

Inklings of the Future

Using conductive inks to print RFID antennas opens up a whole new world of possibilities.

Feb. 10, 2003 - When I first started covering radio frequency identification, what got me so excited was not all the gee-whiz stuff about the milk telling the fridge when it was about to go bad. What got me all hopped up was this: RFID was a way for companies to get more accurate information with less labor.

When I rushed home from work to tell my wife about this important technology I'd just learned about, she didn't exactly tell me I should quit my job and launch a Web site to educate people about it. It was more like: "That's nice, honey. Did you pick up the bread?"

But I knew in my gut that RFID was going to be very important. At the time, I was covering supply chain technologies for the *Industry Standard*, and the one thing I kept hearing over and over from end users of technology was that they were struggling to get clean, accurate information into their fancy new supply chain applications. RFID was not only away to get good data; it was a way to capture that data in real time -- automatically. This would save companies piles of money.

Now, a lot of people warned me that it would never happen on a large scale. The argument, even from some RFID vendors, went something like this: "Yes, RFID is great, but it will never be cheap enough to use on every pallet and case, let alone item. It's a matter of economics. The chip costs so much. The antenna costs so much. The process of attaching the two costs so much, and the process of turning the transponder into a finished label costs so much. And you can squeeze only so much cost out of that equation."

Good arguments, I thought. But not good enough. Here's why. If a technology could save companies billions of dollars, then clearly there will be millions to be made selling that technology. And if there are millions to be made, savvy companies and entrepreneurs will invest money to find ways to make it happen. Which is exactly what is happening today.

Alien Technology, Matrics and others are now pushing the cost of the microchip down to a level that many people thought we wouldn't see for many years. If those chips are ordered in the billions, the price will fall even lower. But squeezing the size of the silicon alone won't save enough to get the cost of a tag down below five cents. The coiled metal antenna still cost a few cents. Attaching it to the chip costs a few cents, and creating a label costs a few cents.

But now we have companies attacking those costs as well. Ink makers are working on conductive inks that could reduce the cost of printing antennas on packages to next to nothing. Conductive inks have been around for a long time. Acheson Industries, for instance, has been making silver, silver-coated copper, carbon and graphite inks for more than 50 years. For the past few years, it has been supplying silver inks to the RFID and smart card industries for printed antennas.

But makers of conductive inks are now researching formulas that can be used in standard rotary screen, rotogravure and flexographic applications. We recently ran a story about Flint Ink investing several million in the research and development of new conductive inks (see [Flint Bets on Printed RFID Antennas](#)). And last

week we ran an article on a company called Parelec, which has developed an ink that it says is three times more conductive than conventional conductive inks (see [New Ink for Printed RFID Antennas](#)).

If RFID is ever going to be ubiquitous, then clearly printed antennas will be very important. Manufacturers are not going to slap a smart label with a metal antenna on every box of breakfast cereal that comes off the production line. The RFID antenna will be printed and the microchip attached during the normal printing process. That will drive the price of the ink -- and the antenna and attachment process -- down dramatically. It also eliminates the need to create a finished label.

Suddenly, the old economic formula that would keep the price of RFID above tens cents forever is looking very vulnerable. And guess what -- printed antennas will not only be cheaper and faster to manufacture than metal antennas; they will also be more environmentally friendly. The process of etching metal antennas with acid produces hazardous waste. And a box of cereal with a metal antenna can't be recycled unless the antenna is removed, because the metal would damage the recycling equipment.

One of the drawbacks to printed antennas is they have not been able to deliver the performance of an etched antenna. But that is changing. Companies are investing money to find new, better and cheaper ways to create antennas. Innovation creates economic opportunity, which leads to more innovation. Who knows, we might see the entire RFID tag and antenna printed with conductive inks before very long.

I can't say which ink technologies will win out in the end, or predict how long it will take for ink antennas to reach a price-performance ratio where it makes sense to printed on packaging. Heck, for all I know, someone could reveal tomorrow that they've developed some other technology that makes printed antennas obsolete. What I do know is that the investments being made today in conductive inks is proof of what I believed when I launched *RFID Journal*: There's a huge need for low-cost RFID systems, and clever people will find ways to meet that need because there are massive economic incentives to do so.

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