HPD's reputation based on precision

By Joshua Lindenstein February 28, 2014

High Precision Devices' president Bill Hollander stands next to a cryostat, a cylindrical cold chamber capable of cooling to a temperature of about three-hundredths of a degree Kelvin. The company makes equipment using core technologies of precision mechanics, optics, vacuum and ultra-high vacuum, electronic sensing and control, and cryogenics.

BOULDER — So a scientist walks into a bar and asks, "Hey, anyone know how to make an adiabatic demagnetization refrigerator cryostat?"

OK, maybe not in a bar, but it's not uncommon for such a scene to play out in the offices at Boulder-based manufacturer High Precision Devices Inc. Often, said scientist would have in tow a hand-scrawled drawing of whatever complex instrument it is he would like constructed.

The sketches adorning walls and desks at High Precision Devices aren't the grade-school artwork of employees' kids. Rather, they're the beginnings of what eventually become, say, an adiabatic demagnetization refrigerator cryostat, or a Josephson voltage standard cryoprobe, or a laser power meter.

High Precision Devices has carved out a niche in Boulder by more often than not answering the scientist with a "yes."

High Precision Devices develops and makes scientific instruments — and to a lesser extent parts — for researchers at universities, government laboratories and private companies in a variety of sectors. The privately owned business has been in its same location at 1668 Valtec Lane since president Bill Hollander founded the company in 1993, gradually expanding into more space over the years. But if current growth is any indication, the company might finally have to make a move one of these days.

"If things continue as it's seeming this year, we may well be out of room," Hollander said recently.

Credit the cryostats, cylindrical cold chambers capable of cooling to a temperature of about three-hundredths of a degree Kelvin – almost absolute zero, or minus 460 degrees Fahrenheit.

The devices have developed into a full-fledged product line for HPD. The company sold 12 last year, and anticipates about 15 this year. At roughly $250,000 apiece depending on the model, that would account for about 75 percent of the company's projected record revenue of $5 million this year.

The cryostats are used for conducting research or creating processes that require such a low temperature. They can be used for research involving ultra sensitive superconducting detectors. Such detectors can be used for things like nuclear forensics to discern between materials made at a facility in the United States versus a facility in another country.

The cryostats are also used to study quantum computing, a field Hollander said the Army has shown interest in because it can be used for things like breaking codes and, conversely, cryptography or creating

unbreakable codes.

Although other companies make cryostats, HPD developed its first for a scientist at the National Institute of Standards and Technology in Boulder. As other organizations requested their own versions to meet their needs, HPD has added those to its product line, which now includes seven different models.

HPD is in the process of building cryostats for Harvard University, NASA and the Argonne National Laboratory. Once parts are machined, each cryostat takes about a month to assemble.
“They really mastered the technology, and it’s grown into a product line for them where they’ve made a lot of improvements and a lot of options,” said Joel Ullum, a research scientist at NIST.

Charlie Burroughs, an electronics engineer at NIST, has worked with HPD for about 15 years on various devices, including the Josephson voltage standard probes, for which NIST makes a chip that attaches to the end and allows users to calibrate devices like volt meters.

“They make fully assembled things so that when it gets here a lot of thought has been put into making it so it’s likely to work immediately,” Burroughs said.

To be sure, HPD’s capabilities go far beyond cryostats. The company’s core technologies include precision mechanics, optics, vacuum and ultra-high vacuum, electronic sensing and control, and cryogenics.

“We’re doing these particular technologies and the integration of those,” Hollander said. “That’s kind of our sweet spot.”

Sometimes a researcher or company will need a single device. Other times, they’ll need a small batch or contract with HPD to manufacture higher quantities of a device. Often a research lab might have the capability of making the device it desires but not necessarily the ability to manufacture multiple units that all work exactly the same.

Achieving that type of precision is more difficult that many people imagine, Hollander said. And it’s particularly important when you’re designing devices for places like the National Oceanic and Atmospheric Administration to use to measure atmospheric carbon dioxide levels in its modeling of climate change.

“They have to be confident that what we’re giving them has been done in such a way that it doesn’t influence the readings,” Hollander said.

Hollander, 62, grew up in Oakland, California and attended the University of Oregon for a year before leaving school and moving to Colorado at the age of 19. He worked as a mechanic and photographer before spending about 12 years as an instrument maker at the JILA research institute on the University of Colorado-Boulder campus.

He left JILA in 1990 to start Axis Instruments to commercialize a gravity meter he had helped develop at JILA. When that company failed three years later, he started HPD with the notion that not many research facilities had their own quality instrument and electronics shop like JILA did to build the devices needed to conduct its research.

With a co-signed line of credit and a few thousand dollars of his own, Hollander launched HPD with himself and one machinist. The company now has about 20 employees, with the expectation of adding six more this year.

HPD has ramped up marketing efforts recently to increase business in the private sector. But about 75 percent of HPD's revenue still comes from the government and university sectors. HPD has won Small Business Innovation Research grants in recent years through NIST, the Army and the National Institute of Health.

One of the most recent awards came in working with a professor at the University of California-Berkeley, who is developing a low field magnetic resonance imaging machine that might someday be capable of confirming whether a patient has prostate or breast cancer without doing an invasive biopsy.
"That's very exciting because it has some significant commercial potential, and it has some significant societal health value for a lot of people," Hollander said.