



Transportation Technologies

Oak Ridge National Laboratory is accelerating the pace of research and development for efficient, safe, secure, and environmentally friendly transportation. By leveraging the National Transportation Research Center—the Department of Energy’s only dedicated user facility focused on transportation—researchers identify new materials for next-generation systems; provide decision-making tools and intelligent technologies for the secure, efficient movement of passengers and freight; and create economic opportunity for the nation by improving the energy efficiency of light-, medium-, and heavy-duty vehicles.

Research and Development

Automation and connectivity—Advanced simulation, hardware, and novel control methodologies to provide a comprehensive approach to accelerating the introduction and management of connected and autonomous mobility systems, reducing congestion and improving fuel economy

Electrification and fast wired and wireless charging—Early-stage technologies to speed deployment of electric vehicles, including extreme fast charging; advanced batteries, fuel cells, electric machinery, and power electronics; and roll-to-roll technologies

Data science and vehicle cybersecurity—Unique security expertise to detect and prevent cyber intrusions; advanced sensors, controls, algorithms, and other technologies to safely and efficiently guide automated and connected vehicles; and analysis of transportation fuel economy and fleets

Materials for future vehicles—Durable, cost-effective, lightweight materials and advanced processes for next-generation vehicles, including high-temperature alloys for engines, advancements in carbon fiber, 3D printing, and advanced materials joining techniques

Fuels, engines, and emissions research—Co-optimization of advanced fuels and engines, low-temperature catalysts, and emissions controls; breakthroughs in biofuels production; and integration of vehicle systems

Virtual/physical research environment—Integration of simulation, hardware, and analyses to address the challenges within complex mobility systems and identify opportunities for improvement



ACCELERATING extreme fast charging for electric vehicles



ADVANCING technologies for automated and connected vehicles



DEVELOPING durable, lightweight materials for next-generation vehicles



CO-OPTIMIZING advanced fuel and engine technologies



APPLYING data science for vehicle cybersecurity and fleet efficiency



“By leveraging ORNL’s world-class facilities in high-performance computing, data analytics, and transportation, we’re able to develop and deliver interdisciplinary solutions for next-generation mobility.”

Jacky Rios-Torres, Researcher, Connected and Automated Vehicles

Impacts and Partnerships

- Using Summit, the world's fastest supercomputer, worked with General Motors to advance artificial intelligence to improve sensory perception
- Partnering with Rototest to develop vehicle-in-the-loop technologies in support of ORNL's virtual-physical research environment that connects laboratories and accelerates the development of advanced technologies
- Working with partners FCA US LLC and Nematik, developed high-temperature aluminum alloys for automotive cylinder heads using materials characterization expertise and high-performance computing
- Collaborating with the National Renewable Energy Laboratory, improved regional transportation networks by developing a digital twin using Chattanooga, Tennessee, as a testbed
- Developing a neutronic engine for use with the VULCAN instrument at the Spallation Neutron Source to provide unprecedented measurements in a running engine critical to the development of next-generation engines



Licensed Technologies

Batteries—SPARKZ Inc. licensed five ORNL technologies to eliminate cobalt in lithium-ion batteries.

Carbon fiber production—RMX Technologies licensed ORNL plasma oxidation technology to reduce energy consumption by 75%, shorten production time by 2.5 to 3 times, and cut production costs by 20%.

iDriving real-time data—SanTed Project Management LLC licensed technology to determine how driving style affects fuel economy for the trucking industry.



Laminations are compiled to form the core of modern electric vehicle motors. ORNL has developed a software toolkit to speed the development of new motor designs and to improve the accuracy of their real-world performance.

DOE's Most Comprehensive Transportation R&D Facilities

The **National Transportation Research Center** helps industry, academia, and other agencies accelerate the development and deployment of efficient and secure transportation technologies. Research focuses on electrification, efficiency of combustion and emissions, data science and connected vehicles, and materials for future systems.

The **Carbon Fiber Technology Facility** 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.

The **Battery Manufacturing Facility** is the country's largest open-access battery research and development center focused on high-performance, low-cost waterborne processing technology, high-speed curing for advanced electrodes, low-cobalt and cobalt-free cathodes, and high-performance computing for advanced processing, performance validation, and life prediction.



CONTACT:
Claus Daniel
Sustainable Transportation
Program Manager
danielc@ornl.gov
865-241-9521
One Bethel Valley Road,
Oak Ridge, TN 37830

ornl.gov/
transportation