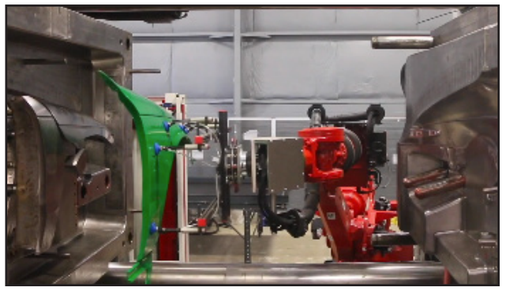

Ohio's Milacron creates first Injection molding of textile carbon fiber and PA66

Ohio company, Milacron, participated in the IACMI project to create the first-ever successfully compounded and injection molded full-size automotive component with TechmerPM PA66 and low-cost carbon fiber made from textile-grade PAN precursor developed at Oak Ridge National Laboratory (ORNL). The project utilizes Milacron's 3,000-ton injection molding press at the IACMI Scale-Up Research Facility (SURF).

The injection molded textile carbon fiber has an estimated 40 – 50% reduced cost from its commercial counterpart. While traditional carbon fiber composites have long been touted for their weight savings in stiffness-critical automotive applications including automotive bodies, b-pillars, and other structural components, the implementation of textile carbon fiber makes these applications more cost-competitive with traditional, heavier materials. Textile carbon fiber has potential for significant impact in the automotive industry because of the reduced cost for supporting weight savings opportunities.

Showcasing Ohio technology impact at the 2019 North American International Auto Show

IACMI showcased the textile carbon fiber at the first Composites Pavilion at the 2019 North American International Auto Show, hosted by JEC Group. Through their IACMI partnerships, JEC, ACMA, and CompositesWorld contributed to the JEC Composites Pavilion at the 2019 North American International Auto Show (NAIAS) to provide additional composites-related media and visitors to the pavilion.

IACMI – The Composites Institute
www.iacmi.org
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Knoxville, TN 27932

University, State, Regional, National Laboratory, & Association Partners

The Institute for Advanced Composites Manufacturing Innovation (IACMI), managed by the Collaborative Composite Solutions Corporation (CCS). CCS is a not-for-profit organization established by the University of Tennessee Research Foundation. As a Manufacturing USA institute, IACMI is supported the U.S. Department of Energy's Advanced Manufacturing Office in the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE).

IACMI – The Composites Institute®

Institute Outcomes in Ohio

March 2020

Ohio: Strengthening U.S. Manufacturing

Ohio is home to more than 20 IACMI members, representing small and medium organizations as well as large companies and members from industry. Ohio members operate in a variety of industries, including the automotive sector, composite manufacturing processes, and the aerospace industry. Ohio has more than 14,000 manufacturing business, and the Ohio manufacturing industry employs more than 600,000 workers in the state. This employment level makes Ohio not only the third-largest manufacturing workforce in the U.S., but also the #1 supplier state to Airbus and Boeing. Ohio's strong history of manufacturing legacy makes it a critical IACMI partner, and IACMI members' diversity in expertise is cruicial to the impact of the Institute.

**Source: JobsOhio*

About IACMI

IACMI – The Composites Institute is a 160+ member community of industry, academia, and government agencies leading innovation and workforce development initiatives to drive the adoption of advanced composites to grow U.S. manufacturing and support national security. IACMI, a Manufacturing USA institute, is supported by the U.S. Department of Energy's Advanced Manufacturing Office, as well as key state and industry partners.

Advanced composites provide strength and stiffness while being very lightweight. These characteristics provide advantages in many transportation, energy, and inrastructure applications. Greater deployment of advanced composites can offer benefits, such as providing safer, more energy-efficient vehicles. IACMI is working to drive the large-scale adoption of advanced composites in diverse markets.

IACMI – The Composites Institute creates an **ecosystem of innovation** to drive **commercial outcomes** that lead to **economic growth**.

Creating an Innovation Network

6 Current IACMI technical projects with innovations created in Ohio

12 Ohio members participating on current IACMI technical projects

Initiating award-winning new recycling technology

CHZ Technologies was awarded the bronze medal from R&D Magazine's 2018 Special Recognition Award for Green Technology. CHZ Technologies implemented this technology on an IACMI composites recycling project with the American Composites Manufacturer's Association (ACMA), Owens Corning, Continential Structural Plastics and Oak Ridge National Laboratory.

"The IACMI consortium has been an effective way for industry, universities, and federal laboratories to collaborate on industrially-relevant technology."
– Joe Fox, Ashland Composites | 2018 Innovation Policy Forum at the National Academy of Sciences

Airbus is participating on two IACMI technology projects, partnering with SMEs such as Hycomp, Zoltek, Harmony Systems, Cincinnati Inc., as well as the University of Dayton Research Institute (UDRI). These projects address critical industry issues such as additive manufactured tooling for large composite aerostructures and injection molding of continuous fiber preforms. Innovations from these projects can lead to manufacturing cost savings in the aerospace industry and beyond.

Establishing an Environment for Innovation

Composites Laboratory at UDRI

The Composites Laboratory at the University of Dayton Research Institute (UDRI) features full-scale manufacturing work cells and small business incubation.

Commercially available products for Ohio companies developed through IACMI collaborations:

Saving cost through rapid curing	**New rapid curing prepreg & sheet molding compound:** New vinyl ester resins: Ashland Arotran™ 901 Ashland Arotran™ 902	Ashland always solving
Creating efficient manufacturing technologies	**Scale-up novel technology:** N12 NanoStitch ®	N12

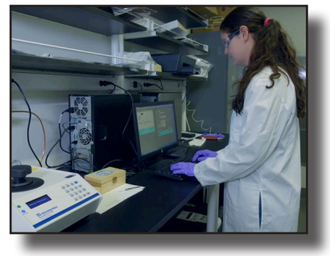
Serving Workforce Needs

270+ Adult composites training participants in Ohio

- **270+** attendees at Composites One hands-on training events at the University of Dayton Research Institute (UDRI) and the Dayton Composites Center
- Annual participation in IACMI Internship Program
- Partnership through UDRI with Midwest SAMPE chapter, engaging industry thought-leaders

"We are so proud to be a part of this important program. Mentoring these talented college professionals through projects that are critical to the success of not just Michelman, but the industry overall, is an opportunity we value."
– Steve Bassetti, Michelman

MICHELMAN



Impacting Economic Development

In Ohio, the IACMI partner network announced:

$5.6M in capital investment* **147** new manufacturing jobs**

In 2017, N12, announced its partnership with the University of Dayton Research Institute (UDRI) to bring high production capacities of NanoStitch® interlaminar reinforcement product. The partnership supports N12 Technologies' high-volume production of NanoStitch using UDRI's carbon nanotube production technology. - CompositesWorld, 2017

IACMI hosted its semi-annual Members Meeting in Dayton, Ohio, in July 2017 bringing more than 300 attendees from more than 100 companies across 30+ states to Dayton, OH. During the meeting, IACMI members toured UDRI's newly renovated composites laboratory, and heard from speakers, including Senator Bill Beagle, who highlighted Ohio's thought leadership and innovations in the composites field.

GLOBE

In 2018, Globe Machine Manufacturing Company announced the establishment of the UDRI-Globe Composites Technology Center (CTC) in Dayton, OH. The CTC will leverage the IACMI network and UDRI technology capabilities to support applications development projects across mutiple markets.
- Globe Machine, 2018

Orbital ATK NORTHROP GRUMMAN

Orbital ATK announced the plans for an addition of 57 new jobs in Ohio with $3.5M in new payroll by 2019.
- Dayton Business Journal, 2017
Northrop Grumman acquired Orbital in 2018

* Source: Composites Advantage move featured in Dayton Business Journal, May 2017, https://www.compositeadvantage.com/newsblog/composite-advantage-move-featured-in-dayton-business-journal

** Source: Expanding Company adding 57 jobs, Dayton Business Journal, June 2017, http://www.bizjournals.com/dayton/news/2017/06/16/expanding-company-adding-57-jobs-gets-greene.html