

Making Sense of Change: AlSentis Explores New Sensor Technologies

By Matthew Gryczan

When it comes to technology, Dave Caldwell has the touch.

Caldwell's thin-film sensors are used by people around the world daily to control their dishwashers, input settings on medical devices, or make selections from vending machines. Literally millions of devices use his technology that differentiates between the touch of a fingertip meant to control a machine, and the pressure exerted on a control panel when it is being wiped down or sanitized.

But Caldwell also has a knack for recognizing and applying new technologies that go way beyond a clever touch sensor circuit.

Try wireless devices that can individually control hundreds of locks on file cabinets in an office building or lockers in a fitness facility for remote security, or inexpensive biochemical sensors that can detect minute traces of specific organic compounds.

He has even begun working on his answer to the energy crisis by burning algae, the single celled plants that float on a pond as green scum.

While that may seem far-fetched, it may not be wise to dismiss the ideas of someone who once pounded on a table at a General Motors plant in Flint when he was told something couldn't be done, and predicted: "If we don't change our ways, we will all lose our jobs."

A Career in Films

When the talk turns to technology, Caldwell, 52, takes on the persona of an over caffeinated Bill Nye the Science Guy. Enthusiasm just bubbles from the Lapeer, Mich. native as he discusses flexible substrates, organic-based transistors, vacuum sputtering and integrated circuits -- all in the context of solutions meant to conquer a problem.

It's obvious that he revels in the challenge of harnessing some new method to make a product cheaper, lighter, or more robust. But the former nuclear technologist of the U.S. Navy and engineer at Donnelly Corp. has acquired a deep toolbox of experience to back up his convictions whether a process is feasible.

Originally working on the use of thin films to heat windshields, Caldwell began to develop ways to use films also as touch control technology about 10 years ago. He left Donnelly to start his own company in Lapeer, then joined with other investors to launch TouchSensor Technologies, which was acquired about two years ago by Methode Electronics Inc. near Chicago for \$65 million.

"It's amazing how many people in this area went on to start their own businesses were ex- Donnelly, ex- JCI, ex- Prince employees," Caldwell says.

As chief technology officer and vice president at [TouchSensor Technologies](#), Caldwell investigated other promising technologies that now form the basic intellectual property of [AlSentis](#) LLC in Holland.

"Here's why we put Dave's office back here," says Kevin Bird, director of marketing and new business development at AlSentis, who beckons to take a look at Caldwell's workspace as he flashes a smile. Caldwell's executive suite is windowless, with an electronic test bench against one wall and only a short walk from the factory floor. Bird, 56 and a Belding native, met Caldwell while the two worked at Donnelly, but joined him at AlSentis after stints in management and marketing at Gemtron, Material Sciences Corp. and other companies.

"We always been attached somehow, even when I worked at Gemtron and Material Sciences," Bird says. "We were not together, but not apart either. He's an incredibly entrepreneurial and intelligent guy, so I wasn't going to get too far away."

The Next Chapter

Caldwell has assembled a playground of sorts for technology geeks at AlSentis, which has five full-time employees housed in two suites in the James Street complex. In one section of the building, the year-old company has equipment to design and silkscreen delicate integrated circuits on flexible plastic. In another corner, AlSentis has an electron microscope and industrial grade vacuum chamber that allows the company to lay down metallic films on plastic where the thicknesses are measured in molecules rather than millimeters.

But the company is more than just a research and development lab.

Its first commercial product will make its debut in two weeks at Neocon in Chicago, the largest trade show in North America for office furniture manufacturers. AlSentis has designed and manufactured a touch sensing circuit that it silk-screens onto a flexible piece of plastic that was then inserted into a small cylindrical lamp about a foot long to be sold by Herman Miller Inc. The user activates the lamp by touching Herman Miller's logo.

While manufacturing techniques used at AlSentis are sophisticated, the basic products are relatively simple.

Say that a customer wants to create a control panel for a dishwasher. AlSentis designs the circuit for the electronic control, then "paints" the circuit on clear flexible plastic sheeting that may be about .007" thick -- about the thickness of a couple of sheets of typing paper. The circuit may be literally silk screened on the plastic, or applied using more complex techniques. The dishwasher manufacturer can then insert miniature electronic components on the sheet, apply it to the back of the control panel and backfill the panel with more plastic, making a water tight seal.

The polyester sheeting AlSentis uses is less expensive and a superior insulator to the traditional FR-4 board, the rigid green fiberglass board found in many electronic devices. "Since it is clear, our flex

sheet can become any color that I want just by putting an additional layer on it," Caldwell says. "That saves additional money for in-mold decoration of a part."

Doing it All

But AlSentis can take the process much further by also laying down the electronic components such as sensors, transistors and resistors on the flexible sheet, essentially cutting out another step that manufacturer may have to make by embedding components in the circuit.

"And we can do the same for glass as plastic," says Caldwell, as he points to the back of a glass appliance control panel with a 2-foot by 3-inch FR-4 board behind its facade manufactured under old methods. "Why add a circuit board, adhesive and a bunch of other stuff when I can just put on the decorative layers, along with the sensors and the circuitry, on the glass itself."

AlSentis has a license to all the intellectual property of TouchSensor and its field effect technology that has other applications such as detecting liquid levels. While the current technology is good, Caldwell says the next generation is HSS technology, which projects a small electrical field outside of the surface that changes slightly when touched.

"With HSS technology, we measure the action of touch," Caldwell says. "The product is always looking for touch -- not other things -- in real time. Even if there is an ice buildup on the surface, the HSS will detect touch properly." HSS technology does not need software to operate like other touch sensor systems, which again saves time and money during manufacture of the component. "The need for software makes it very cumbersome and expensive," he says. "A sensor using software responds slower and is harder to implement."

AlSentis already is making converts in industry with its new systems.

"The technology that AlSentis has developed will significantly influence the way products are made and designed," says Tom Hammer, director of new business development for [Emerald Medical](#) in Grand Rapids. Emerald Medical and its sister companies makes plastic injection molded products for the medical, appliance, and automotive industries. Its specialty is in-mold decoration of plastic parts during the molding cycle.

Products made using the AlSentis method don't have holes that water or other fluids can travel through to corrode electronic circuits, and they are lighter and more reliable than more traditional manufacturing methods.

"We are very supportive with what they are trying to accomplish," Hammer says. "As a matter of fact, we've introduced them to a number of key companies in West Michigan."

Caldwell formed another company called [Venntis Technologies](#) to handle applications that do not rely on touch sensor technology, such as biochemical sensors, LED displays and wireless devices. Bird says Venntis Technologies expects to ship its wireless locking mechanisms to a Spanish company in fall for use on company file cabinets.

As if all the activity wasn't enough to handle, Caldwell has launched another business called Venntis Environmental that aims to have a working prototype of an algae-fueled engine by the end of summer to generate heat and electricity, particularly to help Third World countries.

"It's going to work," Caldwell says with characteristic conviction.

Matthew Gryczan is the managing editor of Rapid Growth magazine.