**AM Parts and Repairs**

Concurrent Technologies Corporation (CTC) currently offers three Additive Manufacturing processes to provide our clients both complex part manufacturing and the ability to repair worn or damaged high-cost components.

- Laser Powder Bed Fusion
- Hybrid Additive Manufacturing
- Cold Spray

Whether you need specific part geometry for performance enhancements or a cost effective repair process for high-dollar components, CTC offers the AM process that can get you results in days. Our engineers can move you quickly from concept and design to manufactured product. These processes can also be merged together to provide customized solutions.

**Why Choose Concurrent Technologies Corporation?**

CTC applies its 30-year history in metals and metal processing solutions to be an all-encompassing service provider for Additive Manufacturing solutions. All processes are controlled in-house to ensure quality results.

We provide a comprehensive suite of services including reverse engineering, process development, characterization of powder and substrate, surface profile preparation, material application, post processing, final machining and inspection. CTC also provides services to evaluate, validate, and qualify the part through mechanical and physical property characterization.
Concurrent Technologies Corporation’s In-House AM Processes

Laser Powder Bed Fusion
To create the highest quality parts, CTC is equipped with the all-in-one SLM 280HL 3D printer. Using various materials—aluminum, titanium, stainless steel, cobalt-chromium and others—we provide versatile, fast, rapid prototyping using double laser beam technology.

The SLM 280HL is an all-in-one selective laser melting machine with a build envelope of 280 x 280 x 350 mm. At almost ten feet tall, the SLM 280HL is used for continuing research and development efforts at CTC, where we innovate and build upon industry knowledge of additive manufacturing, especially for metals.

Hybrid Additive Manufacturing
Hybrid AM can be combined with CNC machining. Because of this dual nature, hybrid machines can begin producing a part by using either of the two processes. However, beginning production using additive manufacturing is inherently more efficient than needing to mill a form and typically offers broader design freedom.

Our engineers are experienced in the additive production method called laser cladding. Laser cladding is a precision welding process that deposits granular metals onto a surface where they are immediately liquefied into a melt pool by a high-energy laser, and it is important in the hybrid manufacturing process.

Once cooled, the deposited metal becomes a solid. Then we begin CNC milling on the part. We can use a number of tools to shape a surface and add critical features where needed.

High Pressure Cold Spray
Cold spray is a lower temperature solid-state thermal spray process that deposits metal powder using a heated inert gas through a supersonic nozzle.

Benefits include a greater than 80% high-deposit efficiency, bond strengths greater than 10 ksi, coating strengths greater than 40 ksi, and no real limit on deposition thickness. With porosity commonly below 1%, high pressure cold spray preserves powder microstructure and properties.

We use the Gen III system, which is efficient, mobile, and has quickly become the system of choice for the U.S. military.
Project Examples

Electron Beam Melted (EBM) Ti-6Al-4V AM Demonstration and Allowables Development
AmericaMakes
- Demonstrate full-scale component fabrication of EBM Ti-6Al-4V titanium alloy components
- Develop complete set of material design allowables
- Validate non-destructive inspection (NDI) methods on full-scale EBM demonstration components

NDI for Electron Beam Direct Manufacturing (EBDM) of Titanium
Navy Metalworking Center
- Identify and optimize traditional and emerging NDI processes for reliably detecting critical flaws of various types and sizes in EBDM manufactured components
- Develop procedures for production inspection of aerospace EBDM structural components

NDI for Direct Metal Laser Sintering (DMLS) Additive Manufacturing
National Institute of Standards and Technology (NIST)
- Identify methods for optimized NDI of DMLS produced parts, through intentionally seeding and inspecting defects in both simple and complex shapes
- Leverage project findings to influence the standardization process for NDI of DMLS components

Forward-Deployed AM Capability
Army Rapid Equipping Force (REF)
- Unbiased and broad overview of AM technologies
- Current and perceived challenges for future U.S. Army REF deployment scenarios
- Design matrix to identify candidate parts
- Part identification/AM process spreadsheet

Reborn in the USA
America Makes
- Develop specifications and knowledge base of best practices in advancing AM methods to repair aerospace metal components using Laser Powder Feed Directed Energy Deposition
- Identify high value Air Force components (e.g., hard to source or obsolete) for part repair and sustainment applications
- Determine/develop design allowables and guidelines, includes testing

AM Solutions for the Air Force
Air Force Research Laboratory (AFRL)
- Conduct a baseline investigation on the use of laser powder feed coatings for repair of gas turbine engine parts
- Further investigate viability of using laser-based repair process (OC-ALC)
Concurrent Technologies Corporation (CTC) is an independent, nonprofit, applied scientific research and development professional services organization. Together with our affiliates, Enterprise Ventures Corporation and CTC Foundation, we leverage research, development, test and evaluation work to provide transformative, full lifecycle solutions. To best serve our clients’ needs, we offer the complete ability to fully design, develop, test, prototype and build. We deliver robust, technical, and innovative solutions that safeguard our national security, retain U.S. technological advantage, and ensure the primacy of American manufacturing.

CTC’s quality management system is certified to the ISO 9001:2015 and AS9100D:2016; CTC’s environmental management system is certified to 14001:2015.

www.ctc.com

For more information, contact:
Ken Sabo
Senior Director
Manufacturing
(814) 269-6808
additive_manufacturing@ctc.com

100 CTC Drive • Johnstown, PA 15904
Phone: 1-800-282-4392

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