Carbon Footprint

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Chris Wheaton, CFO/COO and co-founder of Seattle-based EnerG2 [2], describes his company's product as "the least-interesting-looking product" around.

"It's literally just bags of black powder," Wheaton explains. "But it's very special black powder."

Despite its rather bland physical characteristics, this black powder – carbon, specifically – has a big job, with even bigger ramifications in energy markets. Designed to optimize the performance of energy storage devices, EnerG2' [2]s carbon processing technique was born in a lab, but had bigger ambitions.

Big Storage

Before you can understand the production process, it's important to understand the carbon and what it's capable of. "We sell ingredients to device manufacturers, and they use our ingredients to make their devices better," explains Wheaton. The carbon product can be tailored to improve a broad spectrum of technologies, most notably lead acid batteries, lithium-ion batteries, and ultracapacitors – energy storage devices with capacities to deploy massive quantities of energy at once and re-charge in seconds. While many of these energy storage devices have various applications across industrial and consumer markets (cell phones, power tools, cameras), the "mother of all applications," says Wheaton, is automotive. What EnerG2 brings to the table is the ability to introduce its carbon product into these storage devices and improve efficiency and durability without adding significant weight and cost. With auto manufacturers struggling for ways to approach CAFE standards, the ability to use carbon paste to modify existing battery technology in hybrid electric vehicles just might be a godsend.

"Our factory is the large scale version of a technology platform that delivers on a variety of market opportunities. The manufacturing magic is that the factory doesn't have to be vastly modified in order for us to be able to hit all of those opportunities," says Wheaton. "We're serving a very important market in a way that's flexible enough to address those needs as they come up. That's why we think we're special."

DOE Stimulus

Wheaton, along with EnerG2 CEO Rick Luebbe, were developing plans for the world's first large scale production facility dedicated to the commercial-scale production of engineered carbon material, when they learned they'd been selected for a multi-million dollar federal grant, sponsored by the DOE through the American

Recovery & Reinvestment Act of 2009.

According to the DOE, the Recovery Act invested more than $90 billion in government investments and tax incentives to lay the foundation for the clean energy economy of the future. These Recovery Act investments were designed to put Americans back to work, make homes and businesses more energy efficient, increase the use of clean and renewable electricity, cut U.S. dependence on oil, and modernize the electric grid. EnerG2 is one of 30 advanced battery and electric drive manufacturing facilities that received the funding under the American Recovery and Reinvestment Act, the Energy Department said.

Supported in part by $21.3 million in funding, EnerG2 was able to remodel a warehouse of one of its partners, Oregon Freeze Dry in Albany, OR – a small town just south of Salem. The early phases of EnerG2 had begun, years prior, with a small scale development, but with large-scale manufacturability in mind. This emphasis was on research, says Wheaton, but also “on how we take what works well in a lab and scale it up into a large, commercial-scale business. Materials businesses to date have really been focused on doing interesting things in the lab, and then someday maybe being able to translate that into a manufacturing environment. We actually took a large-scale manufacturing perspective from the beginning, knowing that the only way we were going to have a big business was if what we were doing in a lab actually translated into a factory. So we raised money on that concept.” So, while going the traditional venture capital route, EnerG2 also applied for and won the DOE grant to build it’s Albany, OR-based factory. “We were able to secure government funding to take us very quickly from smaller scale R&D work to large scale manufacturing.”

One of the ways EnerG2 was able to ease the transition had to do with the fact that the company was already producing its carbon product through contract manufacturers. “So prior to having the driers out there on the factory floor, we had Oregon Freeze Dry run our materials in their driers, so that we could dry material on a large scale. Then we’d take it and give it to a thermal processor, and they’d do the next step, and so on,” explains Wheaton. “Nobody had the complete process; only we knew how it all fit together, but each unit process was performed by a contract manufacturer, doing work to our specifications.”

These contracts served as a great way for EnerG2 to develop its own in-house capabilities. “Working with contract manufacturers, we’ve been to their sites and operated their equipment,” says Shaun Mortenson, Albany’s plant manager. “We started in the lab working with the small stuff, moved gradually to the bigger stuff, and then when we got to the plant, most of the equipment we’re working with is equipment we worked with in our supply chain.”

Once the company was able to get the factory up and running, the cost savings and throughput improvements were outstanding. “We had more control, and we weren’t beholden to somebody else’s schedule,” says Wheaton. “Each of those companies are in business to make money. So not only would we have to pay for the cost for the operation, but we would need to make it profitable for the manufacturer. The cost of those markups became unsustainable.”

Growing Pains

But it wasn't all a perfectly easy transition. The biggest challenge in building the factory related to deadline management of capital equipment manufacturers. "The biggest challenge, and the second biggest challenge, and the third biggest challenge," Wheaton jokes, was equipment manufacturers failing to deliver promised goods on time. The plan for the plant was to sequence the implementation of each piece of the process, but instead of having time to install each piece before the next one arrived, "everybody delayed to the point where it all came at once."

Despite these hurdles, the plant was up-and-running the day of the ribbon-cutting ceremony. "We literally took down the tables and chairs and started running," says Wheaton.

The strategic selection of Albany, OR was able to support this fast-track project for several reasons. "Albany was very focused on getting operations like ours into this location. The permitting process was smooth; there were a lot of people paying attention to how to get us in here and operational quickly," explains Wheaton. A local enterprise tax deferral also meant that all the improvements the company made would be tax deferred for a period of time while they brought operations up to speed. The third reason, explains Wheaton, was that one of EnerG2's key partners, Oregon Freeze Dry, was literally right down the road. "So when we're operating freeze dryers, we can rely on a deeply knowledgeable organization to help us get it right. They helped us figure out what we were doing, at scale. They are probably the most important of the three reasons."

Adds Mortenson: "There is a lot of high tech industry here, so there is chemical processing and other skilled labor in the area. The folks we've drawn on from the area have technical skills." Another boon to training came from local Linn-Benton Community College, which trains much of the local workforce in metallurgical technology, freeze drying technology, and non-destruct testing.

A Fresh Set of Eyes

According to Mortenson, a seasoned plant manager who came to EnerG2 [2] with decades of experience in the manufacturing industry, working with Wheaton and Luebbe has helped facilitate a "hybrid" viewpoint: One where the status quo of traditional manufacturing is often challenged, tweaked, and manipulated. "Bringing somebody in from another industry to say 'this doesn't look right' and then push against it… I think it's been good because it's uncovered a lot of issues we've had with manufacturing (in general)."

Adds Wheaton: "It's interesting, because Rick and I are both start-up people, which is why we think that everything can be done in less time than it actually can. But we bring a perspective of 'Why not? Let's give it a try and see what happens.' We have to take calculated risks. That's how a start-up wins."

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