafting such laws, those states followed the lead of the European Union, which requires the same of manufacturers and retailers in the EU through its Waste Electrical and Electronic Equipment Directive.

Maxwell believes one outcome of the PURE project could be to develop a means for manufacturers to employ RFID tag data to automate their reporting to state and regulatory agencies regarding how much product they collect and recycle. This could also represent a cost-saving measure for those companies.

"We want to move quickly and test our hypothesis," Maxwell says, "and create a workable model for using RFID to improve electronics recycling. The optimal end result is that we'll bring people into the conversation that have not been involved so far. My expectation is that there are lots of other interesting applications that will emerge."