SUCCESS STORY

Integrating a Self-Contained Laser Deposition Engine System into a Production Machine Tool

Reduce Production and Repair Costs by Integrating Additive with Existing Subtractive Machine Tools

The hybrid concept incorporates additive manufacturing (AM) on familiar CNC platforms, expanding the use of AM by making it available on a conventional machine tool.

PROBLEM

Adoption of metal Directed Energy Deposition (DED) technology has been hindered by the difficulty of integration into existing production methods. In addition users must learn a new operating system, controller, and methods. Metal DED systems have been developed and commercialized by several companies such as the Laser Engineered Net Shaping (LENS®) machines from Optomec. While the LENS® technology has matured since its inception in the 1990s and is now generally accepted as a leading method to repair high-value metal components and to build large custom components, broad-based market acceptance has been hampered by its variances from modern machine tool operating platforms and by high equipment and operating costs.

OBJECTIVE

This project aimed to develop a LENS® Engine that would be self-contained and machine tool agnostic. It would be able to integrate with any reasonable production machine tool (such as a mini-mill, a 5-axis mill, vertical or horizontal machining center, lathe, or other CNC machine platforms, as well as robots).

TECHNICAL APPROACH

Utilizing experience from Optomec's Aerosol Jet Print Engine, the project team developed a LENS® print engine head, associated powder feeder, and software to allow integration into a legacy CNC machine tool that was retrofitted with updated motion and controls. The system was assembled at MachMotion where initial testing was performed. The equipment was then shipped to TechSolve for additional testing. Control software tools were developed and installed and the machine output was validated. The project successfully demonstrated that the LENS® Engine could be fully integrated on a familiar CNC platform.

AMERICA MAKES TECHNOLOGY DEVELOPMENT ROADMAP

This project aligns to:

PROCESS

ASTM PROCESS CATEGORY:
Directed Energy Deposition

EQUIPMENT:
LENS®

MATERIAL:
316L Stainless Steel

ACCOMPLISHMENTS

The project clearly demonstrated the practical viability of the LENS® engine modular concept. The project enabled the LENS® engine to be mechanically integrated into conventional machine tools and provided intuitive toolpath generation to the user.

Optomec teamed with Industrias Viwa in Mexico to create a fully integrated product. Their first hybrid machine "Powered by Optomec's LENS® Engine" was built in March 2016 and demonstrated at the ExpoMaq trade show in Mexico in April 2016 and Rapid in Orlando in May 2016.

Optomec has enabled both of its OEM collaborators (Viwa and Fryer) to offer their own "Optomec Powered" adaptations of their products.

The hybrid concept is viewed as a stepping stone for the potential adopter of additive manufacturing who doesn't need to go "all in" for a high-cost system.

PROJECT END DATE

September 2016

DELIVERABLES

- LENS® Engine Demonstration at TechSolve
- Test Results of LENS® Engine Performance
- Component Repaired/Modified using LENS® Engine
- LENS® Engine Interface Documentation
- Educational Materials and Training Modules

All downloadable deliverables are available to America Makes members via the Digital Storefront

FUNDING

$1.45M total project budget
($621K public funding/$834K private funding)

PROJECT PARTICIPANTS

Project Principal:
Optomec

Other Project Participants:
MachMotion
TechSolve
Lockheed Martin
Benet Labs

Public Participants:
U.S. Department of Defense
National Science Foundation
U.S. Department of Energy

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