Thin-Film Battery May Energize RFID

Cymbet has unveiled a flexible, thin-film, rechargeable battery that could transform active RFID technology.

Oct. 18, 2002 - Active RFID tags, those that are powered by batteries, have a longer read range and offer better performance than passive RFID tags that draw their energy from a reader. But active tags have several drawbacks: they need to be much larger than passive tags because they carry a battery; they are more expensive, and the battery has to be replaced on tags on reusable containers.

Cymbet Corp., a startup based in Elk River, Minn., might hold the solution to those problems. The company has unveiled a flexible, thin-film, rechargeable battery that is about the size of a postage stamp. The 3.6-volt battery would add little to the size of an active RFID tag, could be recharged by a reader, and might add only 10 to 30 cents to the price of the tag. (Most active RFID tags cost $10 or more today.)

The battery chemistry was developed over a 12-year period at Oak Ridge National Laboratories. The key was developing a solid electrolyte that sits between the anode and cathode. Cymbet says that because its battery uses a true solid state construction, it can be recharged upwards of 70,000 times with minimal loss of capacity.

Cymbet has licensed 15 patents from Oak Ridge National Laboratory. But VP James Sullivan says the company has enhanced the original technology by developing a way to replace a high-temperature annealing process with a method of growing crystals at a much lower temperature. The company's "programmable orientation with enhanced re-activity" process eliminates the need to mount thin-film batteries on costly sophisticated substrates. Cymbet says its cells can be bonded to virtually any surface.

The cells are capable of operating at temperatures ranging from minus 40 degrees Celsius to 120 degrees Celsius. The company says it can even be soldered onto a circuit board along with other electronic components on high volume manufacturing lines.

The battery cells can be from 5 to 25 microns thick, which means they could be used to create active RFID smart labels. The batteries can be recharged with solar energy, which might work for some RFID applications, but wouldn't be useful for boxes stacked on a pallet or in storage.

Sullivan says the battery can also be recharged by inductive coupling. The tag is put within range of a coil attached to an energy source. The coil "couples" with the antenna on the RFID tag, enabling the tag to draw energy from the magnetic field created by the two coils. (This is how passive tags get the power they need to run their circuitry.)

Sullivan says Cymbet is working with several companies that make RFID tags, but he declined to name them, citing nondisclosure agreements. The company has so far raised $5.5 million in funding. Most of that has come from the Millennium Materials Fund 2, whose major participants are European conglomerates, including Siemens, Bayer, Henkel, DSM, and Schott Glass.

Cymbet is trying to raise $10 million through a second round of funding. It plans to begin manufacturing its

thin-film battery cells in April. The company will be able to produce tens of millions of cells next year and hundreds of millions in 2004, according to Sullivan. He says that for high volume purchases (tens of millions), the cells would cost 10 to 30 cents each, depending on the size and application.

Active smart labels could be used on pallets or reusable roll cages and totes. The thin-film batteries could also be used to power smart cards or increase the range of identity badges with onboard biometrics. But perhaps the most intriguing potential is for low-cost sensors.

The big problem with embedding sensors in machines to detect, say, excess vibration that might signal a potential problem is that the metal in the machine makes using a passive tag difficult, and active tags require new batteries every few years. Cymbet says its batteries will last as long as any machine. If the thin-film rechargeable batteries prove themselves, they could usher in a world of smart sensors.