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Plastics instrumental in Quantum design

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SAN DIEGO (Sept. 19, 10:10 a.m. EDT) -- Quantum Design Inc. of San Diego has shipped the first of a newly designed plastics-enhanced ultrasensitive instrument to measure magnetic properties of materials.

Specialty Manufacturing Inc. of San Diego thermoforms portions of the housing, primarily using a design from Strategix Vision Inc. of Bozeman, Mont.

Targeting the academic and government scientific research market, the fully automated, analytical instrument combines the sensitivity of a superconducting Quantum interference device magnetometer, known as a SQUID, and the speed of a vibrating sample magnetometer.

Called SVSM, the instrument is "the most sensitive detector of magnetic fields in the world," according to Stefano Spagna, Quantum director of engineering. Spagna's role at the firm involves research in characterizing the magnetic properties of new materials — and includes designing smaller disc drives for the magnetic recording industry. Each SVSM costs \$150,000-\$250,000.

Quantum miniaturized the instrument's electronics into small modules and asked suppliers for an integrated design. Previous instruments were a series of cabinets made of wood and extruded aluminum, Spagna said.

"Now, it is one monolithic cabinet" of sheet metal and five thermoformed parts of Kydex T acrylic-PVC alloy sheet, Spagna said.

The SVSM is a first within the research instrument market, he said.

"We broke the mold with a bold design and deliver great technical aspects," he said.

Specialty Manufacturing engineering manager Jack Schrieffer said the product's thermoforming challenges included "undercuts and putting the panels together." The designers used undercuts to get crisp breaks between mating parts and to hide routed edges. Also, they reduced the fastener count and eliminated visible fasteners.

"Sheet-metal forms are limited to flat surfaces and fairly sharp corners," said Marty Albini, Strategix Vision senior mechanical engineer and project manager.

"Thermoforming offered us fewer limitations: nonprismatic surfaces, organic shapes and very complex features," he said. "Every different surface in a sheet-metal part usually represents a separate operation, but you only pay for complexity once in a thermoforming tool. From then on, it's free."

A processor can paint over a molded-in color to hide scratches, and the material does not dent or ding like sheet metal, Albini said.

"We were able to achieve an uncommon and unique aesthetic," said Cory Williamson, Strategix Vision senior industrial designer. "It's a nice departure from the traditional clamshell design. Also, we were able to achieve a high amount of misalignment tolerance."

Albini credited Specialty Manufacturing for facilitating aspects of the design.



Thermoformer Specialty Manufacturing and designer Strategix Vision helped Quantum Design develop the SVSM, above, an instrument that measures magnetic properties in materials. The product took silver in this year's Industrial Design Excellence Awards.

"SMI took the time to show us what they were capable of and gave us a lot of ideas that got past the traditional limitations of the process," Albini said. "When we wanted to try something, instead of saying 'no' they offered alternatives that we often liked better than what we started with."

SMI identified some problems and offered solutions. As a result, "we were able to eliminate a number of parts and reduce risk of production problems," Albini said.

Quantum began working on the new product in mid-2004, commercialized it in March and shipped the first SVSM in June to Zach Fisk, a physics professor at the University of California's Irvine campus. Privately held Quantum has sold five SVSM units and is aware of numerous pending applications for government research funding grants for the instrument.

Quantum specifies glass-filled ultrahigh-molecular-weight polyethylene and phenolic for instrument components that need to withstand extreme cryogenic temperatures.

The SVSM has advances in data acquisition, temperature control and magnetic field control and may supplant Quantum's current industry-standard magnetic property measurement system, initially introduced in 1983.

The SVSM received a silver award in the 2006 Industrial Design Excellence Awards competition.

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