Poise Under Astronomical Pressure | College of Engineering

10/21/2019

News Release — Oct. 21, 2019 — At Brigham City-based HyPerComp Engineering, USU alumnus Jake Walker can be found wrapping composite vessels in endless strands of black carbon fiber. His colleague Tucker Smith, also a mechanical engineering alumnus, is nearby testing another vessel to its bursting point in an underground test chamber. Intern Colby Jones, a senior in mechanical engineering, is using what he learned in class to modify the hardware and software tools the team uses every day to build and test these high-tech, high pressure tanks. The three USU alumni make up HyPerComp’s engineering workforce.

Jake Walker
BS Mechanical Engineering, USU, 2011
MS Mechanical Engineering, USU, 2017

Tucker Smith
BS Mechanical Engineering, USU, 2014
MBA, U of U, 2018

Colby Jones
BS Mechanical Engineering, USU, Dec 2019

The team specializes in designing and manufacturing filament-wound, high pressure composite vessels for multiple applications with a focus on the aerospace industry. Company owner Daryl Thompson invited us to the facility on a day the crew was wrapping a 14-inch-long plastic vessel designed to store hydrogen for a military drone.

“Battery powered drones work great, but with one of our lightweight tanks, a hydrogen-powered drone could stay aloft much longer,” said Thompson. “In a moment of critical need on the battle field, the last thing we want is for an electric drone to run low on power.” HyPerComp is revolutionizing the high pressure vessel market. In the years before carbon fiber, steel tanks were capable of high pressure but at a prohibitive cost: weight. “Any tank can withstand 10,000 psi if it has thick steel walls,” said Thompson. “But they weigh a ton! We’re making vessels that operate at 10,000 and 15,000 psi that only weigh a few pounds.”

HyPerComp even developed a method to wrap plastic vessels, a game-changing technology that was impossible just a few years ago. Once wrapped in the glossy carbon fiber, the finished vessels look like works of art, each with its own pattern of crisscrossing carbon fiber bands. Filament-wound vessels are ideal for another important reason. If a vessel is struck by debris or bursts due to failure, it does not fragment or send shrapnel into neighboring vessels, a safety feature that makes HyPerComp vessels ideal for the aerospace industry.

Tucker Smith, who joined the company in 2014 after an internship, says filament-wound, high pressure vessels are an elegant solution to complicated engineering problems. “They allow us to store high density energy in a strong, lightweight container,” he said. For months, Smith has been leading a project to design and build tanks for a new commercial space vehicle. One tank, a medium-sized composite vessel that stores nitrogen, is being tested through a range of temperatures and pressures.

“You wouldn’t believe how many high-pressure tanks are on some of these spacecraft,” said Smith. “This one will store nitrogen to re-pressurize critical systems on the launch vehicle. Other vessels serve as accumulators for nozzle steering, and others provide bursts of nitrogen for crew capsule reaction control.”

The testing regime was a success thanks in part to intern Colby Jones who painstakingly managed the hot and cold tests for weeks at a time.

“It’s amazing what these engineers are capable of,” says Thompson. “Each task presents a whole new set of problems, but there’s nothing they can’t handle.”