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SMART Technology

University of Dayton, Ohio (url: http://www.udayton.edu/index.php)

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"SMART" RFID technology developed at the University of Dayton Research Institute for safety applications was named today one of the year's "most technologically significant new products" by the editors of *R&D Magazine*.

The 2012 R&D 100 Award is the third for the Research Institute distinguished research chemist Robert Kauffman, who developed Status and Motion-Activated Radiofrequency Tag (SMART) sensors under FAA funding to help ensure the safety of aircraft. But the technology quickly showed promise in a variety of other areas related to safety, and – less than 24 hours after news of the technology was first published in 2011 – Dayton-based American Thermal Instruments contacted Kauffman to license SMART sensors for use in monitoring temperature-sensitive products during shipment.

Kauffman and ATI are also talking with several companies about bringing the technology to market in a variety of other applications, including: impact sensors to monitor possible damage to items during shipping; impact sensors for football, firefighter and mining helmets; and temperature sensors for firefighter apparel and for train wheel bearings.

SMART sensors work by reporting unsafe or undesirable changes in the condition of a product or device the sensor was programmed to monitor. A SMART sensor designed to monitor temperature, for instance, could be packed with a crate of frozen food en route from producer to store. As the food arrives at checkpoints along the distribution route, a simple handheld scanner – similar to those used at grocery stores – could be used to quickly and easily check the tag for temperature issues without having to open the crate. If at any point the food was exposed to unsafe temperatures – even briefly – the tag will report the problem to the scanner. If the food remained safely frozen the entire trip, the tag will provide no read-out.

SMART sensors, which are simple and inexpensive to make at less than 50 cents a tag, can also be designed to monitor products and devices for hidden impact, corrosion, cracks and tampering. SMART sensors attached to football helmets for peewee and professional players alike could be scanned after a game or practice to report a dangerous level of impact, even if the player wearing it showed no signs of a concussion; the same technology could be used to tell if a composite aircraft panel has sustained a sub-surface crack.

ATI will use SMART technology to develop and manufacture RFID tags for temperature monitoring of products such as food, pharmaceuticals and medical devices during shipment. The company is also targeting railway safety in the form of temperature sensors for train wheels which, when they overheat, typically indicate a problem with the wheel, bearing or brakes – any of which could cause derailment.

Kauffman and University of Dayton Research Institute physicist Doug Wolf originally developed the technology for use in SMART electrical wire clamps for aircraft, which were designed to alert aircraft maintenance personnel if they became broken or were not properly closed. A typical commercial aircraft has miles of wiring secured in bundles by hundreds of thousands of clamps, Kauffman said. If a clamp breaks and wires become loose, they can rub against each other or against the aircraft fuselage – which could lead to a break in the insulation. An exposed wire could prove catastrophic because of its potential for sparking, Kauffman added, especially if it is in the presence of fuel.

In 2009, Kauffman won an R&D 100 award for Power-Activated Technology for Coating and Healing (PATCH), a type of self-healing wire that reacts instantly to a breach in its insulation by creating a new layer of insulation at the breach site. PATCH has been licensed to Pinnacle Systems in Beavercreek, Ohio.

In 1992, Kauffman won an R&D 100 award for the Remaining Useful Life Evaluation Routine (RULER), a computerized dipstick used to measure the quality of lubricating oil in aircraft, automobiles and electrical power-plant turbines as well as cooking oil in restaurant kitchens. By accurately predicting how long the oil will be useful for its intended purpose, the RULER – now being sold worldwide by Fluitec – saves money by eliminating the need for routine oil changes based on a calendar rather than oil quality.

About the awards:

The 50th annual R&D 100 awards recognize the 100 most technologically significant products introduced into the marketplace over the last year, according to Paul Livingstone, senior editor for *R&D Magazine*. Established in 1963 and international in scope since 1965, the awards are selected by an independent panel of experts, including professional consultants, university faculty, industrial researchers and the editors of *R&D Magazine*. The winners represent a cross-section of industry, academia, private research firms, and government labs, and winning technologies are used in medical, industrial, research, consumer, and manufacturing applications.

Past R&D 100 award winners include the flashcube (1965), automated teller machine (ATM) (1973), halogen lamp (1974), fax machine (1975), liquid crystal display (1980), Nicoderm anti-smoking patch (1992), Taxol anticancer drug (1993) and HDTV (1998).

Winners will be recognized in the September issue of *R&D Magazine* and at the R&D 100 Awards Banquet on Nov. 1, 2012, in Orlando, Fla. A list of winning innovations is on the R&D 100 Awards website.

For media interviews, contact Pamela Gregg, University of Dayton Research Institute communication administrator, at 937-229-3268 or pamela.gregg@udri.udayton.edu (url: mailto:pamela.gregg@udri.udayton.edu) ; and Paul Livingstone, senior editor, R&D Magazine, at paul.livingstone@advantagemedia.com (url: mailto:paul.livingstone@advantagemedia.com) .