"The speed at which a national lab can move to address complex scientific challenges is amazing."

Lonnie Love,
Manufacturing Systems
Research Group Leader

Innovations in Advanced Manufacturing

A thriving manufacturing sector is vital to the nation's economic health and global security, yet few companies possess the R&D capacity that's essential to staying competitive. Oak Ridge National Laboratory (ORNL) draws upon unmatched capabilities in materials, neutrons, and computational sciences to develop and deploy innovative manufacturing technologies, helping large and small companies alike. These efforts are directed toward solutions that will drive US economic competitiveness and energy productivity.

Research and Development

Through exploration of new energy-efficient next-generation materials and innovative processes, ORNL has introduced a variety of technologies including strong lightweight materials for more efficient transportation and other clean energy applications. Priorities include additive manufacturing or 3D-printing, carbon fiber and composites, materials for harsh service conditions, critical materials, sensors and controls, modeling and data analysis for manufacturing, and roll-to-roll processing.

- **CONTROLLING** microstructure in 3D-printed metal parts
- **CUTTING** carbon fiber costs by more than 50%
- **PRINTING** large 3D polymer objects: cars, houses, tools
- **CREATING** better batteries with new alloys
- **SOLVING** metal 3D-printing challenges

Model. Make. Measure.

Using ORNL's world-class resources for scientific discovery, researchers can examine microstructures to better design new materials and fabrication methods, leverage multidisciplinary expertise for the development of new biobased materials, and measure residual stress to certify printed components.

The frame and body panels of this Shelby Cobra replica were 3D-printed at ORNL.

Manufacturing Demonstration Facility

MDF is the nation's only large-scale open-access facility for new manufacturing technologies. Its mission is to lower production costs, increase efficiencies, create new products, and generate new opportunities for American jobs.

Carbon Fiber Technology Facility

CFTF is developing methods to make carbon fiber production more affordable using low-cost feedstocks. The center focuses on real-time characterization and analysis of fiber production, scalability of processes, quality control, and development of fiber-reinforced polymer composites for end use.

An Innovation Campus

At ORNL, the US Department of Energy's (DOE's) Manufacturing Demonstration Facility and Carbon Fiber Technology Facility provide platforms for bringing together diverse capabilities and talent in computational modeling, data analytics, characterization, materials, and manufacturing science. MDF and CFTF provide access to tools for fundamental R&D in additive manufacturing, carbon fiber, and composites technologies at an industrially relevant scale.

ORNL, in collaboration with numerous partners, produced the first fully functional excavator using additively manufactured components. Known as Project AME (additively manufactured excavator), this working demonstration showcases a wide range of industrial applications for 3D printing.

Public-Private Partnerships

Among DOE's national labs ORNL is a leader in public-private partnerships, linking benefits across the manufacturing sector to integrate existing public and private resources into a national innovation ecosystem. The Lab addresses reliance on rare-earth metals and other materials for clean energy manufacturing through its role in the Critical Materials Institute. Through its membership in the Institute for Advanced Composite Manufacturing Innovation, ORNL works with other national labs; universities; and federal, state, and local governments to accelerate development and commercial deployment of new products in the growing advanced composites industry.

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