

Customer story

Elevated Materials: fine process control for space-grade waste recycling

Raspberry Pi solution

Size of business

Industry

Raspberry Pi 3B+

Small to medium

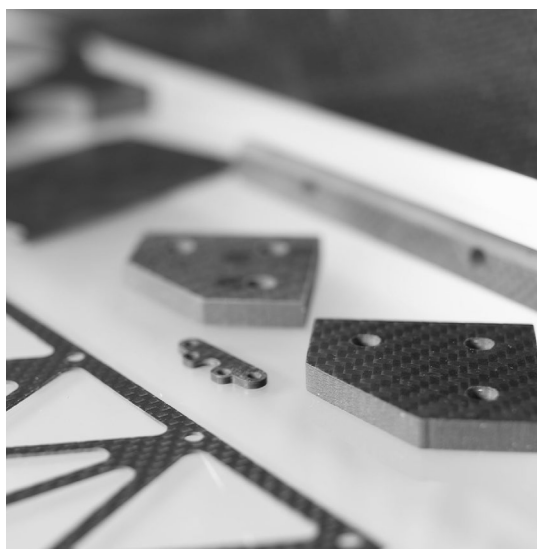
Manufacturing

The idea that grew into Elevated Materials came about when founder Ryan Olliges, then seconded to the Rocket Propulsion Lab at the University of Southern California, was tasked with sourcing carbon fibre offcuts that he and fellow students could use for their designs. He soon found he had more waste material from the space and aeronautical industries than the lab could use, and his first business used a heat press to repurpose the material to produce extremely robust, streamlined, lightweight skateboards.

The project was a commercial success, and having proven the possibilities of secondary-use carbon fibre, Olliges and colleagues set up Elevated Materials to address in earnest the need for a responsible alternative to landfill for this industrial by-product. They ramped up their recycling efforts, bringing in the technology needed for precise control of the finely tuned heat treatment that is required to repurpose each consignment.

The challenge

Most of Elevated Materials' commissions involve waste produced during the manufacture of rockets and spacecraft – high-tech vehicles that really need the strength-to-weight ratio that carbon fibre offers, explains Jaysen Harris, the company's co-founder and Tech Development VP. These waste materials come from the manufacturer with bonding resin already introduced into the carbon fibre weave. Bonding together in multiple layers and orientations is what gives carbon fibre products their strength, but the composition of each product that Elevated Materials receives from each client is different. Consequently, each consignment needs a different heat treatment to process it for reuse.



“Alternatives would have been more expensive and inaccessible at that level of startup”

Importantly, the design patterns embodied in the waste carbon fibre are destroyed in treatment. This is critical to preventing its composition from being reverse-engineered: a key part of the service Elevated Materials provides is to make sure nothing persists that could potentially let a client's competitor know the temperatures, resin amounts and composition used.

Sophisticated temperature control and detailed logging are essential.

The solution

Elevated Materials uses a heat press and technology developed in-house together with Raspberry Pi 3B+ as the process-controlling computer to bring in multiple temperature and pressure values, ensuring they are adhering to the manufacturers' specifications of the material – exactly how much heat to apply and how quickly to increase it.

Raspberry Pi provides detailed report logging so processes can be analysed and replicated. Later in the recycling process, some of the treated and pressed material is precision-cut into smaller sizes and custom parts with a Raspberry Pi-controlled CNC router.



Why Raspberry Pi?

Tech Development VP Jaysen Harris credits the precision afforded by Raspberry Pi as a defining feature of Elevated Materials' offering. "Raspberry Pi is constantly taking values and evaluating where it's supposed to be, making any changes and turning on and off the power."

Other available solutions were inferior: "There are products out there that do temperature control, but we would not have gotten such an easy-to-use, thorough logging capability." Alternatives would also have been more expensive and, given the level of sophistication required, "it would have been inaccessible at that level of startup," he says. "We just wouldn't have been able to do it."

The results

Elevated Materials is the only company in southern California offering a carbon fibre reprocessing service; the minute control offered by the Raspberry Pi controller at the heart of each of its heat presses allows it to offer more services than competitors as well as greater precision, assets that win them more customers.

Innovation, key to the company's success so far, is something Raspberry Pi's broad product range continues to support. Harris is investigating further use of Raspberry Pi computers, particularly the Compute Module line, which he envisages as the brain of their heat presses. Meanwhile, Raspberry Pi 4 offers upgrade possibilities for CNC routers, and Raspberry Pi camera modules could provide valuable monitoring. Raspberry Pi digital signage is used to explain the process to visitors. "We are constantly iterating," Harris says.

To date, Elevated Materials has kept more than 200,000lb (approx 90,000kg) of carbon fibre out of landfill.

Connect with us