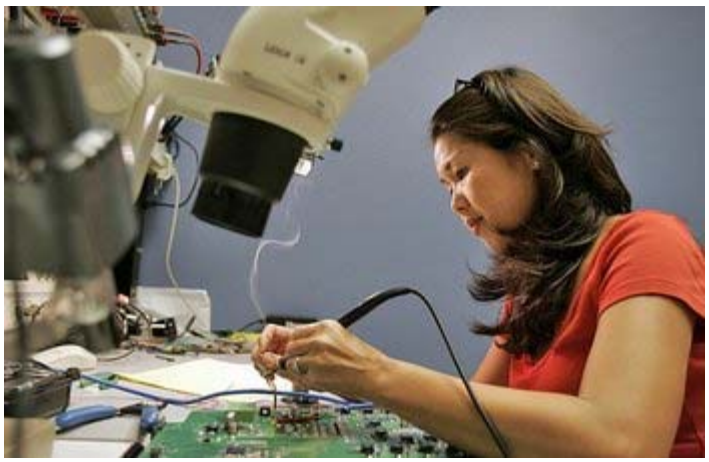
June 1, 2009

Downsizing is real upper for Daylight

Laser technology reshaped for more commercial uses

By Mike Freeman
UNION-TRIBUNE STAFF WRITER
2:00 a.m. June 1, 2009

In a Poway lab, Paul Larson holds a small metal case with a sliver-like lens down the center and two tiny lenses on either end. It's the guts of a laser sensor, from startup company Daylight Solutions, that detects the color of heat.



Technician Ly Le soldered on an integrated circuit board at the company's Poway lab. COO Paul Larson said, “I look at this as next-generation technology.” (John Gastaldo / Union-Tribune) -

Or more precisely, the color of chemical vapor. By being able to find and measure chemical vapor, Daylight is betting that its cutting-edge sensor technology will change the landscape in fields ranging from medical diagnostics to environmental monitoring.

The four-year-old firm, which has raised $13 million in venture capital, has essentially uncovered a way to transform bulky infrared-laser technology, previously confined to university labs, so it can be brought to the real world.

With a Daylight-powered laser-sensor device, diabetics can detect glucose in their breath, eliminating the need for finger-prick tests. Vehicles can be equipped with laster-powered breathalyzers so if a driver has been drinking, the vehicle won't start. And smoke alarms can be beefed up to find harmful gases before a fire starts or people get sick.

“I look at this as next-generation technology,” said Larson, the company's co-founder and chief operating officer. “It's like going from the mainframe computer to the desktop.”

Daylight has accomplished this by shrinking the sensitive sensors from the size of a desk to the size of a fast-food hamburger box – with the aim of getting even smaller.

It also has figured out how to run the laser sensors on batteries and make them tunable like a radio, opening the door to detecting a variety of molecules without complex adjustments.

Daylight Solutions has uncovered a way to transform bulky infrared-laser technology, previously confined to university labs, so it can be brought to the real world. Laser core modules are shown. (John Gastaldo / Union-Tribune)

A real-world experiment using Daylight's technology occurred during the 2008 Summer Olympics in Beijing. Students of Princeton engineering professor Claire Gmachl used one of Daylight's systems to detect and measure the relative concentration of greenhouse gases.

The experiment, done with blessing of the Chinese government, sought to determine whether steps taken by the government to improve air quality worked.

“Do factory shutdowns, do restrictions on car traffic really clean up the air?” Gmachl asked. “Can people influence air quality in the short term? It obviously helped, because the air quality was fine.”

Gmachl's students now are using one of Daylight's laser sensors on a trickier problem. On the coast of Ghana, it is common to smoke fish in ovens to enhance the shelf life and flavor of the catch. The students are studying how much of a health risk the smoking process poses to people. They are using an infrared laser sensor to detect chemicals in fumes.

“If our eyes could see in the infrared, chemical vapor would have color,” Gmachl said. “So different chemicals would have distinct colors . . . based on what the laser system and sensors are doing.”

The wave lengths, or colors, of many different chemical vapors have been mapped in labs, Gmachl said. In China, her students used Daylight's sensors to search for ozone, carbon dioxide and ammonia.

Timothy Day, chief executive and co-founder of Daylight Solutions, said the company's lasers operate in the mid-infrared wave-length spectrum, which the human eye can't see.

“It's the color of heat,” Day said. “It's the color snakes can see.”

The lasers are produced in part using quantum-cascade semiconductor chips first developed by Bell Labs in 1992.

What Daylight has added is patented technology around the quantum-cascade chips to enable commercial products. The company calls its innovations External Cavity Quantum Cascade Laser technology.

Day, Larson and Salvatore Crivillo III founded Daylight, which now has 23 employees, with the idea of bringing techniques from the telecommunications optical world to laser sensors.

Day has a doctorate in electrical engineering from Stanford. He was a chief technology officer for New Focus, a photonics firm in the San Francisco Bay Area that was acquired in 2004. His father, Tom Day, was president of San Diego State University for 22 years.

Larson was the director of specialized integrated circuits at Qualcomm and has 20 years of experience in the communications chip business.

For now, much of Daylight's sales come from universities and research labs. It expects revenue to be in the “double-digit millions” by the end of this year, Larson said.

The portable, tunable sensors potentially have many uses outside the lab. Airport scanners, for example, are not very good at analyzing liquids – perhaps one reason open water bottles don't make it on airplanes.

But laser sensors are good at detecting chemical vapors from liquids.

“I am very impressed with their technology,” said Lowell Burnett, a member of Daylight's advisory board and former chief executive of airport-scanner developer Quantum Magnetics in San Diego.

“There are hurdles for any innovative new technology coming to market. But I think their hurdles are not as high as many other technologies. This is something the country needs.”

Daylight is working with defense firms to use the lasers to confuse heat-seeking missiles fired at commercial and military aircraft or ships.

Felix Comeau, chief executive of Alcohol Countermeasure Systems Corp. in Canada, is working with Daylight on new types of alcohol-interlock breathalyzer devices, which will prevent a vehicle from starting if alcohol is detected.

Laser sensors have an advantage over existing technology, Comeau said, in that they are durable and need less service. Over the long term, they have the potential to be smaller. For now, though, they are too big to be practical, he said.

But Comeau has high hopes.

“It's going to take some doing from an engineering standpoint,” he said. “What they need to do is take this device that's relatively large and relatively expensive and take it down to where it's about the size of a cell phone.”

Mike Freeman: *(760) 476-8209; mike.freeman@uniontrib.com*

In the Union-Tribune on Page C1

•

antisolder 06/01/2009 09:41 AM

You guys should send this picture of technician Ly Le soldering to O.S.H.A. Seems to me she is not using a Fume Extractor. Look at her face how disgusted is smelling the solder resin fumes!!

- Like
- Report
- Reply
- More ▼