

What happens when lightweight meets

STRONG FINISH



Automobile components. Bridges. Satellites. Military vehicular armor. Propellers. What do these have in common? Carbon fiber. Whether for the automotive, aerospace, defense or transportation infrastructure industries, Michigan's carbon fiber manufacturing capabilities are as strong as the composite it produces.

We can rebuild them better...stronger... faster

Ford Motor Company, in collaboration with carbon fiber supplier DowAksa, is working to take automobile manufacturing to the next level using low-cost, high-volume carbon fiber technology. Tomorrow's cars could benefit from an improved power-to-weight ratio and better fuel economy without sacrificing significant strength. Advanced composites could reduce the weight of a passenger car by 50 percent and improve its fuel efficiency by about 35 percent without compromising performance or safety.

So what's the big deal? It could help save American families more than \$5,000 in fuel costs over a car's lifetime.

Bridge on the River Rouge

The first carbon fiber reinforced polymer (CFRP) bridge built in the United States is the Bridge Street bridge spanning the Rouge River in Southfield, designed and built by researchers at Lawrence Technological University's (LTU) Center for Innovative Materials Research in 2003. Innovative CFRP technology replaces traditional black steel reinforcement with a combination of stainless steel and carbon fiber materials, manufactured by Tokyo Rope, to prevent corrosion while maintaining the same strength and durability. When it came to major renovations to Detroit's Southfield Freeway, LTU's CFRP technology was once again deployed as well as in the M-102 (8 Mile Road) bridge over Plum Creek in metro Detroit.

In a time of aging transportation infrastructure, this technological innovation could be the answer to long-term durability, saving tens of millions of federal and state dollars—and it's happening in Michigan.

These successes aren't unique. Other carbon fiber manufacturing-related companies that have found success in Michigan include:

- Altair
- BASF
- Continental Structural Plastics
- Dow Chemical Company
- Eaton Corporation
- ESI North America
- Faurecia USA Holdings
- Magni Group Inc.
- Plasan Carbon Composites
- Toyota Motor Engineering & Manufacturing North America Inc.

Diversified manufacturing and R&D

Michigan is still the epicenter of automobile manufacturing, one of the primary reasons carbon fiber manufacturing companies have located in the state. But that's not the whole story. The state has also diversified its manufacturing expertise to other growth industries such as aerospace, defense and robotics. Adaptability is the cornerstone upon which Michigan's advanced manufacturing is thriving. Michigan still leads U.S. manufacturing and R&D with overwhelming capacity and workforce talent:

- More than 14,000 manufacturing facilities
- 900 automotive manufacturing facilities
- 63 of the top 100 automotive suppliers to North America
- 200,000 skilled labor force
- Home to the country's largest concentration of industrial and mechanical engineers and R&D professionals



Deep engineering, STEM and composite materials talent

Michigan boasts a strong engineering, STEM (science, technology, engineering, mathematics) and composite materials-related talent base:

- Sixteen universities and colleges have nationally ranked undergraduate engineering programs.
- Michigan Technological University ranks in the top 10 nationally for graduating the highest percentage of undergraduate STEM degrees. It also boasts nationally ranked master's and doctorate materials science and engineering programs that emphasize composite materials.
- Kettering University is among the top five colleges for auto industry job prep.
- University of Michigan's undergraduate aerospace, civil engineering, materials science, and mechanical engineering programs are all ranked in the top 10 nationally by *U.S. News & World Report*.
- Michigan State University has seven ranked engineering graduate programs.

Strong composite materials foundations

Michigan's carbon fiber manufacturing ecosystem goes beyond manufacturing and talent. It includes a strong underlying support network of university, public/private and government-funded programs that concentrate on composite materials.

- **Institute for Advanced Composites Manufacturing Innovation** (IACMI) is working with industry to reduce technical risk and develop a robust supply chain for advanced composite materials in automotive applications, wind turbines and compressed gas storage. energy.gov/eere/amo/institute-advanced-composites-manufacturing-innovation
- **American Lightweight Materials Manufacturing Innovation Institute** (ALMMII) is a public/private partnership that supports innovative technologies for cost-effective lightweighting of components for the transportation

industries. It is partnering with Oak Ridge National Laboratory's Carbon Fiber Technology Facility to focus on advanced composite material processing and component development for the automotive industry.

lift.technology/about/fact-sheet

- **Lightweight Innovations for Tomorrow** (LIFT) is ALMMII's industry-led, government-funded consortium that is facilitating technology transfer into supply chain companies and empowering the lightweight metals workforce. lift.technology/about/fact-sheet
- **Lawrence Technological University's Center for Innovative Materials Research** (CIMR) is best known for developing new applications for carbon fiber in bridge construction. Many other advanced materials have also been developed and/or tested for applications in the military as well as in business and industry. ltu.edu/cimr
- **Michigan State University's Composite Materials & Structures Center** is one of the foremost facilities for the study of polymer composites and is internationally recognized for its contributions to composite science and engineering. egr.msu.edu/cmssc

And now the rest of the story

Michigan is writing a new chapter in its economic history, offering unparalleled start-up and expansion opportunities:

- Michigan GDP growth outpaced the nation 2009–2015, with growth of 14.4 percent compared to 11.9 percent
- No. 6 nationally for most private job creation since 2011
- Ranked among the top seven states for major new corporate facilities and expansions
- Ranked a top-10 pro-business state for 2015 by Pollina Corporation/AEDI
- Flat rate 6 percent corporate income tax among lowest in the nation
- Reform of the manufacturing personal property tax is estimated to cut \$372 million in taxes by 2020
- Michigan is a right-to-work state

More information

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