The University of Maine’s Advanced Structures and Composites Center’s award winning research staff help clients create innovations from concept through design, modeling, prototyping, testing, and code reports. The 100,000 ft², $110 million, ISO 17025-accredited laboratory employs over 180 people with expertise in multi-scale materials and structures design and evaluation, composite materials analysis and manufacturing, finite element analysis and multiphysics modeling techniques. We have a successful history of partnering with industry and government, with over 500 product development and testing projects completed to date.

**OUR MISSION:**
The University of Maine’s Advanced Structures and Composites Center, founded in 1996, is a world leader providing research, education, and economic development encompassing the material science, manufacturing and engineering of composites and structures.

**DESIGN AND SIMULATION CAPABILITIES**
- Finite element analysis in ANSYS or ABAQUS
- Nonlinear material modeling including impact and fatigue
- Multiphysics simulation in LS-DYNA
- Creation of application-specific analysis software
- Finite-element software development
- Fluid-structure analysis in WAMIT or ANSYS Aqwa
- Coupled floating wind turbine analysis in FAST

**MANUFACTURING CAPABILITIES**
- Thermoplastic vacuum consolidation
- Vacuum assisted resin transfer molding
- Wood-plastic extrusion
- Filament winding
- Compression molding
- Property enhancement using nanomaterials
- Low-logistics concrete formwork
- Hybrid concrete/composite structures

**STRUCTURAL TESTING CAPABILITIES**
- Total reaction floor space 845 m²
- Test structures up to 70 m long
- Reaction wall static capacity > 30,000 kN·m
- Reaction wall fatigue capacity > 20,000 kN·m
- Large and small scale fatigue testing
- Offshore model testing
- 10 servohydraulic actuators ranging from 100 to 1,300 kN
- Six winch frames with 130 kN static capacity
- Two MTS inertial resonance excitation systems
- Complete fixturing and instrumentation services
- Extensive digital image correlation capabilities

For more information, contact:
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The UMaine Composites Center is an ISO 17025 accredited testing laboratory with nearly 20 years of testing experience meeting industry standards from coupon-scale to full-scale. We have a successful history of partnering with industry and government, with over 500 product development and testing projects completed to date. Our facility includes fully equipped, integrated laboratories to develop and test durable, lightweight, corrosion-resistant material solutions for a wide variety of industries including, among many, offshore wind energy, civil infrastructure, and electrical utilities.

**IEC 61400-23 WIND BLADE TESTING**
- Static proof loads to > 30,000 kN·m
- Fatigue loads to > 20,000 kN·m
- Natural frequency and damping measurements
- Blade rotation system with > 150 kN·m brake system
- Digital image correlation to characterize surface buckling
- Rolling ultrasonic probe to inspect adhesive joints
- Root stud pull-out testing

**STRUCTURAL TESTING EQUIPMENT**
- 845 m² available reaction floor space
- Servohydraulic static and dynamic tests
  - MTS and Instron systems
- Structural test frames (vertical reaction)
  - 3 x 1300 kN capacity
  - 1 x 450 kN capacity
  - 1 x 220 kN capacity
- Structural test walls
  - 1 x 3200 kN·m capacity
  - 1 x >30,000 kN·m capacity
- Winch frames
  - 6 x 130 kN capacity
- Servohydraulic actuators
  - 2 x 1300 kN (2000 kN in compression)
  - 3 x 450 kN
  - 3 x 250 kN
  - 2 x 100 kN, 1 high-speed (1.2 m/s)
- Hydraulic power stations
  - 280 kW in Offshore Wind Laboratory
  - 170 kW in Structural Testing Laboratory

**NONCONTACT DISPLACEMENTS AND STRAINS**
- GOM ARAMIS optical 3D deformation analysis
- Displacement resolution 0.1 mm over large surfaces
- Strain distributions around joints
- 4 sets of cameras
MATERIAL COUPON TESTING EQUIPMENT
Servohydraulic tension-compression test frames
• 1 x 500 kN capacity
• 3 x 100 kN capacity
• 1 x 20 kN capacity
Servohydraulic axial / torsional test frames
• 1 x 100 kN / 1100 N·m capacity
• 1 x 25 kN / 100 N·m capacity
Drop weight impact testing machine, 1.5-1250 J

NON-DESTRUCTIVE TESTING
• Phased-array ultrasonic inspection
• Acoustic emission testing
• Embedded fiber optic strain sensing

MICROSCOPY
• Optical microscopy
• Scanning electron microscopy (SEM)
• Environmental SEM
• Transmission electron microscopy
• Atomic force microscopy (AFM)
• Microtomography
• Laser scanning confocal microscopy

MATERIAL AND SUBSTRUCTURE TESTING
• Plastic, adhesive, composite, and fabric property testing
• Multiaxial strength and stiffness
• Application-specific fatigue, creep and impact testing
• Multi-scale tests from constituents to structures

ENVIRONMENTAL TEST CHAMBER
300 m³ chamber (6.8 m x 6.8 m x 6.1 m high)
Door opening 4.3 m x 4.25 m high
Temperature range -40 to +50°C
• Uniformity ±3.0°C, constancy ±0.2°C
Relative humidity range 20 to 95%
• Uniformity ±5%, constancy ±2.5%
Ramp rate in thermal cycling ±10°C per hour
Capability to conduct fatigue tests within chamber
DAGHER CHOSEN AS 2015 WHITE HOUSE TRANSPORTATION CHAMPION OF CHANGE

On October 13, 2015, Dr. Habib Dagher, founding Director of the University of Maine’s Advanced Structures and Composites Center, was recognized as a “2015 White House Transportation Champion of Change.” Dr. Dagher is the primary inventor of the award-winning composite arch bridge system.

“Dr. Dagher has long been an innovative force in Maine, and we are delighted that his work is being recognized so prominently by the White House,” said Senators Collins and King in a joint statement. “The University of Maine continues to prove that it is a first-class research institution, and Dr. Dagher and his team at the Composites Center are exemplary of that excellence.”

HAROLD ALFOND W² OCEAN ENGINEERING LAB DEDICATED ON NOVEMBER 23, 2015

The Harold Alfond Foundation awarded a $3.9 million grant to match $9.98 million already raised, formally establishing the Harold Alfond W² Ocean Engineering Laboratory and Advanced Manufacturing Laboratory.

The Alfond W² Ocean Engineering Lab is a unique facility equipped with a high-performance rotating wind machine over a multidirectional wave basin. The facility will accurately simulate towing tests, variable water depths, and scaled wind and wave conditions that represent some of the worst storms possible anywhere on Earth.

This world-class ocean engineering facility will assist businesses in developing products for the marine economy while offering hands-on training for students. These products include improved boat and ship hulls; ocean energy devices such as wind, wave and tidal energy; aquaculture technology; oil and gas structures; waterfront infrastructure such as bridges, piers, docks and port facilities; as well as systems to protect coastal cities from effects of erosion and extreme storms.

CONSORTIUM FOR MANUFACTURING INNOVATION IN STRUCTURAL THERMOPLASTICS (CMIST)

In May 2015, UMaine was awarded nearly $500,000 by the National Institute of Standards and Technology (NIST) to map technical manufacturing challenges in structural thermoplastic materials.

Through this award, UMaine Composites Center has formed CMIST with partners U.S. Army Corps of Engineers Engineer Research and Development Center (ERDC), Celanese Corporation, Eastman Chemical Company, Polystrand, Royal TenCate, and others.

CMIST aims to address the following technical challenges in structural thermoplastic composite materials:

• Realizing faster manufacturing cycle times.
• Developing reliable and fast thermoplastic joining methods.
• Transforming manufacturing methods to substitute high volatile organic compound thermosets with thermoplastics.
• Characterizing thermoplastic composites for desired performance and economical manufacturing including recycling methods.