MISSISSIPPI STATE UNIVERSITY™
CENTER FOR ADVANCED
VEHICULAR SYSTEMS

ADDITIVE MANUFACTURING

ABOUT AM LAB

The Additive Manufacturing (AM) Laboratory at the Center for Advanced Vehicular Systems (CAVS) is advancing the understanding and adoption of metal-based AM for a variety of applications important to our state and region. With a focus on helping partners in industry and defense fully realize the potential of AM, CAVS has acquired $1.5 million in state-of-the-art equipment in recent years for its 4,000-square-foot AM lab. CAVS has been doing AM-related research for more than 20 years and has assembled an interdisciplinary team to support all aspects of AM research. The future of AM relies on the synergistic advancement of predictive modeling, advanced data analytics, and in-situ monitoring capabilities — all of which are areas of focus for the AM Lab at CAVS.

AM is experiencing rapid adoption, evidenced by the current $20B market that has more than doubled from $10B in the past 5 years. Metals-based AM is a significant contributor to that growth as sectors begin to adopt metals-based AM for part production. As AM finds its role increasing in domestic manufacturing, CAVS experts are using experimental and computational modeling methods to ensure manufacturing quality through the mitigation of defects or printing anomalies; the development of new materials or optimal printing conditions through the evaluation of as-printed mechanical performance; and advancement of digital twins for AM technologies. The lab employs many MSU undergraduate and graduate students, placing them at the forefront of AM and this growing industry.

CAPABILITIES

The Additive Manufacturing Lab is comprised of a multidisciplinary research team that includes expertise in physics-based modeling, in-situ monitoring, data science, and material testing/characterization.

IN-SITU MONITORING

The AM Lab have developed a novel method for real-time in-situ monitoring of AM technologies. This software-enabled multi-modal sensor suite will allow for improved closed feedback control of the AM process and non-destructive evaluation (NDE).

PHYSICS-BASED MODELING

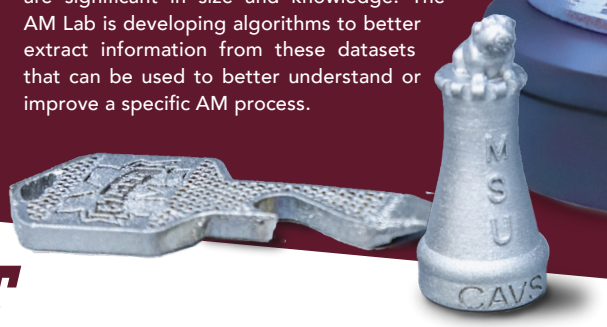
Thermo-mechanical finite element (FE) models have been developed for the purpose of predicting part-scale distortion and thermal histories. This information is vital to understanding the parts' as-printed stress-state and mechanical properties.

MATERIAL TESTING/ CHARACTERIZATION

The AM Lab has access to a complete suite of mechanical testing frames, hardness/plastometry testing, and optical microscopy. All of which are required to characterize as-printed components and optimize printing conditions for mechanical integrity.

DATA SCIENCE

AM is a data intensive process, generating experimental and computational datasets that are significant in size and knowledge. The AM Lab is developing algorithms to better extract information from these datasets that can be used to better understand or improve a specific AM process.

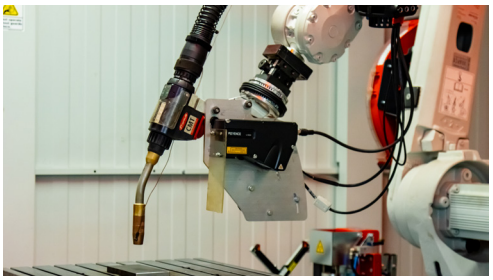


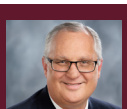
EQUIPMENT

Powder DED: The Beam Modulo 250 uses an AM technology known as Directed Energy Deposition that focuses thermal energy in the form of a laser to melt metal powder as it is being deposited. Specially designed for the activities of R&D, training, and the production of small dimension parts, the BeAM Modulo 250 offers the ability to create Functionally Graded Materials (FGM) by printing multiple powders at once.

Laser Powder Bed Fusion: : The Renishaw AM400 is a selective laser melting 3-D printer that utilizes the laser powder bed fusion (L-PBF) AM process. With 400W of laser power, the AM400 has been used for printing stainless steel, titanium, aluminum, and Inconel alloys. Additionally, the Renishaw has a reduced build volume (RBV) kit, which allows for research on small amounts of novel powders.

Wire Arc DED: The ABB FlexARC 250A is a robotic welding cell used for wirearc additive manufacturing. The cell consists of a 6-axis robotic arm and 2-axis positioner made by ABB, a Fronius TPS 400i cold metal transfer power source, a Fronius TransTig 3000 and Plasma Module 10 Plasma arc welding power source.





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ADVANCED EXPERTISE | STATE-OF-THE-ART EQUIPMENT | INNOVATIVE RESEARCH

LOOKING TO LEARN MORE ABOUT ADDITIVE MANUFACTURING OR FIND SOLUTIONS TO KEY AM CHALLENGES? CONTACT MATTHEW PRIDDY, CAVS ADDITIVE MANUFACTURING LEAD.

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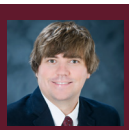

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