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Wireless Sensors Monitor Mobile Machines

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Wireless sensors can help companies monitor mobile equipment and environments too large to be outfitted with wired sensors.

By Mark Roberti

June 8, 2009—The other day, I was sitting across from two building maintenance executives on my train ride into Manhattan. One gentleman was explaining that his company had installed new boilers in all its residential buildings. The boilers are equipped with sophisticated sensors and connected to the Internet, so he can log on to a Web site and view the performance of each one. He can see the average efficiency across all of the units, and identify which ones are underperforming so they can be optimized. "Whenever one goes off line or exceeds certain thresholds," he said, "I get an alert on my Blackberry."

This kind of remote monitoring is still in its infancy, but will continue to grow as companies replace older equipment with new, more efficient equipment that can be monitored remotely. It's part of what IBM has called "building a smarter planet." But what if your equipment is not in a fixed location? Or what if you want to measure the condition of a remote environment? You can't simply plug in Ethernet cable. That's where wireless sensors come in.

Wireless sensors allow companies to deploy data-capture devices in remote areas, or on mobile assets or machines, to capture information cost-effectively and use it to improve efficiencies and save money. Take the Merion Golf Club, located in Ardmore, Penn. A *New York Times* article about the club (see On Golf Courses, Sensors Help Save Water said that Matt Shaffer, Merion's director of golf operations, was already known for conserving water, but wound up using far less after deploying subterranean wireless sensors that constantly monitor moisture, temperature and salinity in the soil, then transmit the data to a software network that can be accessed from a laptop, handheld device or desktop computer.

"Well, what I thought was dry isn't even my baseline," the *Times* quoted Shaffer as saying. "These sensors are just so much more sensitive, so much better, so much more complete. I am now hooked. I'm a sensor addict."

The golf courses using these systems are saving 18 to 20 million gallons of water per year (an annual savings of approximately $130,000) because better data enables them to water only when moisture drops to a certain level.

Passive radio frequency identification tags are the simplest form of wireless sensors. They provide information regarding the location of a specific object. Active tags can be combined with accelerometers, as well as temperature, radiation and other types of sensors. The most sophisticated RFID sensors are like microcomputers—they have operating systems and the ability to communicate with one another, so they can form ad hoc or mesh networks.

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Some might argue that these more sophisticated wireless sensors are not RFID at all. They assume, for some reason, that radio frequency identification applies only to simple devices—whether passive or active—that lack computing power or an operating system. In reality, all wireless sensors use RF, and most are used to identify an object or location (an area of a putting green, for instance) and, therefore, they are indeed RFID.

As we build a smarter planet, companies are using simple wireless devices—passive RFID tags—to identify and locate products, tools, reusable assets and so forth. But they are also utilizing more sophisticated RFID tags not just to communicate the identify of an object and its location, but also to monitor its temperature, movement, speed, level of vibration and so on.

The U.S. Navy has been placing RFID sensors inside containers used to store spare aircraft engines and sensitive electronic components. If the moisture level within the container gets too high, it could damage the engine or components. Therefore, an alert is sent so that someone can take action.

BP has tested wireless sensors to monitor motors on one of its oil tankers. The sensors measured the motors' vibration, and when the vibration exceeded a predefined limit, that information was conveyed through the ad hoc wireless sensor network to a host system that alerted engineers on the ship to take a look at the motor and performance preventive maintenance.

Sensors can also be used to monitor the environment by providing readings at individual locations in a larger area. Microsoft's Global Foundation Services division, which oversees the platform the company uses to provide its online services, is deploying a wireless sensor network intended to bring visibility into the firm's data centers, and to reduce energy wasted in keeping a large room of IT equipment cooler than necessary.

GE Sensing's RF ValProbe helps pharmaceutical and life sciences companies monitor temperature for regulatory- and quality-compliance purposes. The wireless sensor nodes with built-in memory storage could be placed in a walk-in cooler for storing vaccines, and could collect and report data at intervals ranging from every 10 seconds to once per minute.

Why not just employ thermometers to measure temperature and moisture sensors to detect the amount of water in the ground? Because golf courses would have to pay an army of people to take soil readings three times a day on a golf course covering 150 square acres.

By contrast, you could deploy a wireless sensor network that could capture that information continuously without any labor cost. The systems can be deployed relatively cheaply, because mesh-networked sensors don't require a lot of infrastructure—you don't need a lot of readers, because data is transmitted from one sensor to another until it reaches a node that communicates with the host system.

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The future of business is all about collecting and sharing more information more quickly, and allowing people and systems to react to the data in near-real time. Wireless sensors are going to play a big role.

Mark Roberti is the founder and editor of RFID Journal. *If you would like to comment on this article, click on the link below. To read more of Mark's opinions, visit the RFID Journal Blog or click here.*