RFMicron Releases New Passive UHF Chips With Moisture, Temperature, Pressure Sensors

The chip maker says its chips can enable companies to inexpensively monitor for moisture in everything from car interiors to drywall and diapers.

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Apr 24, 2015—RFMicron has launched the latest version of its Magnus S passive EPC Gen 2 ultrahigh-frequency (UHF) RFID chip, with moisture- and temperature-sensing capabilities. The Magnus S3 temperature and humidity sensor chip follows the release of the Magnus S humidity-sensing chip in June 2014 (see Smartrac Group and RFMicron to Develop Passive Sensor Tags). The Magnus S chips can also come with pressure, weight and proximity sensors. Several companies are considering using the chips for solutions aimed at the industrial, health-care and automotive sectors.

The Magnus S3 temperature and moisture sensor chip was released at this year's RFID Journal LIVE! conference and exhibition, held last week in San Diego, Calif., and is commercially available now. As shipped, the new temperature sensor chip can report a temperature within 1 degree Celsius, via a one-point calibration, according to Shahriar Rokhsaz, RFMicron's CEO and president. The accuracy can be improved to within 0.3 degrees Celsius with a two-point calibration, he says. Several firm are currently testing it, as well as the moisture, pressure and proximity Magnus S2 sensing chip.

Smartrac's Sensor DogBone tag is made with RFMicron's Magnus S moisture-sensing chip.

The Magnus S2 chip is being incorporated in RTEC's RS-Magnus, a small on-metal tag that can be used to sense moisture or pressure. The company has begun providing the tag, which measures 18 millimeters by 4 millimeters (0.7 inch by 0.2 inch), for such use cases as tracking tools or metal parts, as well as the conditions to which they are exposed. RTEC can customize the antenna, dimensions or casing as needed, and also offers its Atom-Magnus and Proton-Magnus tags with the same sensor chip.

Magnus sensor chips utilize a self-tuning circuit known as Chameleon technology to provide sensing capability without a need for batteries or external sensor devices. Each chip comes with a 12-bit sensor code to report any change in impedance resulting from environmental changes, such as the rising or lowering of temperature or the presence of fluids. The chips are intended to provide a low-cost solution for sensing applications in large-scale deployments, for which users would want to capture changes in conditions by reading a label containing a UHF reader. Smartrac is one of the inlay manufacturers now building the chip into its products for early pilots (see Smartrac's New Passive Sensor DogBone Transmits Moisture Levels).

RFMicron, based in Austin, Texas, makes the Magnus chips, as well as full solutions for fixed or handheld readers. A Smartrac tag made with RFMicron's Magnus S moisture-sensing chip is being used by companies in the automotive manufacturing industry to detect whether water penetrates a vehicle's body during high-pressure water tests. Without the Smartrac inlay, auto manufacturers must use a more manual method of detecting whether water penetrates a car during high-pressure water tests conducted following assembly. Ionic probes, for example, are inserted in moisture-collection areas and are then removed and visually read to determine the presence of moisture. This manual process is time-consuming, Rokhsaz explains.

Instead, the unnamed automotive manufacturing companies are using the Smartrac inlay that comes with wicking paper attached to the tag itself. The wicking paper is inserted in the recesses in which moisture can collect (such as under mats, in door panels or in the trunk) during the assembly process. If the paper inserted in a recess becomes wet, the water spreads to the section of wicking attached to the tag, thereby detuning the tag's antenna, which serves as an indicator of the water's presence. The tag itself is attached via an adhesive, the company reports, and can then permanently remain within the vehicle, as it is invisible to

car users and low enough in cost to be disposable. For the testing, RFMicron is using a Nordic ID handheld reader to capture the ID number, which can be linked to the specific spot on the vehicle, along with the sensor readings.

The testing began this year with only tags attached at two locations on a vehicle, Rokhsaz reports, and has since been expanded to other locations.


Shahriar Rokhsaz

An automotive seat manufacturer is considering employing the Magnus S moisture and pressure sensor chips for a proof-of-concept pilot, in order to sense the presence of people seated in cars, for use with airbag systems. An RFID tag made with the Magnus S pressure-sensing chip is embedded in the seat cushion to detect when someone or something is in the seat, based on an increase in pressure. Two additional inlays, each made with a Magnus S moisture sensing chip, would be installed in the back of the seat, and would thus detect the change in the tag antenna's impedance as a result of an individual sitting on the cushion. In this case, the impedance of the tag's antenna would be affected by the presence of water in a person's body if he or she sat back against the tag. The data from the pressure sensor and the two moisture sensors would be used to determine if there is something in the seat, and whether, in fact, that object is a passenger, thereby indicating that the airbag system should be turned on so that it would deploy in the event of an accident.

If a company piloting the technology adopted the sensor tags for use in its seats, the tag made with a Magnus S pressure-sensing chip would replace traditional weight sensors currently used in seats. Such traditional sensors can be expensive and are unable to determine the difference between a person and, for example, a piece of luggage.

At one health-care facility, the Smartrac Sensor DogBone tag was successfully tested in a clinical trial, and a second trial is slated to be held at another site next month. For these trials, a Sensor DogBone tag is attached to the exterior of an adult diaper, in order to spare patients from the indignity of diaper checks, while staff members can more quickly learn who may need their diaper changed.

Most recently, RFMicron is testing the use of its RFID sensor in wood products, in order to detect whether there is moisture present in the wood. This could help to manage leak detection in structure walls, ceilings or floors, for instance. That data could then be captured by a Nest alert system to warn a homeowner or building manager of, for example, the presence of a leak.