RFID Markers Track Buried Cables at Atlanta Airport

The U.S. Federal Aviation Administration has buried more than 1,000 RFID-enabled marker balls to improve the process of locating and identifying the airport's underground infrastructure.

By Claire Swedberg

Sept. 12, 2006—The U.S. Federal Aviation Administration (FAA) has buried more than 1,000 RFID-enabled marker balls around a new runway at the Hartsfield-Jackson Atlanta International Airport. The marker balls, supplied by 3M's Communication Markets Division, allow the FAA, airport employees and contractors to use handheld RFID interrogators to locate utility cables and pipes buried 5 feet underground, determine what type of infrastructure they represent and who owns that infrasructure.

"Airports, especially major ones, are very dynamic environments, with constant improvements and construction—terminal expansion, new taxiways, runway extensions, etc.—going on," says FAA project engineer Brian Murphy. For the FAA, accurately knowing the location of underground cables on the airfield is vital. "Cable cuts can cause disruption and costly delays with airport operations," Murphy says. The marker balls are expected to help prevent possible cable cuts.

Until the FAA started using this system about one year ago, the Atlanta airport depended solely on a system of concrete markers to denote cables' locations. Contractors find concrete markers inconvenient since the 300-pound slabs had to be formed, set in place and hand-painted. Such slabs are unpopular with airport maintenance workers, who have to be careful when cutting grass at sites where the markers are located, says Murphy. "They tend to get covered up," he says. "Grass grows around them; clippings fall on them. For identifying cables, it can get very confusing as to what is where."

About two years ago, the FAA opened conversations with 3M about the possibility of deploying underground RFID marker balls. In 2005, as construction proceeded on a new 9,000-foot runway at the airport, the FAA began using them whenever a new cable was installed underground.

The Dynatel 2200MiD Series Locating and Marking system uses 4-inch-wide, high-density polyethylene plastic marker balls, each containing a coil antenna and a passive RFID chip floating in a liquid combining water and biodegradable propylene glycol. This ensures that the liquid does not freeze. Since the RFID tag floats, it can automatically align itself in the best orientation for receiving and transmitting RF signals. The RFID chip's 256-bit memory includes the ball's unique serial number and also allows users to program additional data on the chip. The FAA is using that feature to program each marker ball with details as to which kind of cable is located in what location, whose cable it is and whether it is fiber, copper or another material. The ball can be positioned up to 5 feet underground. The FAA deployed the balls approximately every 200 feet along cables—every 10 feet in more congested areas with multiple cables in close proximity or with cable bends.

After the ball is buried, a 3M RFID handheld interrogator can energize the RFID tag and receive the chip's RF

signal. There are seven different frequencies, ranging between 66 kHz and 169 kHz, for telephone, power, gas, water, wastewater, CATV and general-purpose applications. The company opted for markers operating at different frequencies so utilities could differentiate between each type of underground infrastructure, says Dynatel product manager Corey Willson. "Depending on the resonant frequency, the electronic markers mark a wide range of facilities," he says.

Dynatel RFID interrogators have a GPS interface capability for automatically collecting GPS coordinates for markers as they are buried. However, the Atlanta airport is not using GPS technology. "I felt that was information overload," Murphy says. The handheld devices save data from the last 100 reads (or programmings), and the FAA downloads that data directly onto a laptop computer using 3M's PC software. The FAA intends to use the same marking system at other airports in the process of building runways or other infrastructure in the Southeast, he adds, including Charlotte, N.C., Greensboro, N.C., and Tampa, Fla.