What is Additive Manufacturing and Why Is It So Important To CT Manufacturers?

Featuring Jeff Crandall, CCAT Advanced Manufacturing Center

Hosted by Connecticut Center for Advanced Technology, Inc. (CCAT)
& Advanced Manufacturing Employer Partnership (AMEP)

November 5, 2020

Presenters





- Ron Angelo, CCAT, President & CEO
- AMEP Co-Chairs
  - North CT: Glenn Ford, President, Phoenix Manufacturing
  - Central CT: Charles Daniels, Chief Financial Officer, Wepco Plastics
- Ari Santiago, President, IT Direct
- Colin Cooper, Chief Manufacturing Officer, State of CT
- Dr. Kelli Vallieres, Executive Director, CT Workforce Development Unit
- Doug Folsom, CEO, Whitcraft
- McAllister & Quinn
  - Chris Fish, Vice President
  - Jake Parduhn, Director of Federal Affairs




Agenda

- **Made in America Minute (Ari Santiago)**
- **CT State Updates (Colin Cooper and Dr. Kelli Vallieres)**
- **Additive Manufacturing (Jeff Crandall)**
- **CT Manufacturer's Perspectives (Doug Folsom,Glenn Ford)**
- **Federal Updates from McAllister & Quinn (Chris Fish, Jake Parduhn)**
- **CCAT Program Updates (Ron Angelo)**

Made in America Podcast - we've got lots of great CT manufacturing stories!

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YouTube channel:
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Made in AMERICA
with Ari Santiago

Read our featured article in the Hartford Business Journal:
https://tinyurl.com/MIA-HBJ

STATE UPDATES

Colin Cooper, Chief Manufacturing Officer, State of CT

Dr. Kelli Vallieres, Executive Director, CT Workforce Development Unit

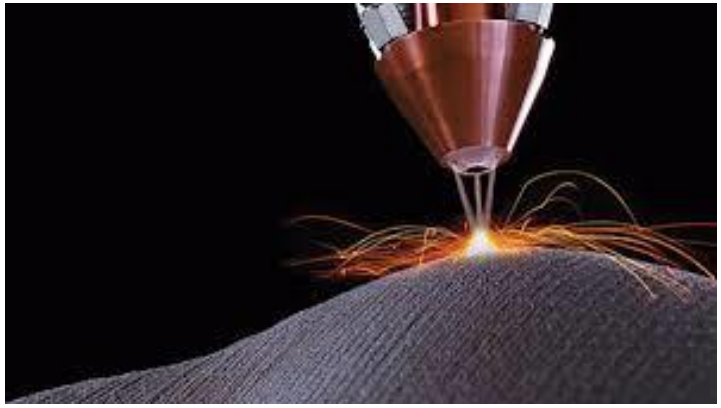
Additive Manufacturing

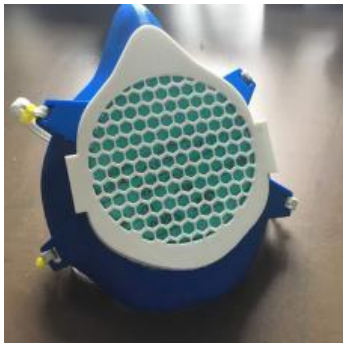
an industry update

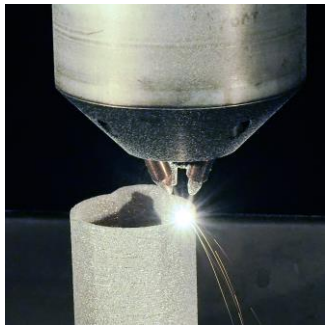
Jeff Crandall – Additive Technologies Manager

What is Additive Manufacturing?

- Additive manufacturing (3D Printing) uses a digital model to build a part one layer at a time, adding material where it is needed.







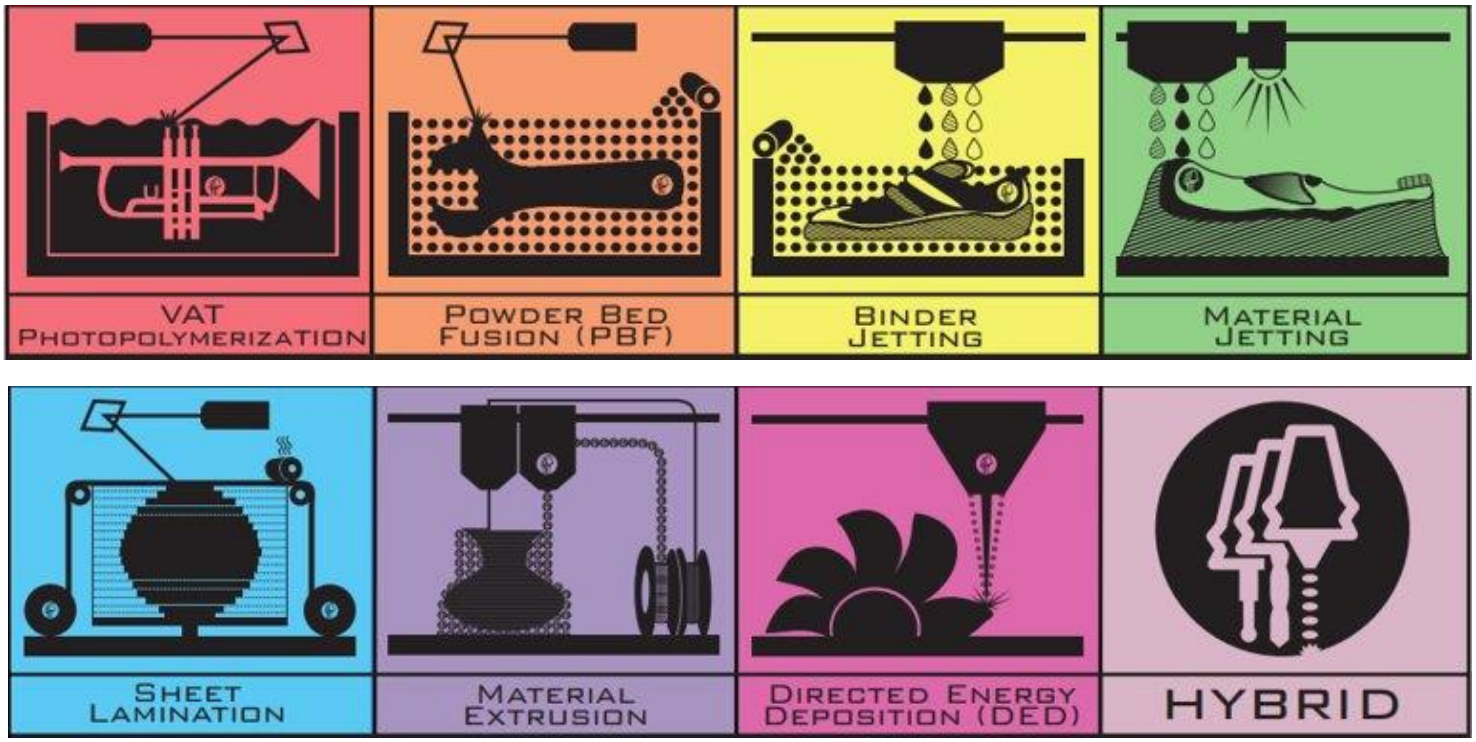
Why Use Additive Manufacturing?

- In many applications additive technologies can be used to:
  - reduce manufacturing material cost
  - improve product performance
  - reduce design cycle time
  - reduce manufacturing lead times
  - improve MRO and spare parts processes and availability

- Additive Manufacturing is a subset of “tools” in the full spectrum of “tools” available to manufacturers.

- Additive Manufacturing is a family of technologies that can be applied to almost every industry sector and business size.

Additive Manufacturing Families

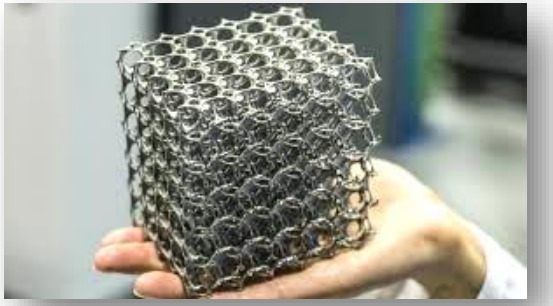


AM Evolution

- AM has been evolving and maturing over the past 30+ years.
  - Equipment - faster, bigger, robust, QC
  - Technologies available
  - Materials - new specialized materials
  - Advanced design tools

Why Use AM?

- Create things that are difficult or impossible with other technologies
- Design for end use Vs Manufacture
- “Free” complexity



Why Use AM?

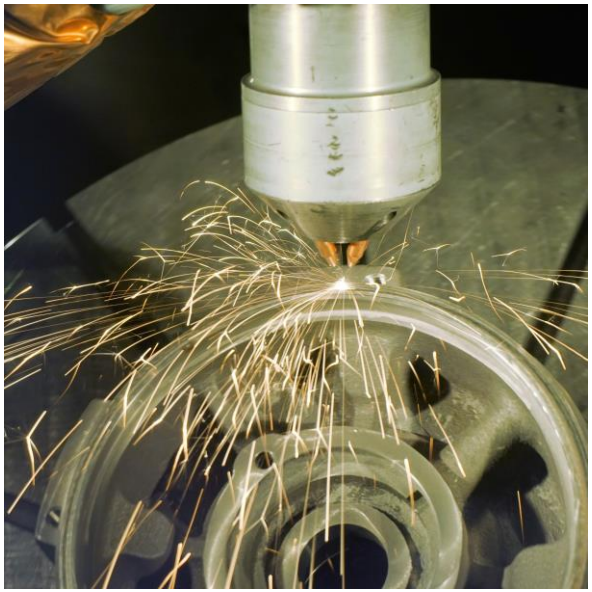
- Very little waste
- Mass Customization
- Low-mid volume production

Why Use AM?

- Potential to make things better, faster, cheaper, lighter
  - (save time/energy/materials)
- Typically no tooling/fixtures
- Part consolidation

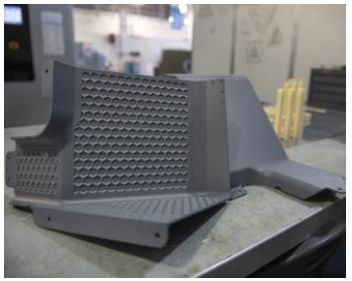
Why Use AM?

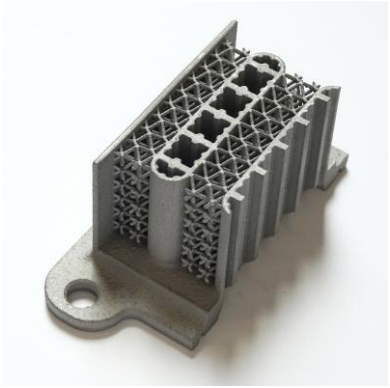
- Sustainment/MRO/Readiness/Legacy Parts / Repair / Repurpose
- Make at point of use
- Reduced inventory, warehousing & transport

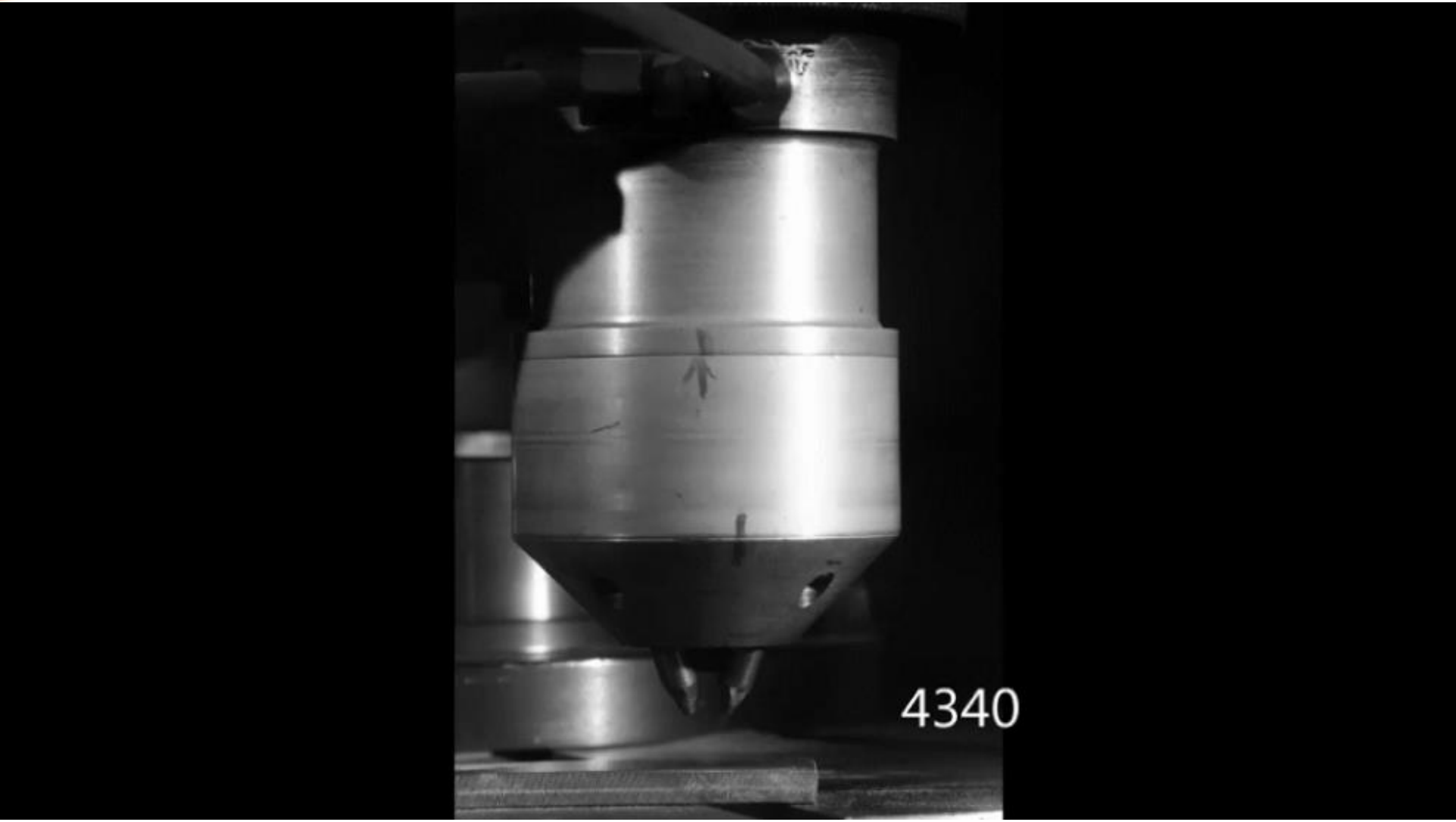


What Materials Can I Use?

- Broad range of materials and technologies
  - Plastics, Nylon, Composites
  - Metals
  - Biological materials, pharmaceuticals
  - Concrete/Building materials – Contour Crafting
  - Food
  - Electronics
  - Ceramics



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Applications – Aerospace

>1,000 Additive Manufactured Parts

Improved fuel efficiency, performance and emissions reductions in existing technology air frames and engines

Future of Air Travel - Electric/Hybrid Aircraft

Lightweighting

- Topology Optimization / Generative Design
- New Materials

Part Consolidation

GE LEAP Engine Fuel Nozzle

- Part Consolidation: 20 – 1 Part
- 25% Lighter
- Longer Life (5X)
- 95% Inventory Reduction

GE Catalyst Turboprop Engine

- 855 – 12 Parts
- 20% Lower Burn Rate
- 25% of all parts are AM

Manufacturing & Sustainment

Reduced Material Cost

- >90% savings in raw materials compared to traditional methods
- "Game changing"

Reduced manufacturing time

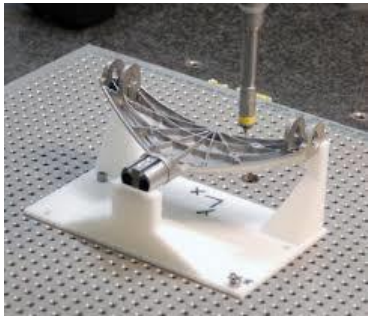
- Coupled with other Ind 4.0 technologies reports of 50% reduction
- Potential replacement for forgings/castings = reduced lead time

Reduced MRO time & enhanced repair capabilities

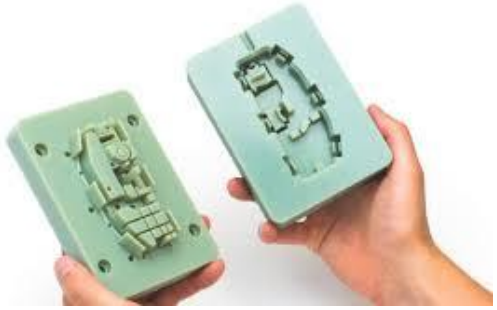
AM - Industry Adoption

- Medical – patient specific prosthetics, implants, devices, surgical models, surgical guides & devices, medications, tissue
- Automotive – light weighting, customization
- Consumer – Customization / Mass Customization of everything from device covers to high performance shoes & sports equipment
- Casting – digital molds & patterns, direct metal printing
- Injection Molding – molds, low-mid volume production
- Maritime - sustainment

AM - Industry Adoption

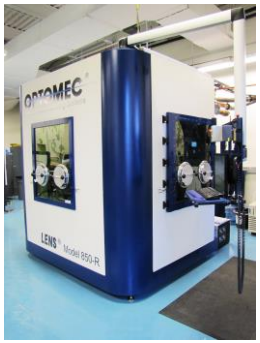


- End Use Parts
- Aids to manufacturing
  - Fixtures, tools, tooling, assembly guides, parts & tool trays
  - Robot grippers
  - Part visualization



CCAT Additive Technologies Currently Available For Validation Projects with CT Companies

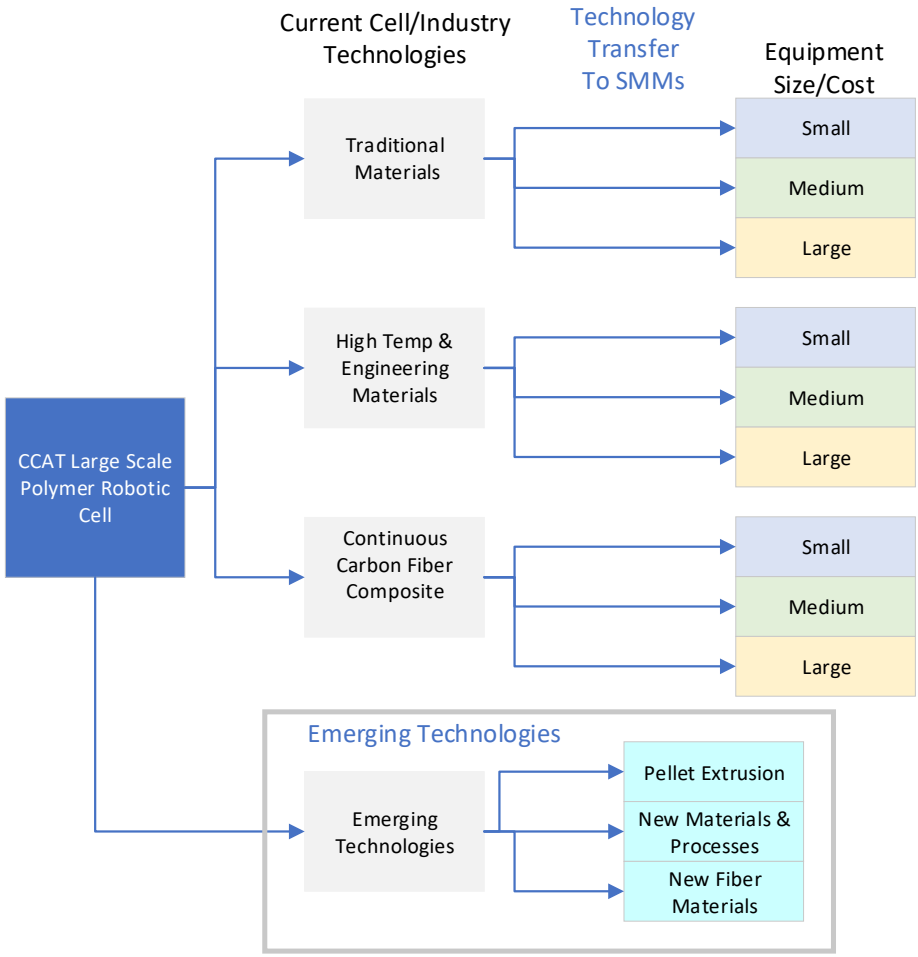
- Metal printers
  - Directed Energy Deposition (Optomec) – new parts, repairs/mods, R&D
  - Hybrid (DMG Lasertec 65 Hybrid) – new parts, repairs/mods, R&D
  - Powder Bed Fusion (Renishaw AM400) – new part builds



CCAT Is Expanding AM Technologies Available for Validation Projects with CT Companies

- CCAT is adding:
  - Binder Jetting – MIM, casting molds
  - Large Scale Polymer/Composite Robotic Cell
  - HRAM Robotic Flex Cell with WAAM & LASER Wire
- Build large end-use parts, fixturing, tooling, repair/part modifications

CCAT Large Scale Polymer Additive Manufacturing – Supply Chain Technology Transfer Matrix



The polymer cell allows for the highest level of technology application and industry flexibility which is transferable to SMMs in a wide range of equipment capabilities and price points. A similar approach is being developed for the HRAM Metal Cell.

CCAT / State of Connecticut Initiatives

- **CCAT's Additive Program is here to**
  - Help companies understand what AM is and how they may be able to benefit from it using polymers, composites and metals
  - Work with companies to determine feasibility and how to apply the appropriate additive technologies to their manufacturing and/or MRO process through demonstration and pilot projects
  - Do applications and process development and transfer the technology to you
  - Support the training of your work force
  - Act as a conduit to CT State resources and programs to assist in adopting AM
  - Do applied research and support fundamental research in the AM industry

Additive Manufacturing - The Future of Making Things

"The problem with the future is that it usually arrives before we're ready for it."

Arnold H. Glasow

Jeff Crandall – Additive Technologies Manager jcrandall@ccat.us 860-282-4201

Employers' Perspectives

Doug Folsom, CEO Whitcraft Group
with
Glenn Ford, President, Phoenix Manufacturing

McAllister & Quinn Federal Update

2020 Election Day Update/Overview and Potential Impacts on Connecticut

11/5/2020

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- **Wage subsidies up to $20/hour for new or returned COVID impacted employees**

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- **Employee supports**
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Introduction to Metal Additive Manufacturing

Wed. Nov. 18th| 1:00 - 3:00 PM

Learn more about metal AM and how to get started with choosing the appropriate technology for your applications and needs.

Attend a Virtual Tour of *Your* Advanced Manufacturing Center

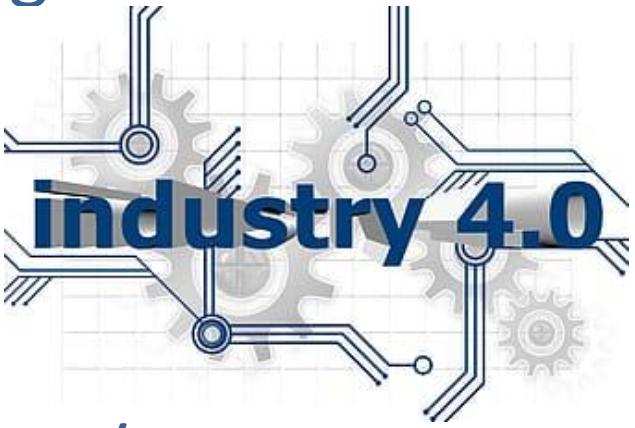
Wed. Dec. 9th | 1:00 - 1:45 PM

Learn about the AMC's technologies

- **Additive Manufacturing**
- **Precision Machining**
- **Metrology & Inspection**

CCAT Program Updates

- Voucher Programs (CTMVP, IVP, AMAP)
- Industry 4.0 Demonstrations & Trainings
- High Rate Additive Manufacturing
- REV-UP! Re-hire and Upskill
- 180 Skills Free Online Trainings
- Small Turbine Engine (AFRL)
- Defense Communities Grant – MBE/MBD



FREE Industry 4.0 Workshops

For CT small to medium sized aerospace & defense manufacturers

On Demand Any Time

- Design to Print Technology
- Data Dashboards & Applied AI
- Predictive Maintenance Technologies
- IoT/Cloud & Cognitive Computing
- Modernization Strategies
- High Speed Contact Metrology
- High Speed, Automated, 3D Scanning for Part Inspection
- Low-Cost 3D Scanning-Part Digitizing & Parametric Models
- Machine Tool Probing for Industry 4.0
- Augmented Reality Solutions in Manufacturing
- Industry 4.0 and Smart Manufacturing
- The Digital Twin aka Model Based Definition

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Follow-Up

Slides have been posted on the CCAT website:
https://www.ccat.us/events/2020-11-05-webinar/

- CCAT Point of Contact:

  Lynn Raicik, Associate Director, Workforce Pipeline Programs
  lraicik@ccat.us, (860) 982-6637

- For questions or suggested topics for upcoming webinars, email:
  workforce@ccat.us