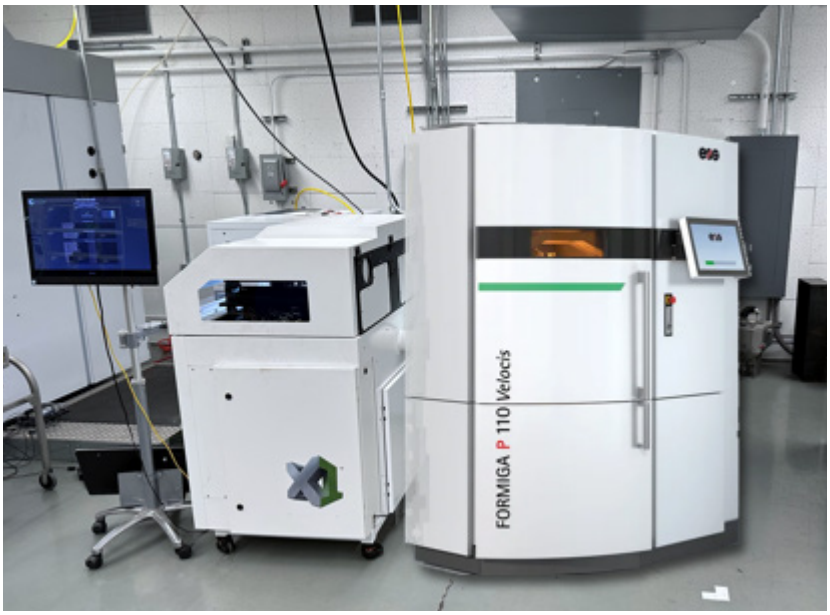
PROJECT SUMMARY 5551

Cold Metal Fusion Preliminary Research for Air Force Sustainment and Repair



EOS P110 Polymer Laser Sintering Machine used in cold metal fusion printing process

PROBLEM

The Department of Defense (DoD) industrial base continues to adopt advanced manufacturing technologies that enhances the readiness and effectiveness of the United States military. Adoption of additive manufacturing (AM) is creating new opportunities to provide advanced technical solutions to the warfighter. However, material qualification, material cost, and overall process efficiencies are limiting broader implementation of AM. Cold metal fusion can provide a more efficient and cost-effective solution to support the warfighter, but limited testing of this emerging process exists. Further testing is necessary to prove the process and inform the larger DoD industrial base.

OBJECTIVE

The project objective is to develop and demonstrate a cold metal fusion process through manufacturing and testing three Ti6Al4V material manufacturing builds.

AMERICA MAKES TECHNOLOGY DEVELOPMENT ROADMAP

This project aligns to:

PROCESS

ASTM PROCESS CATEGORY
Powder Bed Fusion

EQUIPMENT
EOS P110

MATERIAL
Ti6Al4V

TECHNICAL APPROACH

To investigate and evaluate cold metal fusion, the research team led by The Ohio State University (OSU) Center for Design Manufacturing Excellence (CDME), will perform four separate tasks.

- Task 1 involves commissioning the EOS P110 while concurrently drafting a 10-page technology overview to be submitted at the end of the project. Further, the team will compare the productivity and design criteria to those of similar modalities (Laser Powder Bed Fusion, Directed Energy Disposition, Binder Jet, etc.).
- Task 2 involves creating three manufacturing builds from Ti6Al4V material, verifying machine parameters, and assessing part performance. The first build specimen will be geared toward parameter development and the second build specimen will consist of mechanical test specimens (tensile and fatigue). OSU and Tinker Air Force Base (AFB) REACT Laboratory will collaborate to determine a demonstration component to use as the third test specimen.
- Task 3 will focus on measuring the green and final part densities, conducting tensile testing, and performing basic material characterization to assess the mechanical properties of the produced parts.
- Task 4 involves consolidating all the findings from the previous tasks into a comprehensive final report. The final report will serve as a valuable resource for the DoD and its supply chain, providing them with insights into the feasibility and potential of cold metal fusion technology.

PROJECT START DATE

July 2023

EXPECTED END DATE

January 2024

EXPECTED DELIVERABLES

- Technology overview summary
- Conduct three manufacturing builds including test specimen for evaluation
- Part Densities (Green and Final), Tensile (12 specimen minimum), Fatigue (5 specimen minimum), and Witness Coupon Microstructure from each build
- Technical report and presentation at a public forum

FUNDING

$225,000 total project budget

PROJECT PARTICIPANTS

Project Principal:
The Ohio State University, Center for Design and Manufacturing Excellence (CDME)

Other Project Participants:
Headmade Materials
EOS
Air Force Research Laboratory (AFRL)
Air Force Sustainment Center
NCDMM/America Makes

Public Participants:
U.S. Department of Defense