

# FIBER & SPECIALTY TEXTILES RESEARCH (*FASTR*) LAB

## SERVICES & CAPABILITIES

The **FASTR Lab**, located within the University of Maine's Advanced Structures & Composites Center (ASCC), is a premier hub for Fiber and Specialty Textiles Research. We are dedicated to advancing the frontiers of functional fabrics, aligning seamlessly with the national imperative to innovate in advanced manufacturing, bolster national security, and cultivate a highly skilled workforce.

### **FASTR Lab: Core Equipment & Capabilities**

#### **WEAVING**

CCI Evergreen II Dobby Loom: Industrial prototype loom for novel fibers and yarns, including composites with zero-twist insertion. Weaves textured patterns (max 60cm width).

Optima 3D Jacquard Shuttle Loom: Critical for advanced 3D fabric architectures and pre-forms; enables seamless, tubular, and intricate 3D weaving (max 10cm thickness, 24-inch width).

LeClerc Diana Hand Loom: Rapid prototyping loom for novel fibers/yarns; supports 60cm fabric width, computer-controlled with 2 warp beams.

#### **KNITTING**

Stoll 3D Knitting Machine (ADF 530): Flatbed machine for high-performance prototypes and fully-fashioned 3D shapes. Creates diverse knit constructions including seamless, and integrates wires/composites (max 58-inch width).

#### **FIBER CREATION**

Hills Bicomponent Fiber Extruder: Produces custom multi-material fibers with precise control over filament diameter and geometry (0.05-1 kg/h/extruder).

Elmarco Nanospider Electro-Spinner: Creates ultrafine nanofiber mats for specialized membranes, advanced shielding, or integrated sensors in a controlled environment.

Domobio 4A (Melt Electro Writing/Electrospinning): High-precision electrospinning with 4 printheads for intricate 3D microstructures.

#### **COMPOUNDING & EXTRUSION**

Thermo Fisher Process 11 Twin Screw Compounder: Customizes polymer formulations by compounding polymers, additives, and adhesives (20 g/h - 2.5 kg/h throughput).

#### **CONTROLLED ENVIRONMENT & COATING**

Class 1000 Clean Room & Four-Station Thin Film Coating: Controlled environment for sensitive processes. Produces functional, durable, lightweight coatings on wires for energy harvesting and responsive applications.

#### **YARN PROCESSING**

Agteks DirecTwist 2C6: Provides high-speed, precise twisting, cording, and covering for single, multi-yarn, and composite structures.

Creel: Optimizes feeding tensioned yarn spools for 3D weaving (max 2304 spools).

Bobbin Winder: Three-position winder with independent speeds for efficient yarn preparation.

CCI Warping Machine: Prepares warp beams for advanced textile constructions (3.6m length), supporting 24 colors with optional zero-twist feeding.

#### **TESTING & PROPERTY ASSESSMENT**

Mechanical Testing (Instron 68SC-5): Tensile testing for fibers, yarns, and fabrics.

RF & EMI Shielding (Rhode & Schwarz ZNL20 VNA): Evaluates electromagnetic shielding effectiveness.

Solar & Environmental Exposure (Newport Sol3A): Analyzes OPV efficiency under controlled illumination, UV, and thermal exposure.

Surface & Interfacial Properties (Biolin Sigma 700 & Data Physics OCA-25): Measures surface energy for various materials.

Microscopy & Elemental Analysis (Keyence Digital, SEM with EDS, AFM, Optical): Advanced micro/nano visual analysis and elemental composition for material characterization.

Thermal Properties (C-Therm Trident, DSC, TMA, DMA, TGA): Quantifies thermal conductivity and provides comprehensive thermal characterization.

Rheology (Gottfert RG50, DHR, Ares): Essential for understanding material flow behavior to optimize processing.



A full list of FASTR Capabilities  
can be found at [composites.maine.edu](https://composites.maine.edu)



# FASTER, AT YOUR SERVICE

FASTR offers comprehensive, vertically-integrated services spanning the entire textile innovation lifecycle, from raw materials to finished fabrics. We serve as a large-scale digital additive and hybrid manufacturing test bed, providing unparalleled resources to:

**Research & Development:** Conduct cutting-edge research into novel materials, functional fabrics, and smart textiles. This includes pioneering novel material research, developing custom polymer formulations, and exploring AI-powered hybrid manufacturing and digital twin technologies.

**Accelerate Product Development:** De-risk new technologies, accelerate prototyping, and support the maturation of innovations from concept to commercialization.

**Scale Manufacturing:** Facilitate the scaling of manufacturing processes, enabling economical and cleaner production, and de-risking industrial adoption of new technologies.

**Comprehensive Testing:** Provide rigorous material testing and characterization to ensure performance and quality.

**Consulting:** Offer expert consulting services to guide partners through complex textile challenges.

**Sustainable Solutions:** Develop and implement methods for upcycling textile waste, promoting circular economy principles.

**Workforce Development:** Cultivate the next generation of innovators and skilled professionals through hands-on learning and training in advanced manufacturing.

We partner with industries—from startups to established organizations—government agencies, and academic units to enhance U.S. textile manufacturing capabilities and improve global competitiveness. The FASTR Lab, as part of the ASCC, is committed to engineering a sustainable and prosperous world, securing U.S. global competitiveness and well-being across industry, academia, and our nation.



## Advanced Structures & Composites Center



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