



“The technology breakthroughs we’re delivering today will spur innovation to enable the industry of tomorrow.”

Lonnie Love,  
Manufacturing Systems Scientist



## Innovations in Advanced Manufacturing

A thriving manufacturing sector is vital to the nation’s economic health and global security, yet few companies possess the research and development (R&D) capacity essential to staying competitive. Oak Ridge National Laboratory (ORNL) draws upon unmatched capabilities in materials, neutrons, and computational science to develop 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 energy applications. Priorities include additive manufacturing or 3D printing, carbon fiber and composites, materials for harsh conditions, rare-earth metals, sensors and controls, modeling and data analysis for manufacturing, and roll-to-roll processing.

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.



**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



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

## 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. These facilities provide access to tools for fundamental R&D in additive manufacturing, carbon fiber, and composites technologies at an industrially relevant scale.



### Manufacturing Demonstration Facility

*MDF is the nation's only large-scale open-access facility for rapidly demonstrating early stage R&D manufacturing technologies and optimizing critical processes.*



### Carbon Fiber Technology Facility

*CFTF is developing methods using low-cost feedstocks to assist industry in overcoming the barriers of carbon fiber production cost, scalability of processes, and development of fiber-reinforced polymer composites for end use.*

*“ Our collaboration with the Lab has led to the development of many new technologies in the additive manufacturing market. ORNL thinks big, which is good for the growth of US industry and our global competitiveness.”*

– Tom Drye, Vice President, Emerging Markets and Business Innovation, Techmer PM

## 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 energy manufacturing through its role in the Critical Materials Institute (CMI). 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.



*Jointly developed by ORNL and CMI, this new aluminum-cerium alloy has proven to be lightweight, corrosion-resistant, and exceptionally stable at high temperatures, creating new possibilities in automotive and aerospace applications and supporting domestic rare-earth mining.*

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