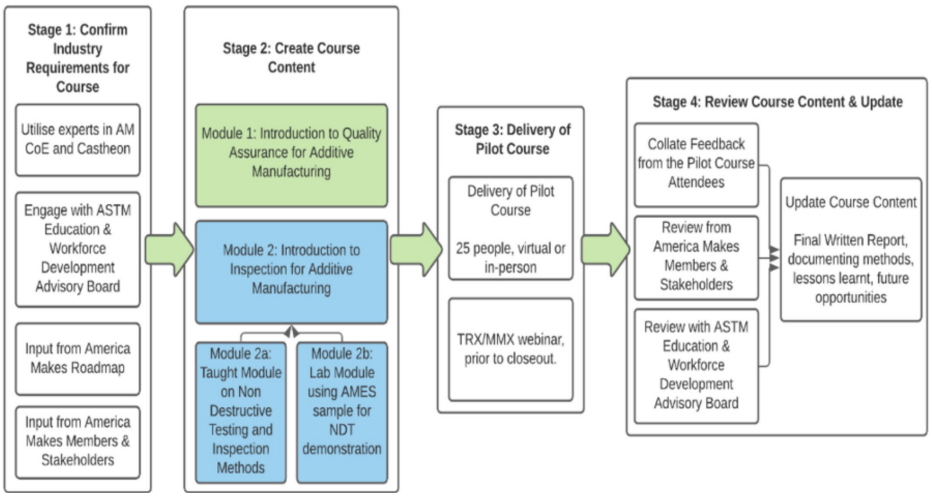
Success Story 5001.002.001.004

Input from America Makes Education Roadmap utilized to effectively create Introductory Course to Quality Assurance and Inspection for AM

150 course registrations indicated quality assurance and inspection are recognized as current key challenges



Steps needed to effectively create a course that teaches students the importance of qualification in additive manufacturing.

PROBLEM

It can take a nondestructive examination (NDE) inspector years to learn to accept or reject parts. Many good parts are scrapped because the NDE inspector lacks the skills to adequately evaluate additively manufactured (AM) parts. Training for inspection and quality assurance in AM is needed to meet the requirements of safety-critical applications. AM is different from traditional manufacturing—an entire generation of manufacturing personnel requires new skills to determine whether a part meets all the requirements for the specific applications.

OBJECTIVE

The aim of this project was to create an NDE training module to enable inspectors to consistently make correct decisions. The intent was to enable the quality assurance and NDE communities to have input at the start of the course and then use a post-pilot review to update the content. To provide hands-on experience, the America Makes Educational Specimen (AMES) was developed.

AMERICA MAKES TECHNOLOGY DEVELOPMENT ROADMAP

This project aligns to: **PROCESS**

ASTM PROCESS CATEGORY
Directed Energy Deposition
Binder Jetting
Powder Bed Fusion

EQUIPMENT
Concept Laser M2

MATERIAL
Nickel Alloy In718

TECHNICAL APPROACH

The project team, led by ASTM International Additive Manufacturing Center of Excellence (AM CoE), utilized several approaches to create a successful training course. The first step was for the AM CoE and Castheon project team to convene with America Makes members and stakeholders to confirm industry requirements for the course. Next, course content was created to fit into two modules: "Introduction to Quality Assurance for Additive Manufacturing" and "Introduction to Inspection for Additive Manufacturing." The AMES was designed by Castheon as a teaching NDE sample, created with intentional artifacts for the demonstration of testing various inspection methods. A virtual pilot study was delivered to present the course to a wide range of organizations and individuals to effectively provide a peer-based review of the content and delivery methods. The course was managed and executed by ASTM International, with strong support from America Makes to market the course.

ACCOMPLISHMENTS

The project team was able to create a course that teaches the critical skills needed to correctly inspect and assure quality in additive manufacturing of parts. This was accomplished through a virtual pilot study to present the information to a wide range of organizations and individuals. Overall feedback from the pilot course attendees was positive. From the course author's perspective, the face-to-face experience for training would still be preferred, but the virtual world enables a pilot study with a wide global reach. When conducted virtually, course times were maintained at 4 hours per module to ensure that engagement level remained high throughout, despite the initial survey requesting a longer training time. The post-pilot survey confirms that this more concise version was effective. Based on the feedback from the course participants, the content and delivery methods were both highly rated.

PROJECT END DATE

May 2022

DELIVERABLES

- Student learning modules
- Model file for printing of AMES with artifacts
- Instructor materials and guide
- Student handbook
- Pilot course
- Final report

FUNDING

$303,725 total project budget

($213,725 public funding/$90,000 private funding)

PROJECT PARTICIPANTS

Project Principal:
ASTM International Additive Manufacturing Center of Excellence

Project Participants:
Castheon
NCDMM/America Makes

Public Participant:
U.S. Department of Defense