

Creation and deployment of Advanced Manufacturing Intelligence Platform (AMIP)

AMNOW program successfully developed and demonstrated a digital AM supply chain.



How AMNOW fits into the digital thread of the creation of a part

PROBLEM

Significant advancements in digitizing design and analysis methods have transpired since 2011 when the concept of Industry 4.0 was introduced to the manufacturing community. Since then, a highly evolved marketplace of technologies and software tools has been developed, creating a robust and competitive marketplace of innovation. Improvements have been made in the areas of CAD/CAM/CAE software tools used during pre-production, and MES/ERP/MRP systems used during production and post-production. However, a critical segment of the digital thread did not experience a similar level of progress, specifically digital connectivity around sourcing, producing, and delivering parts.

OBJECTIVE

The AMNOW program was created to address a critical technology gap within the digital thread associated with sourcing, producing, and delivering parts. The objective of the project was to develop and deliver a prototype digital AM supply chain (DSC). Goals of the project were to 1) conduct a rigorous benchmarking and evaluation of current and future Army and supply chain capabilities; 2) design and deploy a prototype AM digital thread; and 3) validate the prototype AM digital thread using military-grade components.

TECHNICAL APPROACH

The program began with rudimentary forms of manufacturing data capture and transfer while simultaneously developing a non-proprietary, standards-based, cloud interface software platform. As the platform matured, more data was identified and incorporated as required contract deliverables. This iterative process improved the robustness of data acquisition, visualization, and delivery mechanisms. Over 110 individual projects were conducted involving multiple additive manufacturing (AM) processes, with multiple machine models producing over 2,000 parts. An additional 5,000 coupons were tested across 26 different use case designs that were relevant to U.S. Army equipment. Most of the parts produced were then subjected to various forms of post-processing, metallography, and non-destructive testing, as well as destructive testing in certain cases. Ultimately, the program demonstrated the ability of buyers to securely transmit technical data to suppliers for bids. Additionally, manufacturers established the ability to transmit manufacturing process data and post-process, metallography, and testing data to buyers in the form of a contracted deliverable. The above methods were used to create the Advance Manufacturing Intelligence Platform (AMIP).

This project aligns to:



Supply Chain Management

PROJECT END DATE

October 2022

Providing access to essential manufacturing capabilities.

SUCCESS STORY

ACCOMPLISHMENTS

The AMNOW program successfully developed and demonstrated a digital additive manufacturing (AM) supply chain through the creation and deployment of the Advanced Manufacturing Intelligence Platform (AMIP). The program demonstrated that a regional supply chain can seamlessly connect via a digital thread that enables secure transmission of digital data related to sourcing, producing, and delivering parts. The demonstration proved that it was highly feasible for buyers to contract for delivery of in-situ time series data captured during the manufacturing process as well as various forms of post-process, inspection, and test data.

The program identified new enhanced security software solutions now deployed at each participant supplier location and within the Azure Gov Secure Zone. This solution mitigates the challenge of placing individual hardware solutions at each manufacturing facility while providing an equivalent, if not superior capability, by never having to decrypt data when rendering to the user.

With the addition of exemplar waveguides, high-strength aluminum parts, and additional binder jet parts, the original goal of 19 use cases was exceeded with a total of 28. Four Advanced Process Development Projects (APDP) were completed including Laser Powder Bed Fusion (LPBF) with Al-10Si-Mg, Binder Jet with 4130, LPBF with 316L, LPBF High Strength Aluminum. Forty suppliers were connected to AMIP to execute the AMNOW government projects including the upload of digital data.

FUNDING

\$28,588,598 total project budget

PROJECT PARTICIPANTS

Project Principal:
NCDMM

Other Project Participants:

Catalyst Connection
The Barnes Global Advisors (TBGA)
The Youngstown Business Incubator (YBI)
The University of Alabama – Huntsville (UAH)
LECS Energy
TM Consulting
Quotient
Strong Key
Advanced Engineering Solutions
GCA Coach
SecureAge

Public Participants:

U.S. Department of Defense (DoD)

About NCDMM

NCDMM delivers innovative and collaborative manufacturing solutions that enhance our nation's workforce and economic competitiveness. NCDMM has extensive knowledge and depth in manufacturing areas—both commercial and defense—continually innovate, improve, and advance manufacturing technologies and methodologies. Our experienced team specializes in identifying the needs, players, technologies, and processes to attain optimal solutions for our customers. We connect the dots. That's the NCDMM methodology. NCDMM also manages America Makes and the V4 Institute and is the cornerstone of the Manufacturing Technology Deployment Group, Inc. (MTDG). To learn more, visit ncdmm.org.