

INNOVATION CROSSROADS IMPACT



Justin Nussbaum, Ascend Manufacturing founder and CEO and member of Innovation Crossroads Cohort 2, has developed a new way to 3D print—Large Area Projection Sintering. The technology is the first in the industry to implement a fully automated closed loop fusion process to create parts.

With automated and integrated quality control and assurance measures, mass production capabilities, and the ability to create high-performance components, this technology was designed for industrial production. Better yet, Ascend Manufacturing hasn't yet found a material that their technology can't print with.

Accomplishments

Since joining Innovation Crossroads at Oak Ridge National Laboratory (ORNL), Ascend has been introduced to several funding opportunities. By being able to connect with a large network of potential investors, Nussbaum was able to develop a business model and secure a series of grants. The company was recently awarded two grants—\$25K from the University of South Florida Technology Transfer Office to build a pilot printing system, and \$100K from the Tennessee RevV program to collaborate with ORNL in developing a new class of printing materials. This new class of materials will



offer unique capabilities found nowhere else in additive manufacturing and offer a significantly reduced manufacturing cost over traditional materials.

Nussbaum and team have fully designed and tested materials in the pilot system through the support of industrial designers at the Department of Energy's (DOE) Manufacturing Demonstration Facility (MDF) at ORNL. In addition, Ascend has learned how to properly design the technology so that it is fully scalable to any required size. The system will be ready to launch with industry partners in the coming months.

The Process

Additive manufacturing provides significant cost reductions compared to traditional manufacturing methods and can vastly decrease a product's time to market. However, a serious gap exists in the industry in providing large volumes of high quality and cost-effective products. This is where Ascend Manufacturing steps in and will lead the charge for the coming manufacturing paradigm shift.

Ascend's Large Area Projecting Sintering printing process involves the use of a custom high intensity projector, a thermal camera for closed loop control, and



COHORT 2

Milestones

- Developed new way to 3D print
 Large Area Projection
 Sintering, introducing fully
 automated closed loop control
 to create uniform distribution
 throughout the printing
 process
- Manufactured a single printer from novel materials that includes high performance parts, mass production capabilities, and integrated quality control and assurance
- Scaled for industry testing
- Funding raised: \$115,000



"Without Innovation Crossroads, Ascend Manufacturing would not exist. They have been extremely instrumental in assisting with all aspects of starting and developing a successful business. This includes assistance with all the details from company initiation, to fundraising and to selling vour first product."

Justin Nussbaum, Founder and CEO, Ascend Manufacturing

powdered polymers (plastics). The process provides full control through the thermal infrared camera that inputs the thermal image from the powder bed and part and then outputs a projected image to a high intensity projector. Image processing involves thermal image pixels fed into the processes and outputted as gray scale pixel data. The high intensity projector is capable of fusing an entire 2D area simultaneously and provides the highest manufacturing speeds in the industry. This process can provide hundreds of thousands of parts per day from each machine.

The Challenge

Ascend has overcome its greatest challenge-the build out of the pilot system. Unfortunately, Nussbaum and team experienced many issues in the beginning. A primary stumbling block was engaging in the wrong talent to design and fabricate the system. Ordered components could not be properly assembled and therefore many parts had to be redesigned and fabricated, further extending the completion timeline. While dealing with personnel challenges caused stress early on, Nussbaum is on track with the project and better prepared for the future of the company.

The ORNL Advantage

By joining ORNL's Innovation Crossroads program, Nussbaum had access to DOE's MDF at ORNL and the nation's leading experts in additive manufacturing.

"Being able to work with MDF researchers on developing our technology has provided significant value to the company. They have been able to provide assistance on machine design aspects and industrial control systems," Nussbaum said. "In addition, with tours and support of the Manufacturing

Demonstration Facility, we have been able to form multiple strategic partnerships."

Future Growth

Ascend's technology provides the ability to rapidly manufacture high volumes of plastic components without the need for specialized tooling. This allows the user to manufacture in a new and agile way, responding rapidly to new demands. This could enable the manufacturing of tens of thousands of different product SKU's (stock-keeping unit) all at the same time or provide a rapid response to a national crisis such as COVID-19. Through Ascend's industry connections, they were able to help provide PPE to thousands in need and developed a free open source face mask with a transparent front. This allowed the user to communicate with the hearing impaired through lip reading and provided a more personal experience for those whom simply needed to see a smiling face.

Over the next decade, Ascend anticipates operating a large scale contract manufacturing business while providing high-tech additive manufacturing equipment that is the go-to tool for all types of plastics manufacturing.

"From the use of our machines, we expect our customers will be able to create products on-site and on demand, reducing shipping costs/risks, warehouse rent/logistics, product manufacturing costs and provide significant greenhouse gas emission reductions with the ability to rapidly respond to situational changes," Nussbaum said.

About Innovation Crossroads

Innovation Crossroads is a fellowship program based at Oak Ridge National Laboratory that matches aspiring energy entrepreneurs with the experts, mentors, and networks in technologyrelated fields to take their world-changing ideas from R&D to the marketplace.

Through an annual call, up to seven entrepreneurs will be selected to transform their ideas into energy, advanced manufacturing, and integrated grid companies with financial support from the U.S. Department of Energy's Advanced Manufacturing Office and the Tennessee Valley Authority. Innovators will receive a fellowship that includes a personal living stipend, benefits, and travel allowance for up to two years, plus substantial funding to use on collaborative research and development at ORNL.

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