SMELL TEST

New Mexico company turns Sandia-licensed chemical sensors into commercial equipment

In the early 2000s, the U.S. military was in search of a simple, effective way to remotely monitor an area for chemical or biological agents. Even though the technology behind unmanned aerial vehicles (UAVs) was still in its infancy, scientists and engineers nevertheless saw UAVs as a potential solution.

In 2003, Sandia National Laboratories (Sandia) partnered with Lockheed Martin using a Cooperative Research and Development Agreement (CRADA) to develop a minimal power, lightweight technology that could be attached to drones in order to check for potentially harmful chemical agents from a safe distance. The resulting tech—called SnifferSTAR—was built with Sandia's assistance, under Lockheed Martin's Shared Vision Program and aided by numerous CRADAs.

Douglas Adkins helped lead the effort from Sandia's side. While there were certainly other gas monitors around, the weight, power consumption, and rapid analysis of the SnifferSTAR made it a novel piece of technology. Quick readings are extremely important in a battlefield or emergency-type scenario where time could make the difference between safety and potential danger.

"This is small, lightweight, low power, and offers rapid analysis," Adkins said at the time. "Rapid analysis currently is not possible with any other package near this size."

The invention itself consists of a group of small sensors mounted on a postage-stamp size platform, which is itself mounted on a credit-card size microprocessor board. The entire device weighs less than a golf ball and needs only a half-watt of electrical power to run. Once mounted to a device such as a UAV, movement forces air through the sensors, which absorb it, concentrate it, then release it onto thin strips of coating materials. Those strips are located on a surface that vibrates based on the amount of particles collected. The vibration frequencies are then compared to a library of patterns created by a range of gases in order to determine the chemical or biological makeup of the air.

The device can repeat the sampling process every 20 seconds, feeding data to a processing unit located on the drone or linked to a separate unit on the ground.

SnifferSTAR was an instant hit, winning a coveted R&D 100 Award and receiving positive press from mainstream media outlets, particularly in light of conflicts in Iraq and Afghanistan. But Adkins said that while he recognized its national security applications, he always felt the technology had untapped commercial potential as well.

In 2005, Adkins left Sandia to form a new company—Albuquerque, New Mexico-based Defiant Technologies. From its early days, the small business focused on

Defiant Technologies, Inc.

The Air Frog-200 (previous page) and the Frog-5000 (left) from Defiant Technologies represent the latest in remote-monitoring technology for chemical or biological agents.

environmental contamination work, specifically helping to monitor water quality and detect potential contaminants in water, soil and air. For Adkins, there was plenty of overlap between his previous work at Sandia—and with SnifferSTAR in particular—and what Defiant was doing. So when the opportunity arose to form a licensing agreement with Sandia for some of the second-generation SnifferSTAR tech, it was an immediately symbiotic relationship.

"We went to Sandia and licensed some of the technology that they had developed," Adkins said. "At the time it seemed daunting, but in hindsight it was simple."

Using the SnifferSTAR tech, Adkins and his business partner Pat Lewis adapted the micro-fabricated sensors components into the company's own commercial chemical detection equipment, called FROG. Equipped with a glass collection bottle, the portable gas chromatograph can detect in real-time volatile organic compounds (VOCs) in water and soils down to part-per-billion level concentrations.

"Labs take technology 30 percent of the way to commercialization, but then there's the other 70 percent. That's where our expertise comes in," Adkins said. "The SnifferSTAR technology was an important part in starting up, but taking it from there to a commercial product like FROG was where we at Defiant could be effective."

FROG has been useful for a varied clientele domestic and abroad, including consultants, the construction industry and environmental organizations and agencies.

In one instance, the New Mexico Environment Department utilized FROG to determine benzene levels in soil at a leaking underground storage tank that was also contaminated with fuel products. A handheld photoionization detector (PID) was giving the agency false positive readings due to the hydrocarbon contamination, but the FROG's accuracy and reliability reduced the volume of soil that would have been removed using only the PID, resulting in the savings of time and money.

While Defiant continues to improve the sales and distribution of its detection equipment, Adkins said that initial licensing agreement allowed the company to hit the ground running.

"We have good products and they have filled a niche," Adkins said. "It's a great example of why there are a lot of companies out there that want to license government IP."