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STP

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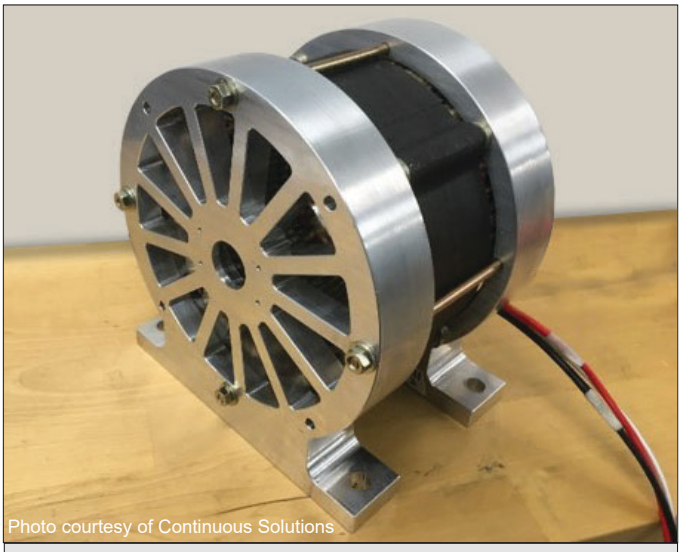
Continuous Solutions Advances Navy Technology with BIRD Foundation Award

By Jennifer Reisch

Technology developed for maritime applications on Navy vessels is finding application in power production through a U.S.-Israeli partnership. Continuous Solutions, an 8(a) certified company, designs, develops and prototypes electric motors and electric motor drives. The company's SBIR-developed technology has been selected by the Israel-U.S. Binational Industrial Research and Development Foundation (BIRD Foundation) to receive government funding to scale up clean energy generation and propulsion.

Continuous Solutions has a Phase II Navy STTR developing power dense rotating machines (PDRM) for propulsion of surface maritime vessels. "We're also designing inverters, from ideation to prototype, starting with circuits for the integrated circuit chips, and in addition, designing enhanced power electronics components," explained Dr. Nyah Zarate, CEO of Continuous Solutions. "In our lab we have the ability to design and fabricate the complete inverter. Recently we've been working on wide band gap technology; this technology is the next generation of power electronic devices. WBG semiconductors permit devices to operate at higher voltages, frequencies, and temperatures than conventional semiconductors."

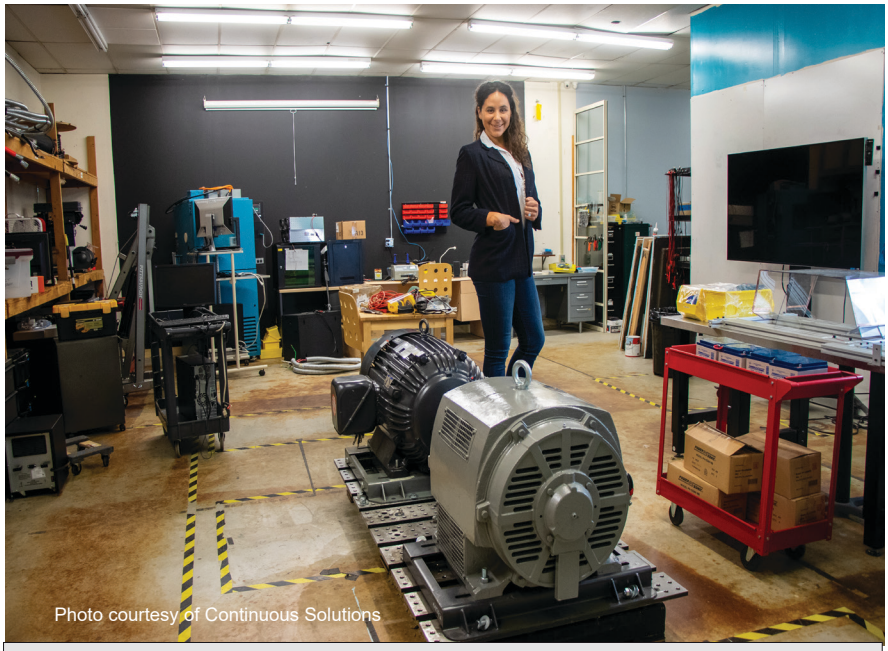
Wide band gap (WBG) semiconductors include silicon carbide (SiC) and gallium nitride (GaN). "We are using gallium nitride devices as one of the first adapters of this technology in a higher power level. While companies around the world are making semiconductor chips in silicon carbide and gallium nitride, they have not been commercially adapted yet at higher power levels. The U.S. Department of Energy believes WBG will be the foundational technology in new electric grid and alternative energy devices. This has applications in electric drive trains as well," Zarate said.



Reduced-scale 10kW power-dense electrical rotating machine built by Continuous Solutions

"We designed and built a torque-dense motor under SBIR, but to go above and beyond, we also wanted to apply this cutting-edge technology to the motor controller—the power electronics of the electric motor—utilizing WBG technology, which allows for higher power density of the controller as well."

This motor controller technology is what Continuous Solutions is further developing under the BIRD Foundation award. Working with EVR Motors Ltd. (EVR), Continuous Solutions will develop an integrated miniaturized powertrain. EVR is developing a very compact and cost-effective motor; "However, they are currently using a bulky motor controller and so Continuous Solutions is designing and creating a very compact integrated inverter, or power electronic controller, for the motor," Zarate said.



Nyah Zarate, CEO of Continuous Solutions at the company's headquarters in Portland, Oregon. She is standing in front of the 120 kW motor test bed, a power dense rotating machine for propulsion and power generation applications.

"This is advancing the technology that we've developed with the Navy. Currently we are working with silicon carbide devices; however, I think that it's important for us to explore both gallium nitride and silicon carbide wide band gap semiconductors and push the limit of their capabilities. For instance, with silicon carbide there are certain advantages in EV applications such as higher voltage. With gallium nitride it can be more robust at higher switching frequencies."

Established by the U.S. and Israeli governments in 1977, the BIRD Foundation's mission is to stimulate, promote and support industrial R&D of mutual benefit to the United States and Israel. The foundation provides matchmaking support between U.S. and Israeli companies and funding covering up to 50 percent of project development costs.

Zarate first connected with EVR in 2014. "I had recently started Continuous Solutions and was visiting Israel for vacation. I wanted to reach out to other electric power and energy companies that are doing electric motor development while I was there, to talk with them and make connections with them. While I was there, I met Eli Rozinsky at EVR. He was also at the very beginning of his start up career. We thought maybe we'd do a project together some day and we stayed in touch. Fast forward to spring of 2021. We were six months into the PDRM project of Phase II, and I was looking at other funding opportunities to continue the research work. I came across the BIRD Foundation. I contacted Eli and he said, 'Absolutely let's talk; let's discuss.' We met several times and had a lot of technical strategy sessions. We presented our capabilities and our work to them; they presented their capabilities and their work to us. We ended up writing a

pre-proposal to each other just to make sure we felt confident in partnering together and then from there we decided to do the official pre-proposal submission. We were invited to make a full proposal. As soon as the full proposal was sent, we went into planning mode so we would know what we were doing if we got it. I started to get my subcontractors and consultants together, and my technical team started to plan out the details of the project. Meanwhile Eli and the EVR team were raising rounds of funding and were going to conferences, so they've already been able to raise a lot of capital and market their product," she explained.

"Continuous Solutions' employees are highly agile and can produce good work in a very quick turnaround time. EVR is a more senior group with funding and market penetration experience. They know business; they know markets and they know how to commercialize. It's a really wonderful fit in terms of us learning from them and them learning from us. Continuous Solutions hasn't raised any investor money; however, we are looking and we believe that partnering with EVR is going to allow for market placement when our inverter is ready. We are really excited about this partnership because of its potential to really impact the industry."

"The BIRD Foundation matchmaking and support of high-tech industrial research and development with a goal of commercialization is a really beautiful complement to the SBIR/STTR program. The STTR program has really been supportive of Continuous Solutions' research development and getting our ideas up and off the ground and into a prototype. It's really important to find the commercialization placement of these products so that it can get implemented into the DoD as soon as possible."

As a participant in the Department of Navy SBIR/STTR Transition Program (Navy STP), Zarate has appreciated having help focusing on transition. "I've done Navy STP twice and it's an incredible experience to work with a business consultant whose job is to push you toward commercialization and toward the mental framework of transition as well as looking at the bigger picture. A lot of time in research is focused on nuances of the prototype and technology. It's very important for a business to think holistically about how this is going to impact society and how it's going to be transitioned into real world environments. For me it's always a great experience and a humbling experience to see how much more my team and I get to grow through the process. It gets more creative juices flowing on the business and marketing side as well," she said.

"I also realized that I need to expand my team. That was one takeaway from the STP: that I need to have the COO, the CFO, all the C-suite people in place, because that is going to help us grow quicker and wiser and more effectively."

For more information on Continuous Solutions, visit the company website at https://www.continuousolutions.com/.