The MPAD center at the University of Alabama at Birmingham (UAB) is a comprehensive R&D and technology center that specializes in advanced FRP and composites-

- Material development
- Testing and Evaluation
- Design and Finite Element Analysis
- Processing and Tooling
- Prototyping and Applications Development
- Modeling and simulation

*This handout summarizes the capabilities for mechanical, physical and thermal testing*
The UAB School of Engineering is a leader in engineering education in the southeastern US.

UAB has a significant effort in composites materials research and application development (R&D) within its Materials Processing and Application Development (MPAD) center, a 20,000 sq.ft facility dedicated to advanced composites and metal castings research and applications development.

R&D efforts with emphasis in the areas of advanced materials focusing on lightweight composites and applications development.

Strong ongoing multi-institutional collaborations including universities, national laboratories, non-profit organizations and small businesses.

The MPAD researchers have transitioned and commercialized R&D efforts into commercial products for the defense, energy industry, transportation & aviation.

The testing capabilities of MPAD are highlighted in this document.
SATEC TC-55 HYDRAULIC TESTING FRAME

- Capacity: 50,000 lbs-force
- Stroke: 18 inches
- ASTM test methods for Flexure, Tension, Compression, Shear, and Static Indentation
  - ASTM D790
  - ASTM D6272
  - ASTM D2344
  - ASTM D7137
  - ASTM D6671
  - ASTM D6641
  - ASTM D3039
  - ASTM D638
  - ASTM D5766
  - ASTM D3410
  - ASTM D695
  - ASTM D7291
  - ASTM D2412
MTS HYDRAULIC TESTING FRAME

- Capacity: 50,000 lbs-force
- Cylindrical Stroke: 18 inches
- Hydraulic grips
- ASTM test methods for Flexure, Tension, Compression, Shear, and Static Indentation
  - ASTM D790
  - ASTM D6272
  - ASTM D2344
  - ASTM D7137
  - ASTM D6671
  - ASTM D6641
  - ASTM D3039
  - ASTM D638
  - ASTM D5766
  - ASTM D3410
  - ASTM D695
  - ASTM D7291
  - ASTM D2412

Materials Processing and Applications Development (MPAD) Center
HIGH SPEED TILE SAW

- Ability to cut regular fiber reinforced composites with accurate dimension control
- Ability to cut ceramic tiles
- Water cooling to prevent overheat on specimens
ROUTER FOR DOG BONED ASTM D 638 TENSILE SPECIMENS

- Accurate dimension control
TENSILE TESTING

- ASTM D5766 - Standard Test Method for Open-Hole Tensile Strength of Polymer Matrix Composite Laminates
COMPRESSION AFTER IMPACT (CAI) FIXTURE

- Residual Compressive Strength and Modulus
- Compressive Failure Modes
• Material study for ballistic damage mechanisms
• Different punch size and shape choice
SQUEEZE FLOW TESTING FIXTURE

- Viscosity vs. time and viscosity vs. temperature for fiber reinforced composites
- Material study for compression molding process
- Heating capacity: 450°F

Before

After

Materials Processing and Applications Development (MPAD) Center
MIXED MODE I-MODE II
FRACTURE TOUGHNESS TESTING FIXTURE

- Fracture toughness for laminated composites
SPLIT DISK TESTING FIXTURE

- Apparent hoop tensile strength
LOW VELOCITY IMPACT (LVI) OR DROP TOWER TESTING FIXTURE

- Impact resistance study
- Impact failure modes
FLEXURAL TESTING


- ASTM D6272 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials by Four-Point Bending

- ASTM D2344 - Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
COMBINED LOADING COMPRESSION TESTING FIXTURE

- Compressive strength
TABER ABRASION TEST

- Ability to test the wear resistance for fiber reinforced composites
- Sample size 3 inches diameter
- Different wear mediums
• ASTM D3410 - Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials with Unsupported Gage Section by Shear Loading
• ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
• ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
• ASTM D 3355 - Fibre Content of Unidirectional Fibre/Polymer Composites (Also see ASTM D3171-76 and ASTM D 3553-76)
• ASTM D 2734 – Standard Test Methods for Void Content of Reinforced Plastics
• ASTM D5528 – Standard Test Method for Mode I Interlaminar Fracture Toughness of Unidirectional Fiber-Reinforced Polymer Matrix Composites
• MIL-HDBK End Notched Flexure test - Mode II fracture toughness
• ASTM D 648 - Deflection Temperature of Plastics under Flexural Load.
• ASTM C297 – Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
CUSTOMIZED TESTING

- Tensile tests with irregular size (up to 18” long sample)
- Tension and flexural fatigue tests
- Tests required with customized fixtures
1. **Thermoset / Thermoplastic** Polymers & Polymer Matrix Composites, Expertise in Thermoset Liquid Molding (*VARTM, RTM*).

2. Expertise in Thermoplastic Processes (*LFT, Thermoforming, Pultrusion, Hot-Melt Impregnation*).


4. Dynamic Response Modeling such as *Ballistic, Crash*, Blast & Low Velocity Impacts (*LS-DYNA*).


