How Green Is RFID?


RFID often plays a part in applications that are helping to deliver a greener world. Systems for recycling or re-use of packaging often use RFID to help identify and route pallets, crates or other packaging. RFID often plays an important part in tracking the health of wildlife and can help to reduce emissions in buildings. But what about the technology itself? How green is it now and what initiatives are being taken by the industry to improve things.

What’s The Problem With Today’s RFID?

Some of the green problems presented by today’s RFID are very evident. After all the most important part of an RFID the processor and its antenna include silicon and metallic components and are not biodegradable.

In fact, the situation is worse than it might seem at first. Most RFID tags are housed in plastic or other petrochemical based materials. Even flat, self adhesive, tags are made using thin polymer substrates such as PVC or PET films. All of these materials are non-biodegradable and threaten to contaminate (from a re-cycling perspective) any packaging to which they are attached.

RFID tags contain a cocktail of materials that may make recycling the tags themselves difficult. And, as tags become smaller, it is difficult to separate the different parts of the tag which may offer different recycling possibilities and challenges. The different types of material involved in the production of tags mean that it becomes impossible to consider a single recycling approach for the tag and the item to which it is attached.

For example cardboard waste is contaminated by the metals, plastics and adhesives; ferrous metals by the presence of copper, wood by materials that cannot be composted and so on. Research conducted by British Glass indicated the potential problems that RFID tags could cause in glass recycling because silicon contamination in glass made from recylate does not melt and mix in the furnace with the result that weak points can result in the new bottles.

Together these issues present two problems; the tags themselves are difficult to recycle and their presence makes it difficult to recycle the things to which they are attached. Hardly a “green technology”, it seems!

There are, however, a number of initiatives that the industry is undertaking.
Research & Development Initiatives

At the simplest level the size of RFID tags (and thus the amount of non-degradable material used in their manufacturing) is being reduced. Many applications that would have needed a solid tag housing only a few years ago can now be implemented with a much less bulky film based tag. Future developments in tag design and manufacturing point towards a generation of micro tags as small as a match head or smaller that will further improve RFID’s recycling footprint.

Other developments being undertaken include the development of RFID tags which sit on a bio-degradable base and the development of completely bio-degradable tags. However both developments need to resolve the issue that a bio-degradable tag still has to have a long enough life to allow it to be deployed and then to perform whatever function it is intended for.

One Dutch company has already announced that it expects to be shipping tags on a bio-degradable base by the end of 2010. For a greener solution, researchers at Standford University in the USA have been trying to create a completely bio-degradable tag. At the end of 2009 they announced that they had managed to create a degradable tag. The research, stimulated by the potential for use in healthcare applications rather than as a green initiative, created a tag that would degrade almost entirely over a period of ten weeks in an environment that mimics the human body. Chris Bettinger, first author of the research published in Advanced Materials and postdoctoral fellow at Stanford, believes that the development can be used outside the health care environment. The tags used materials approved by the US Food & Drug Administration as a part of the process of gaining approval for their use as electronic implants. The research, funded by the US National Institute of Health, is focused on medical applications - for instance, reducing the voltage of the chips - and create encapsulation or improve the chip’s stability but Stanford believe that the patents they hold in this area would allow enterprises active in other areas to exploit their work on bio-degradable RFID.

Other work, being carried out at Manchester University, is designed to deliver a proof-of-concept of an organic, printable, RFID tag for use in the food supply chain. The project, at the Syngenta Sensors University Innovation Centre aims to create such a tag by the end of 2011 and will then seek to engage with a commercial partner to take the concept to market.

Equally important is the work being done by Hitachi on their Mu-tags. These very small (less than 0.4mm square) tags provide RFID functionality in a package that uses far less material (although the 0.4mm square chip does not include an antenna) to achieve the same functionality as today’s RFID chips. The Mu-tag uses a 2.45GHz frequency, incompatible with today’s tag reader standards but, even so, presents an intriguing possibility for the future.

The technology research centre ID TechEx based in the UK published their assessment in January 2010 that some RFID applications could be solved using "printable"RFID circuits. However today’s technology status is that to achieve the one million transistors used by a typical chip on a passport requires a chip with an area much the same as this page (210mm x 297mm). So far all demonstrations of the technology in this field have been based on high frequency applications. ID TechEx believes that UHF implementations could be achieved but does not expect to see them any time soon.

The Contribution of RFID

In spite of the problems and even given the slow progress of RFID towards achieving a more eco-friendly tag, the overall contribution of the technology to a green agenda should not be discounted. The applications that RFID supports are helping to lower the carbon footprint of a number of areas of human activity. Some of these include:

- Improving recycling through refuse management
- Reducing vehicle emissions through better usage
- Improving the management of natural resources
- Encouraging the re-use of containers
- Tracking animals to monitor the impact of climate change
- Reducing equipment by better asset management

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