

New Materials Emerge for Making Tags

ECM releases a new conductive adhesive designed to make UHF tag manufacturing more efficient and an antenna coating that boosts a tag's read range.

By Mary Catherine O'Connor

May 19, 2005—[Engineered Conductive Materials](#), a manufacturer of conductive inks and adhesives based in Delaware, Ohio, and Dongguan, China, has introduced two new materials for use in RFID tag production. One is a conductive adhesive for attaching RFID chips to antennas. The other is a conductive coating designed to be applied to an RFID tag antenna in order to increase the tag's read range.

The conductive adhesive is a material known as a Z-axis conductor, meaning that it conducts current only in one direction, vertically. This prevents the adhesive from conducting RF signals laterally (across the chip and antenna), which would cause the chip to short out and become unusable.

The unique property of the adhesive, according to ECM's national sales manager Steve Toyama, is that it can be precured (by being heated to 230 degrees Fahrenheit for two minutes) and then, when later used in an RFID tag manufacturing process, can bind a chip to an antenna in less than one second by means of a quick blast of heat to activate the bond. All other conductive adhesives (regardless of whether they are Z-axis based) that are currently used in RFID tag manufacturing processes take three and to 10 seconds to harden, which slows the attachment process.

This quick curing time could allow tag manufacturers to significantly ramp up production yield—which is often noted as the biggest obstacle to making lower cost tags. (To use the dry film adhesive, however, tag makers will need to redesign their tag manufacturing process, which will have some associated costs.)

ECM is hoping to sell the adhesive to chip manufacturers who could print the adhesive to an entire wafer of RFID chips, cure the adhesive on the wafer, then dice the wafer with the cured Z-axis adhesive in place. The individual chips would be placed on antennas through a pick-and-place assembly process. Either infrared heating lamps or hot air could be used to heat the film to between 280 degrees and 300 degrees Fahrenheit, which would take two to three seconds. The film, which develops a waxy consistency when heated, would then harden extremely quickly—as quickly as half a second—as soon as the temperature dropped below 280 degrees.

Using the ECM Z-axis adhesive, tag manufacturers can apply the adhesive across a circuit board without having to isolate the material on the connection points between the chip and antenna. Because the Z-axis adhesive is a thermoplastic, it can form a bond and harden very quickly. While thermoplastic adhesives are used in other electronics fabrication systems, they are not currently used widely in RFID tag manufacturing. Some, but not most, tag manufacturers currently use Z-axis adhesives in tag production, according to Ron Oliver, senior RF design engineer for Seattle, Wash.-based semiconductor and RFID systems developer [Impinj](#). Oliver says Impinj is evaluating ECM's Z-axis adhesive and is considering testing the material using the chip wafer application method.

Toyama says the adhesive (ECM product name DB-1505 EXP) costs 15 to 20 cents per gram, depending on volume. He says most conductive adhesives, which are not Z-axis formulations, cost 60 cents per gram, and that the Z-axis adhesive's low cost is due to its low silver content.

ECM's other recently released product, a coating to improve an antenna's read range, can be used on copper or aluminum RFID antennas that are printed, stamped or etched. Tag or antenna manufacturers could use the coating to essentially narrow the RF signal moving through the antenna, making it stronger and able to travel farther. In tests using tags placed on glass, the coating has shown a 6 to 8 percent increase in the read range of a UHF tag compared with the same tag without the coating. In free air the read distance doubled. The tags were not tested while on cardboard or plastic materials, however.

An added benefit of using the coating, according to an RFID tag manufacturer that tested the material but did not want its name revealed, is that tags using the coating can be smaller in size than those without the coating.

The coating can be printed onto the antenna through screen-printing or flexography, or it can be applied as a pressure-sensitive adhesive tape to the back and front of the tag. The coating (ECM product name DC-8001) costs 10 to 15 cents per gram, depending on volume.

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