Introducing the Composites Manufacturing and Simulation Center at Purdue University

8/4/2025

We advance composites manufacturing, simulation, and characterization for industry and government partners through research and engineering

We are experts in composites manufacturing, simulation, and characterization.

We advance composites manufacturing science and simulation technology
- To enrich simulation-based design and manufacturing decisions
- For industry and government partners
- Through research and engineering.

We offer world-class expertise through faculty, professional engineering staff, and researchers

R. Byron Pipes
Executive Director, CMSC

Johnathan Goodsell
Deputy Director, CMSC

Eduardo Barocio
Director, LSAM Laboratory and CAMS Consortium

Ilias Bilionis
Professor, Mechanical Engineering

Andreas Jung
Associate Professor of Physics and Astronomy

Garam Kim
Assistant Director of Manufacturing Co-Director, Raisbeck Advanced Composites Engineering Lab

Kawai Kwok
Director, Space Structures Lab

Ronald Sterkenburg
Co-Director, Raisbeck Advanced Composites Engineering Lab

Wenbin Yu
Director, Composites Design and Manufacturing HUB

Dianyun Zhang
Director, Advanced Fiber Placement and RTM Lab

Ben Denos
CMSC Lead Research Engineer, Director, Precision Structures

FNU Archie
CMSC Manufacturing and Testing Engineer

Justin Hicks
CMSC Lead Composites Engineer, Director, Stamp Forming

Laura Holladay
CMSC Operations Manager

Jordan Kalman
CMSC Composites Additive Manufacturing Engineer

Sushrut Karmarkar
Associate Research Engineer

Vito Mazzarino
Lab Operations Specialist

Akshay Jacob Thomas
Post-Doctoral Researcher

We provide technology solutions across the research, development, and engineering spectrum to our partners

Research, Development, Engineering Spectrum

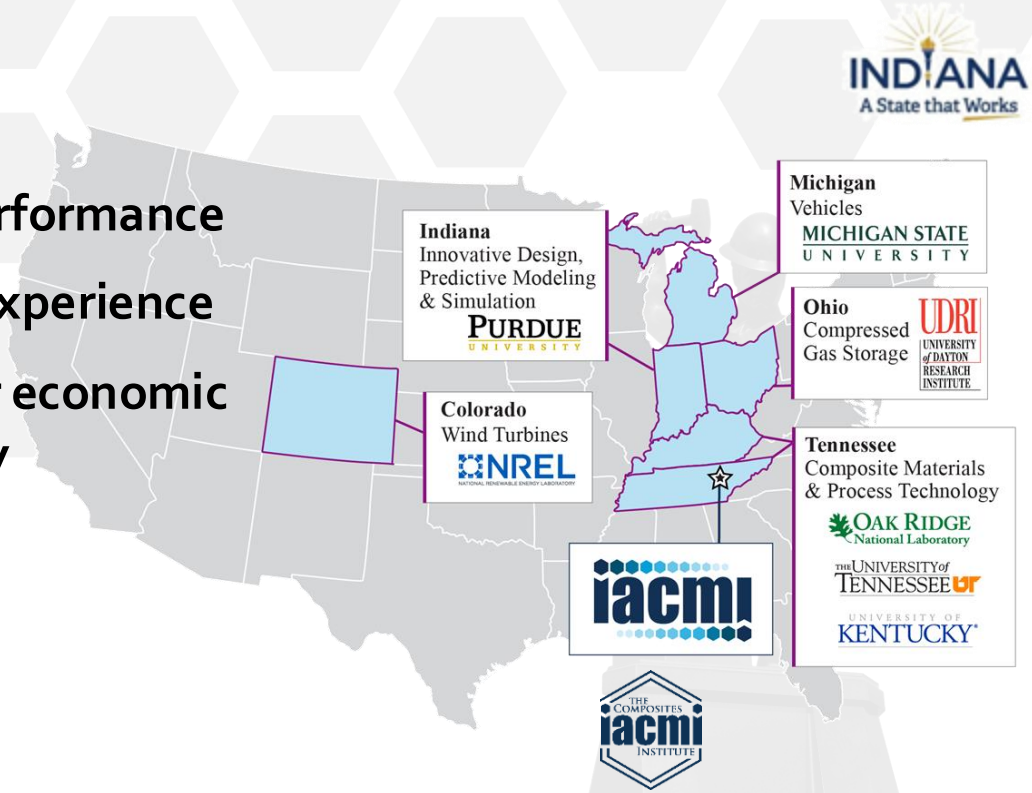
R&D	Design & Analysis	Production Engineering	Product development & prototyping

Technology Focus Areas

- Resin Transfer Molding
- Advanced Fiber Placement
- Stamp Forming
- Compression Molding
- Additive Manufacturing
- Layups & Tooling
- Platelet Molding
- In-Space Manufacturing

We serve as the cross-cutting Design, Modeling, and Simulation Technology Area for the national Composites Institute, IACMI

- Partnerships for prosperity
- Manufacturing-informed performance
- High-rate & thermoplastic experience
- Modeling and simulation for economic prosperity and sustainability



We host world-class research facilities for composites manufacturing, characterization and experimental validation

Manufacturing

- Thermwood LSAM 105 Additive Manufacturing
- TP Sheet Forming
- Compression Molding
- AFP
- RTM, Autoclave, Machining

DASSAULT SYSTEMES The 3DEXPERIENCE Company

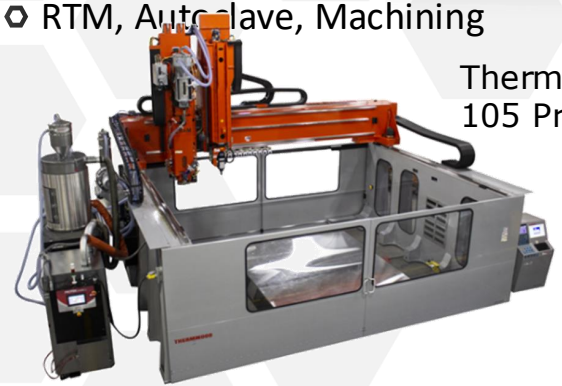
PURDUE UNIVERSITY

BOEING

CMSC Composites Manufacturing & Simulation Center

Characterization

- Test frames, fixtures, Thermal chamber
- DMA, DSC, TGA Rheometer
- Microscopy, CT Scan



Thermwood LSAM 105 Printer

Thermoplastic Sheet Forming

We partner with Dassault Systemes to enrich and offer world-class modeling and simulation tools for research and engineering

Integrated Composites Workflow Applications

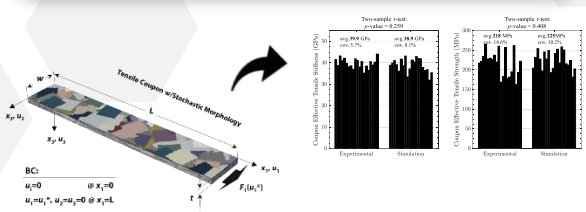
Combine multiple models and simulations to provide end-to-end virtual process twins

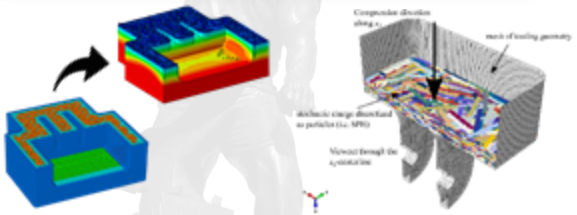
Composites Simulation Validation

Connect virtual twins to reality through characterization, rapid prototyping, and validation

New Composites Simulation Methods

Drive the development of robust and transformative predictive methods





Simulation for Manufacturing Informed Design

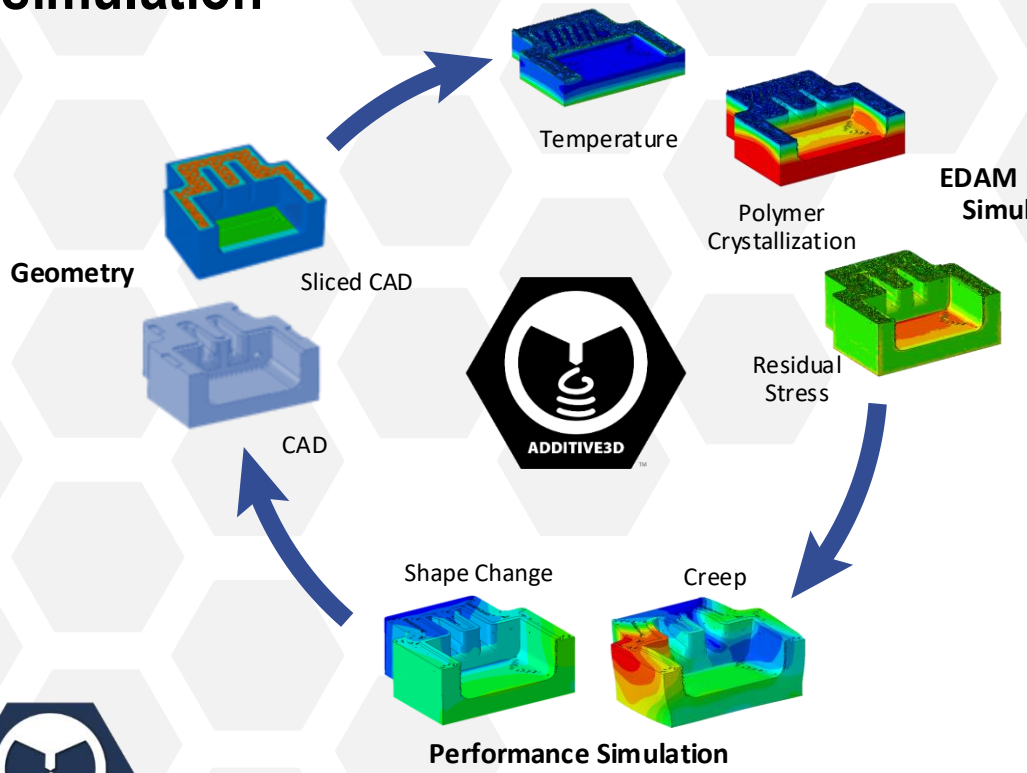
Simulation Driven Certification

Simulation as the Language of Innovation

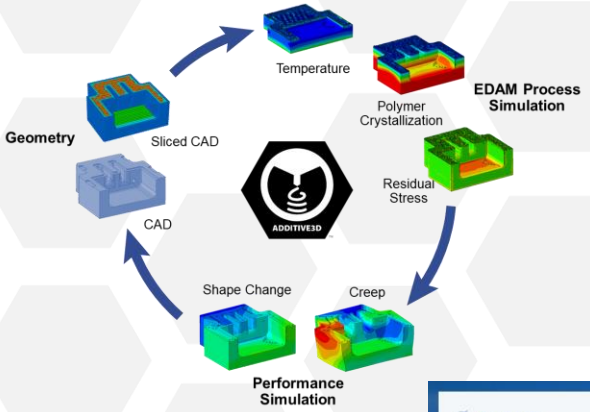
Empowering a manufacturing-informed design experience for composites connected across the supply chain

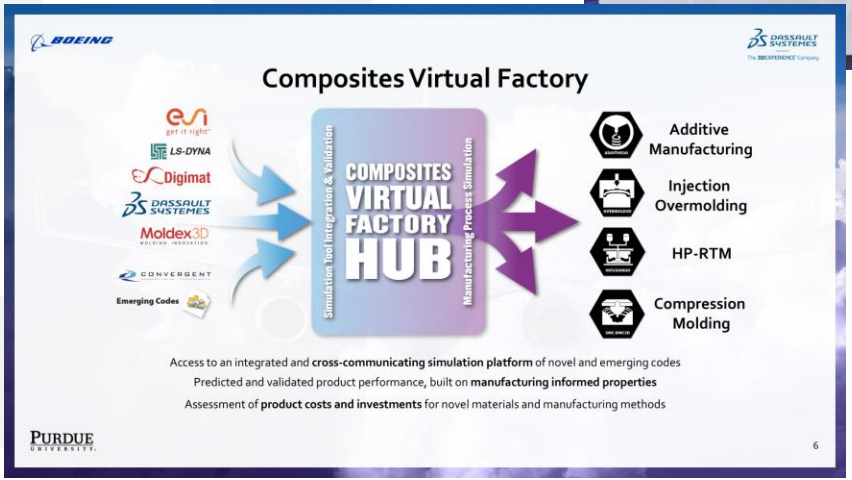
We serve industries such as aerospace, automotive, wind, and advanced air mobility

We develop solutions like ADDITIVE3D to solve large-scale manufacturing challenges through physics-based modeling & simulation

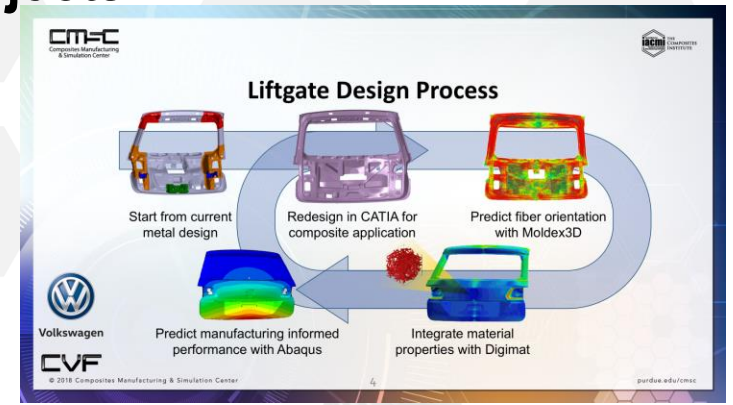


In IACMI 1.0 we developed virtual twins and the cvfHUB platform, and provided key simulation-driven insights on technical projects





In IACMI 1.0 we provided depth and breadth in simulation expertise across key industry projects



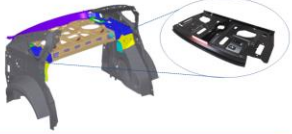
CFRP Automotive Package Shelf for the Mainstream Market

Project overview

150 Jahre

BASF We create chemistry

OEM/Tier: Dura Automotive Systems
Part: Automotive rear Package Shelf, D-segment
SOP: 6/2020
Parts/volumes: 372000 units/annually
Customer contact: Jim Norman (DURA)
BASF project leader: Mohamed Bouguettaya
Key account manager: Brian Shaner (N-PMN)



Project type: Serial lightweight project
Project Duration: 3-4 years
Current phase: Kick-off expected on Q4 2016
Timing / Milestones:

- Project approval expected Q4 2016
- Layup technology identified / machine installed at the IACMI facility Q3 – 2017
- 1st stage tooling approved and running Q2 2018
- 2nd Stage tooling approved and running Q2 2019

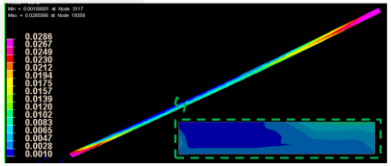
Estimated budget: Industry cost share (BASF+DURA) total : $2M ($803K in cash)
Probability of Success (POS): medium (commercial)

Status: Budget and white paper being Finalized.
Next steps: White paper submitted - End of Q3 2016
Challenges:

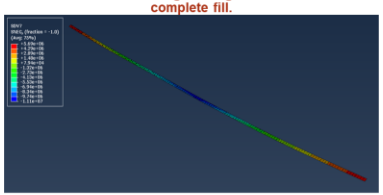
- Completing high speed automation of layup, consolidation, and forming of Ultratape.
- Trimming final component.
- Developing PFMEA and inspection techniques.
- Validation in vehicle

04.02.2016 INTERNAL 1

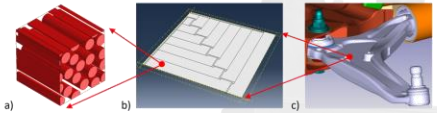
Fiber Buckling in Wind Blade Spar Cap Manufacturing



PAM-RTM model showing the degree of cure at time of complete fill.



Abaqus model showing compressive stress in the middle of the spar cap which can lead to buckling.

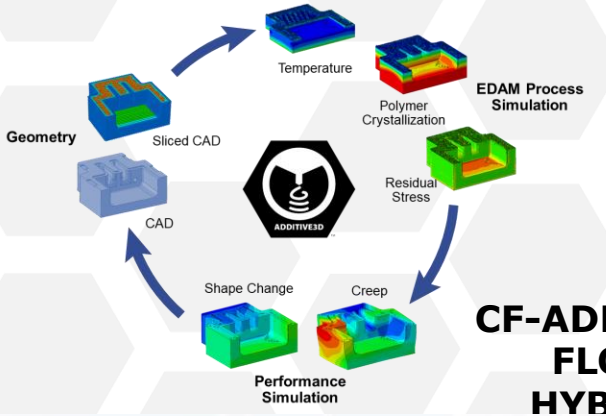


Multiple structural scales of the composite – a) microscale of the fiber and matrix, b) mesoscale of the fabric, c) macroscale of a part

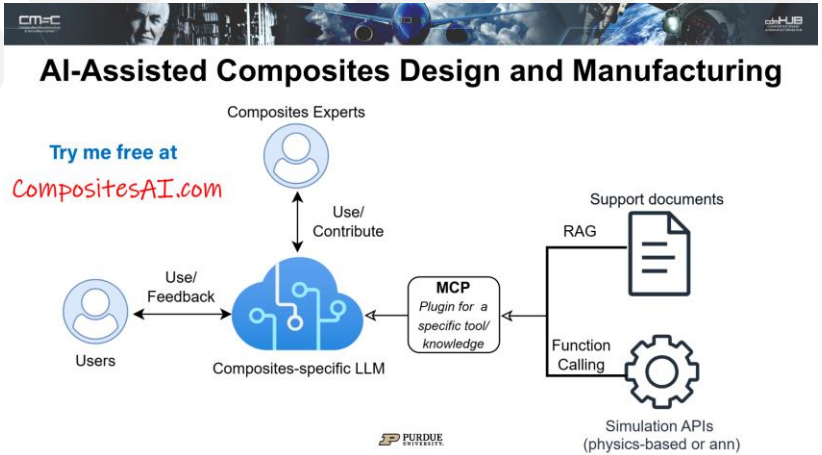
DUPONT

FIBRTEC composite materials made simple for advanced applications

In IACMI 2.0, we will develop virtual twins, provide access to LCA, and provide CompositesAI to the composites supply chain



CF-ADDITIVE3D
FLOW3D
HYBRID3D

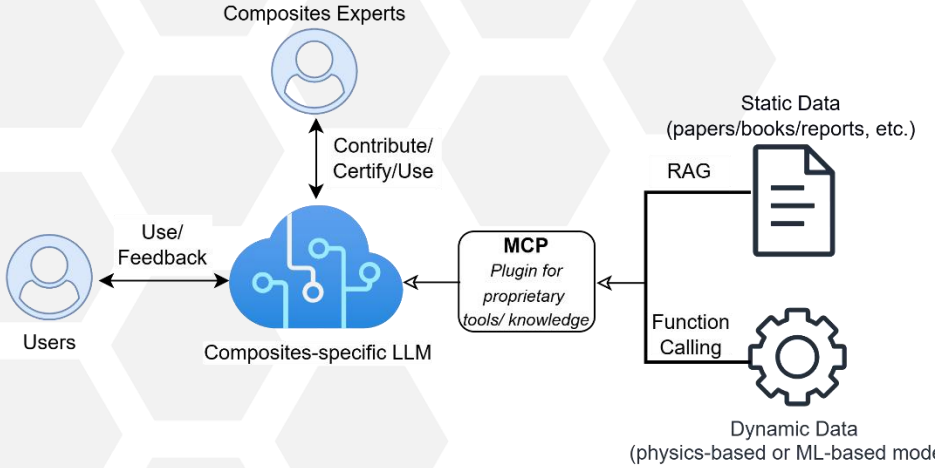


Imagine with us a more intelligent approach to Composites Engineering

Come discuss further with us at Roundtable 7

CompositesAI™

— An AI-Powered Composites Expert System



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