ADVANCED COMPOSITES

An exceptional alternative to traditional materials such as wood, ceramic and metal, advanced composite solutions enable designers to:

- **Design lighter weight structural components for increased lifetime performance and improved fuel efficiency**—higher strength-to-weight ratios to exceed the structural performance of traditional materials while significantly reducing weight—up to 75% lighter than steel and up to 25% lighter than aluminum

- **Extend product lifetime to reduce part replacement and decrease warranty expenses**—the corrosion, weather, flame and fatigue resistance of composite solutions improve component durability

- **Reduce product lifecycle costs**—the extended product lifetime, along with the potential for reduced installation time and cost due to the lighter weight of composite solutions, significantly reduces the associated cost over the lifetime of a part

- **Lower energy costs**—by leveraging a higher strength-to-weight ratio, composite solutions allow designers to engineer products that require less energy or power during installation and use

- **Increase competitive advantage**—PolyOne Advanced Composites' solutions can be customized to provide electrical insulation, thermal insulation, radiopacity, low thermal expansion, flexural memory and load damping, while delivering desired performance and aesthetic specifications
PolyOne's reinforced composite technologies use carbon, glass and aramid fibers with custom formulated thermoset or thermoplastic resins in continuous forming processes. These methods include:

**PULTRUSION**
- Fibers are impregnated with liquid thermoset resins, then pulled through a heated die to cure the resin and form the product
- This continuous, automated manufacturing process creates constant cross section profiles of any pre-determined length with consistent, uniform quality and exceptional mechanical performance
- Applications include rods and profiles of various lengths and complexities, such as utility poles, insulator core rods and structural beams

**CONTINUOUS FILAMENT WINDING**
- Combines the principles of filament winding with pultrusion to create constant or tapered cross-sectional tubing in precision sizes
- The unique axial and biaxial fiber orientation provides flexural and tensile strength, as well as crush and burst resistance
- Applications include lightweight shelter frames and sporting goods components

**CONTINUOUS RESIN TRANSFER MOLDING (CRTM™)**
- Engineered core materials are sandwiched between structural composite laminate face sheets
- Continuous composite sandwich panels feature high specific strength and stiffness-to-weight ratio
- Applications include ballistic resistant panels, truck floors and rail car doors

**PULLWINDING**
- Combines the continuous manufacturing benefits of pultrusion with the specific fiber placement of filament winding to create customized tube shapes
- Continuous transverse fibers eliminate seams and overlaps from the final product, and deliver high strength, torsional stiffness and impact resistance
- Applications include lacrosse and hockey sticks, marine mooring whips, and golf club and paddle shafts

**CONTINUOUS FIBER REINFORCED THERMOPLASTICS**
- Fully recyclable tape, X-Ply™ (0°/90°), and other multi-ply configurations with widths up to 10’ wide
- Sandwich panels in unlimited lengths, up to 6” thick and 10’ wide
- 100% recycled thermoplastic composite flake material for pressed sheet and core
- High volume production capacity

**THERMOSET FINISHING OPERATIONS**
- Customized finishing capabilities include machining, water-jet cutting, profiling/shaping, sanding, slitting, laminating, molding and coatings

**TESTING CAPABILITIES**
- Mechanical – Flexural, tensile, compression, shear, fatigue, impact resistance
- Physical – Specific gravity/density, Barcol hardness, water absorption, void content, resin/fiber content, dye penetrant, viscosity
- Thermomechanical – Coefficient of linear thermal expansion, glass transition temperature, deflection temperature, degree of cure, curing properties
- Electrical – High-voltage, low current dry arc resistance of solid electrical insulation, dielectric strength, water diffusion
PolyOne’s Advanced Composite portfolio offers customized solutions to serve a full range of markets and industries, including:

**USES & APPLICATIONS**

**TRANSPORTATION**
Truck floors, liners and aerodynamic components, rail car doors and panels, automotive structural solutions, leaf springs, traffic safety markers and delineators

**BUILDING & CONSTRUCTION**
Structural blast protection, concrete highway dowel rods, architectural columns, concrete & masonry reinforcements, pipe reinforcement

**ENERGY**
Wind turbine blade stiffening components, sucker rods, oil & gas production solutions

**HEALTHCARE**
External orthopedic fixators, endoscopy wands, prosthetics
AEROSPACE
Aerospace components including wing spars, air cargo unit load devices (ULD)

CONSUMER & RECREATION
Archery bow limbs and risers, furniture springs, diving board springs, golf flagpoles, ski poles, sporting stick shafts, paddle shafts, furniture springs, sail battens, lightweight and extendable mast structures

SECURITY & DEFENSE
Ballistic-resistant panels, lightweight shelter frames, portable military structures

ELECTRICAL & TELECOMMUNICATIONS
Utility poles and cross-arms, high voltage transmission & distribution insulator cores, surge arresters, bus bar covers and electrical tool components
ABOUT POLYONE ADVANCED COMPOSITES

PolyOne Advanced Composites consists of Glasforms®, Gordon Composites™ and Polystrand™ branded businesses. With a leading-edge portfolio of high performance alternatives to typical fiber reinforced composites and traditional materials such as wood, ceramic and metal, PolyOne Advanced Composites serves critical performance applications requiring high strength-to-weight ratios, stiffness and dimensional stability. PolyOne designers and engineers formulate and manufacture customized solutions to meet the technical and structural demands of design across a broad range of market applications.