About That Problem With Metal and Water

I spoke last week at an event in Bogotá, Colombia. Several of the speakers mentioned the challenges that water and metal can present. During a panel discussion at the end of the day, one audience member said, “We have been hearing about the problems with water and metal for the past 10 years. When will it be

solved? Because if you can't read around metal and water, then RFID is worthless."

My response: "The industry has already solved it."

I qualified that claim by noting that a tag cannot be read on a can in the middle of a pallet of canned goods, or on a case in the center of a pallet of bottled water. The energy just can't reach the pallet's center. The metal reflects the energy away from the tag, and the water absorbs the energy. It's unlikely that this will ever change—the laws of physics aren't easily broken.

Metal causes two problems for RFID transponders: It can reflect energy away from the tag, and it detunes the tag antenna, thereby preventing it from receiving energy from the reader. But now there are tags with spacers that can be placed on metal objects, such as racks and servers in a data center. In many cases, tags utilize the metal to reflect a greater amount of energy to the tag, thereby increasing read range. There are also tags that can be placed into metal objects, such as oil pipes and medical instruments.

Earlier this year, we reported that the BIBA Institute, at the University of Bremen, working together with J.H. Tönnjes E.A.S.T. GmbH & Co. (a developer and manufacturer of license plates) and Kathrein Sachsen GmbH (an RFID reader and antenna supplier), developed and tested passive RFID license plates that outperform smart labels on windshields, as well as on-

metal passive tags for vehicle identification (see RFID License Plates: A Successful In-Metal RFID Application).

We also reported, in the May-June 2012 issue of *RFID Journal* magazine>, that researchers at the North Dakota State University Center for Nanoscale Science and Engineering have developed an antennaless RFID tag that essentially transforms a metal object into the device's antenna, consisting of a chip and a small metal loop that straddles a strip of magnetic material. When a tagged metal object is zapped with energy from an interrogator, an electric field is created. The magnetic material helps to capture the charge induced on the metal and diverts it into the loop, where it powers the chip (see The Object Is the Antenna). While not yet ready for commercialization, this innovation could eliminate the need for a spacer between a tag and a metal object.

Water is a bit more challenging, since it absorbs energy and detunes the tag. The detuning issue can be resolved by changing the antenna impedance, so that when it is near water, it becomes tuned to the proper frequency. That would enable the tag to be read, though the range would be relatively short. You could also put metal behind the tag, and use an on-metal tag to boost the read range.

What this means is that there are solutions to the challenge of using RFID on or around metal and water. But specially designed tags are more expensive than generic tags that can be used on RF-friendly objects. So the question, then, is not whether tags can be read in the presence of water and metal, but rather, given the higher cost, whether the application will deliver a return on investment or solve the problem one is trying to solve.

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