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SUCCESS STORY

Open Additive breaks barriers to metal additive manufacturing through SBIR/STTR program

EXPERIMENTAL AND ANALYTICAL TECHNOLOGIES FOR ADDITIVE MANUFACTURING

TOPIC NUMBER: **NASA #T12.04**

CONTRACT NUMBER: **FA8650-20-C-5007 (AF SBIR II.5 CRP)**

SBIR COMPANY NAME: **OPEN ADDITIVE LLC; BEAVERCREEK, OHIO**

TECHNICAL PROJECT OFFICE: **AFRL/RX-MANTECH**

SPONSORING ORGANIZATION: **AFRL/RX-MANTECH**

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THE BASICS

- Produce reliable parts rapidly when and where service crews need them
- Slashes downtime for military aircraft and other equipment
- Air Force Small Business Innovation Research funding was essential

PHOTO COURTESY OF OPEN ADDITIVE LLC

OPEN ADDITIVE LLC HAS DEVELOPED THE PANDA METAL 3D PRINTING SYSTEM, AN OPEN-ARCHITECTURE ADDITIVE MANUFACTURING PLATFORM THAT USES LASERS, METAL POWDERS, SENSORS AND OTHER TECHNOLOGIES TO BUILD COMPLEX PARTS FOR AIRCRAFT AND OTHER APPLICATIONS.

Now, thanks to support from the Air Force Small Business Innovation Research/ Small Business Technology Transfer program and the Air Force Research Laboratory, the Beavercreek, Ohio, company is creating a larger, more robust version of its open-architecture platform, to be commercialized as the GRIZZLY 3D Printing System.

Metal additive manufacturing offers promise to produce reliable parts rapidly when and where service crews need them. Having a verified and versatile capability would slash downtime for military aircraft and other equipment, which supports readiness goals.

In February 2020, the Air Force SBIR/STTR program awarded Open Additive a $2.9 million, Phase II.5 Commercialization Readiness Program contract. The Air Force Research Laboratory, Materials and Manufacturing Directorate, sponsored the 27-month contract.

The CRP funding agreement supports the company's efforts to advance its metal additive manufacturing technology and product line to industrial scale. This effort includes developing and demonstrating a prototype quad-laser powder bed fusion platform with full user control of standard and advanced processing parameters, multi-sensor monitoring and feedback control, integrated heated build plate with 24-inch by 24-inch build area.

The CRP effort has served as a springboard for a series of contracts the company has since landed. These efforts include a Commercial Solutions Opening contract with the Air Force Life Cycle Management Command at Wright-Patterson Air Force Base, Ohio. This contract calls for Open Additive to demonstrate capability of its PANDA system for mobility/ training aircraft needs, and be housed in a custom shipping container for use in austere locations.

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Increased revenue has propelled growth in Open Additive's workforce and its facilities.

Open Additive and its PANDA technology grew out of efforts by Universal Technology Corp., a Dayton, Ohio-based defense contractor. The company has collaborated closely with the University of Dayton Research Institute (UDRI) on additive manufacturing technology with funding from a variety of federal, state, and private sources.

In 2017, UTC launched the entity that eventually would become Open Additive, setting up shop in a 7,000-square-foot facility at the Russ Research Center in Beavercreek, Ohio. The new business unit started with six employees and revenue of $1 million.

During the next two years, that operation grew to 25 people and added another 15,000-square-foot building at the Russ campus.

In 2020, UTC spun off Open Additive and the latter since has recorded $2 million in commercial sales in its first 13 months, in addition to the aforementioned federal contracts.

BEHIND THE TECHNOLOGY

Open Additive develops metal additive manufacturing systems, sensors and applications for military and commercial purposes. It combines lasers, advanced optics, software, and integrated sensors and analytics into configurable system offerings capable of building parts from metal powders such as stainless steel, aluminum, nickel-chromium and titanium alloys.

Laser heat selectively melts the powder in layers to create 3D parts to specifications.

The PANDA system features six- or 11-inch powder beds. However, with Air Force support, the company now is developing a 24-inch bed to accommodate larger projects. The system being developed with AFRL's input will be outfitted with four, individually controlled lasers, said Ty Pollak, president of Open Additive.

"The additional lasers are primarily for building faster, as they can cover different regions of the build area," he said.

However, PANDA's novelty doesn't come from having four lasers, since similarly equipped systems have been available for some time, Pollak said. In fact, in recent months, a German manufacturer even debuted a commercial additive manufacturing system with 12 lasers.

Instead, it's PANDA's open-architecture hardware and software that makes it unique. Buying additive manufacturing technology requires a major capital investment on the part of government agencies and companies. However, their closed architecture often limits the ability to understand their processes and fully exploit their capabilities.

"The resulting product line features highly-configurable laser powder bed fusion platforms with integrated multi-sensor data collection and analytics," company officials said. "These capabilities enable accelerated process validation, reduce vendor lock on process know-how, lower system costs, and increase flexibility for defense application needs.

"The resulting products pave the way for efficient development, demonstration, and implementation of metal AM capabilities across the Air Force, other DoD and government agencies, and their industrial bases," company officials added.

Adam Hicks, an AFRL/RX-MANTECH program manager, is working with Open Additive in its quest to develop additive manufacturing solutions that ultimately advance fleet readiness, a Defense Dept. priority.

"We want to decrease the downtime in the depots," Hicks said. "We don't want a plane sitting on the ground because we're missing one casting, and it takes six months to get that casting, and we can't do anything without it. We want to eliminate those chokepoints in the supply chain. We also want to enable future Air Force platforms to really benefit from everything additive manufacturing has to offer–lightweight, complex geometries, high functionalization."

SBIR FUNDING AND AFRL EXPERTISE WERE CRITICAL

Open Additive–and UTC before it–has leveraged SBIR/STTR funds and commercial revenue to fuel research and development and company growth.

It has other SBIR work in the pipeline. In 2020, Open Additive was awarded an Air Force SBIR Phase II contract to support the Landing Gear Test Facility at Wright-Patterson Air Force Base. Under the two-year contract, Open Additive would receive nearly $750,000 to advance the ability of a custom-built laser-powder bed fusion system to reproduce runway surfaces on 20"-scale test tiles.

The company also was awarded a SBIR Phase I contract through the U.S. Army Combat Capabilities Development Command, Army Research Laboratory, to address Army needs for expeditionary metal 3D printing capability

In addition, the company has recently landed its first project as lead organization through America Makes, the national additive manufacturing innovation institute. The effort, funded by the Air Force's ManTech program, provides first integration of machine learning algorithms within the company's process monitoring product, AMSENSE®, to realize a path for industrial process control.

AFRL's Hicks said the SBIR program helps his organization carry out its mission.

"The SBIR program is important for our organization specifically because it allows us to interface with small businesses and get our hands on technologies early on, make them start thinking about manufacturing," Hicks said. "It also allows us to see up-and-coming manufacturing technologies to help influence where our dollars go, making the best investment for the Air Force."