Keck Center Awarded $900K to Bolster Metal Printing Processes

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Researchers from The University of Texas at El Paso's W.M. Keck Center for 3D Innovation were awarded an Army Research Laboratory grant worth $900,000. The four recipients are, from left, Philip Morton, applications manager for the Keck Center; Cesar Terrazas, Ph.D., research assistant professor; Ryan Wicker, Ph.D., director of the Keck Center; and Jianguo Wu, former assistant professor in UTEP's Department of Industrial, Manufacturing and Systems Engineering.

The four recipients are Ryan Wicker, Ph.D., director of the Keck Center; Cesar Terrazas, Ph.D., research assistant professor; Philip Morton, applications manager for the Keck Center; and Jianguo Wu, former assistant professor in UTEP's Department of Industrial, Manufacturing and Systems Engineering. The money, facilitated through the MSI STEM Research and Development Consortium, will help advance laser powder bed fusion additive manufacturing technology through efficient detection of defects using in situ process monitoring and 3-D metal-matrix composite fabrication process development.

"We are extremely pleased to have an opportunity to expand on the work we do here at the Keck Center," Wicker said. "This is a testament not only to the unique capabilities of our facility but also to the expertise offered by our faculty and staff."

The money is funding a pair of objectives and will be allocated to the Keck Center during the next three years.

The first involves improvements to the method of process monitoring. Morton said plans call for implementation of an infrared camera to observe the metal printing process and develop algorithms to better identify defects and make commensurate adjustments to correct them in a quick, efficient manner.

"A lot of people are already interested in process monitoring," Morton said. "You can buy some systems with cameras. But what we're trying to add is real-time defect detection in order to make real-time corrections."

The second is an effort to institute nitriding of a titanium alloy during the laser powder bed fusion process.

Morton said a laser would be used to heat up the metal as it's printing while it is simultaneously being exposed to nitrogen to form titanium nitride within the alloy.

"Typically, if you nitride something, it's a surface coating," Morton said. "So, you can't really get these nitrides inside of the metal easily. The idea is tailoring the microstructure. Instead of simply designing the shape or geometry of a part, we can tailor the material properties."

"It's a new tool to solve a problem," Morton said. "Traditionally, a designer can look at a part and say, 'Oh, it needs to be thick here to withstand the load.' But what we're wanting to do is tailor sections of it. So, if you had a rocket, you can strengthen the area exposed to the hottest temperatures to avoid failure when running hotter."

Morton said the Keck Center will receive about $300,000 of the grant money during the first year, which will be spent establishing a proof-of-concept. The following two years will involve system fabrication and implementation.

Morton said the past performance of the Keck Center was key in obtaining this grant. Agencies are confident that UTEP is well equipped to carry out the proposals it puts forth, he said. That has made the Keck Center very competitive in securing research money.

"We are one of the first additive manufacturing users to start building feedback control into these systems," Morton said. "Now, these commercial companies are starting to build and implement these systems. So, we have some past performance as well as the research infrastructure, which makes it easier to get awards because agencies don't want to fund your infrastructure. We're excited to get this planned out and working."