Shaping the World with Composites
The Shape of Imagination

Quantum Composites is a leading innovator and developer of advanced composite materials. For more than 30 years, we’ve been at the forefront of imagination – collaborating with our customers worldwide to deliver highly engineered solutions for structural applications across a wide variety of industry sectors.

Based in Bay City, Michigan, Quantum Composites develops and manufactures high-performance carbon fiber and fiberglass reinforced thermoset resin systems. Our proprietary materials enable production of complex, three-dimensional composites – providing our customers with the tough performance characteristics they need, often at lower cost than parts fabricated with traditional materials.

We combine our materials innovation leadership with total product development support, from concept to commercialization. Our team of engineers and chemists employs their world-class technical expertise and project management capabilities to develop cutting-edge and customized solutions for aerospace, automotive, defense, oil and gas, rail, industrial, marine and more.

Imagine How We Can Help You

Quantum Composites is known in the industry for the high-strength, high-temperature Engineered Structural Composites® (ESC®) we develop for use in demanding structural applications and environments.

Those who know us best – our customers – also describe our Quantum team as responsive, imaginative problem solvers and partners.

Get to know us. We can help create the right solution for you.
Shaping Your Success

Nothing motivates us more than providing solutions that help our customers succeed. From reducing vehicle weight and improving manufacturing efficiency in high-performance automobiles, to improving lift and durability in helicopter operations, to developing lighter, stronger materials that drive golf balls farther and straighter, Quantum Composites collaborates with customers from concept development to testing and validation.

Quantum Advantage: ESC®

Quantum’s high-strength, lightweight Engineered Structural Composites® (ESC®) materials allow designers the freedom to conceive and develop complex, three-dimensional solutions for advanced applications at lower cost compared to parts fabricated with traditional composites or metals.

In addition to design flexibility and cost reduction, our ESC® materials also provide:
- High strength-to-weight ratio
- Noise and vibration reduction
- Dimensional stability and accuracy
- Low- and high-temperature performance
- Corrosion resistance
- Low coefficient of thermal expansion
- Low smoke density/low flame spread intensity

The Quantum Advantage: Innovative Materials Development and Collaborative Design Support

We believe strong innovation starts with strong collaboration. Through our ongoing materials innovation, in-depth design and applications engineering capabilities, and total project management support, we have the experience and expertise to develop new concepts into commercial reality.

Our capabilities include:
- Capacity to develop custom formulations for a wide range of industries, including aerospace, automotive and industrial
- Rapid development and turnaround times
- Sample materials for pilot production
- Composite structural analysis
- Tooling and fixture design
- Part design and optimization
- Process development, including layup development, manufacturing process development and fiber orientation analysis
- Prototype build
- Testing and validation

Our reputation for agility, flexibility and quality sets us apart in the industry. Quantum Composites is AS9100C:2009-01 and ISO9001:2008 certified.

Advantages of ESC® Over Other Materials

Whether your goal involves lightweighting, parts consolidation or improved processing times, our value-added solutions can help minimize costs and maximize efficiency.

<table>
<thead>
<tr>
<th>ESC® vs. Metals</th>
<th>ESC® vs. Prepreg</th>
<th>ESC® vs. Sheet Molding Compounds (SMC)</th>
<th>ESC® vs. GMT/Long Fiber Thermo Plastics</th>
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</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>Lower processing cost/times</td>
<td>Higher strength and stiffness</td>
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</tr>
<tr>
<td>Corrosion resistance</td>
<td>Higher production rates and capacity</td>
<td>Higher weight-to-strength ratio</td>
<td>Impact strength and other mechanical properties maintained over much wider temperature range</td>
</tr>
<tr>
<td>Parts consolidation</td>
<td>Design flexibility for complex 3-D parts</td>
<td>Weight reduction with ESC®-designed parts</td>
<td>Higher weight-to-strength ratio with ESC®-designed parts</td>
</tr>
<tr>
<td>Net shape molding provides design flexibility and enables more complex 3-D parts</td>
<td>Parts with variable cross sections and thickness</td>
<td>Cost advantage/parity if mechanical properties are fully exploited in design</td>
<td>Higher-flame retardancy</td>
</tr>
<tr>
<td>Non-conductive</td>
<td>Parts consolidation</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Lower material cost (typically)</td>
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</table>
Providing Unique Materials Technology and Value-Driven Solutions to a Variety of Industries

Our advanced materials and processes give designers the freedom to develop innovative, high-performance parts solutions for a variety of industry challenges.

Aerospace/Military/Defense

Aerospace
Quantum’s materials solutions have been widely specified and used in commercial, military, general aviation and rotary aircraft applications for more than 20 years. Utilizing complex three-dimensional geometry, our Lytex® composite materials, specially designed for the aerospace industry, provide:

- Net shape compression-molded solutions in secondary and tertiary structures
- Metal substitution, weight reduction, cost reduction and prevention of galvanic corrosion
- Molded solutions that reduce cycle time and costs
- Enhanced temperature, flame, smoke and toxicity performance in aircraft interior applications

Quantum materials have received numerous certifications with leading aircraft manufacturers.

Defense
A full range of Quantum materials have been used in land-, air- and marine-based military applications.

Compression-molded ESC® materials provide the weight-reducing advantages critical in military/defense applications such as munitions containers; rifle parts, including hand guards; and weapons components. Lytex® materials have been applied to parts solutions in military aviation applications such as radomes, ammunition cartridge handling guides and rotary aircraft components.

Transportation/Automotive

High-performance automotive
Quantum Composites carbon fiber and glass fiber materials have been designed into various elite, luxury, high-performance automotive platforms, with additional platforms utilizing our materials being released or in development in Asia, Europe and North America.

Our carbon fiber Advanced Molding Compounds® (AMC®) in net shape compression-molded parts allow vehicle design engineers to capitalize on the value of high stiffness, weight reduction, parts consolidation and cycle time reduction.

... and proven performance for your daily commute
Quantum’s polyester and vinyl ester glass reinforced materials are used in mainstream automotive applications such as heat shields, fuel vapor canister brackets, radiator brackets and sunroof drainage channels.

Weight reduction, parts consolidation and reduced tooling costs are advantages of using composite materials in the automotive market.

Faster than a speeding bullet
Rail applications such as locomotive switchgear with glass reinforced vinyl esters and window surrounds using carbon fiber vinyl ester help lighten the load and improve performance and efficiency in high-speed bullet trains.

Oil & Gas/General Industrial

High-temperature, high-pressure materials solutions for extreme environments
Quantum brings a combination of high-performance ESC® materials design and applications engineering along with custom materials solutions to meet the rigorous demands of the oil and gas industry and its environments.

Our portfolio of high-temperature, high-pressure (HTHP) materials enables compression-molded component part solutions to minimize non-productive plant and equipment time and reduce cost.

Innovative solutions in a variety of industrial applications
ESC® materials provide solutions in a wide variety of general manufacturing, machinery, chemical and process, electrical and construction applications.

Insulating properties, corrosion resistance, weight reduction and lubrication are just a few of the solutions to industrial challenges in the areas of power generation and electrical transmission and distribution; process and chemical; power tool and industrial machinery applications.

A History of Innovation

1983
ESC® plant in Midland, Michigan, opens Lytex® fiberglass molding compound developed

1987
Lytex® epoxy carbon fiber molding compound developed

1988
QC-8800 and QC-8700 fiberglass hybrid polyester and vinyl ester ESC® materials launch

1991
World’s leading commercial aircraft producer qualifies Lytex® 9063 for use in various structures

1996
First polyester 50% fiberglass SMC qualifies for automotive fuel tank and exhaust heat shields

1997
Vinyl ester 12K carbon fiber AMC® material developed

2001
Quantum Composites relocates to a newly built state-of-the-art facility centrally located in Bay City, Michigan
Sporting Goods/Recreational

We’ve got drive
AMC® carbon fiber vinyl ester materials enabled Callaway Golf to create their forged composite drivers. The crowns and soles are produced in high volumes by compression molding, enabling Callaway design freedom and the ability to meet aggressive cost targets.

On the wings of the wind
On the water, our complex three-dimensional geometry compression molding combined with our strong, lightweight AMC® materials provides the ideal solution for wind surfer v-joints joining the mast and boom.

Medical

Lightweight strength, reliable solutions
Our ESC® materials provide value-added solutions for various medical devices and components. The advantages of weight reduction, design freedom, sterilization temperature resistance and diagnostic imaging technology provide cost, time and handling savings for medical equipment and healthcare providers.

Carbon fiber and fiberglass ESC® materials provide critical compression-molded part solutions for prosthetic feet and important translucency structural components for X-ray imaging.

Safety

Protecting those who protect us
The protective components in our ESC® materials help firefighters stay safe on the job. Its resistance to extreme temperatures makes it ideal for use in firefighters’ helmets, casings for personal monitor and alarm systems, and backpacks for breathing air cylinders.

Quantum Composites has been shaping innovation for more than 30 years, tracing its roots to 1983 when it was established as a new venture with the help of grants from the National Aeronautics and Space Administration and the Department of Defense.

2003
Dodge Viper launches – in the world’s first production automotive application to use carbon fiber composites – Quantum’s AMC® 8590 and 8595

2006
World’s leading commercial aircraft producer qualifies Lytex® 4149 carbon fiber / epoxy SMC

2007
Next-generation composite-intense twin-aisle commercial airliner adopts Lytex® material for numerous secondary structures

2010
Lamborghini and Callaway Golf use AMC® carbon fiber materials in forged composite applications

2011
Quantum Composites becomes part of The Composites Group, along with Premix, Inc. and Hadlock Plastics

2012
Developed world’s first BMI sheet molding compound
Power of Three

Quantum Composites is one of three businesses forming The Composites Group, which together combine capabilities to deliver leadership in composites.

- Premix, the largest North American developer, formulator and manufacturer of thermoset compounds and custom-molded components
- Hadlock Plastics, offering multiple molding technologies, precision machining, complete finishing and complex assembly
- Quantum Composites, specializing in the development, formulation and manufacturing of high-performance Engineered Structural Composites (ESC®)

As part of The Composites Group, the advanced materials technology offered by Quantum can be leveraged with the capabilities of Premix and Hadlock Plastics to provide customers a full range of integrated composite solutions. Our services include design engineering, compounding, molding, machining, finishing, coating, assembly and program management of sophisticated thermoset composites.

A Family of Innovative Products

Our diverse family of ESC® materials includes:

**Lytex®** – Chopped fiberglass or carbon fiber in a specially formulated epoxy resin matrix, providing high strength and cost-effective solutions for tough composite design problems. Delivers superior shear strength and thermal stability with higher flexural strength at elevated temperatures.

**AMC®** – Family of materials for structural applications requiring high stiffness and high strength, particularly open- and filled-hole tension and compression. Designed for compression molding of complex geometries where traditional laminated prepreg solutions are not as cost- and weight-effective.

**High Temperature BMI** – Proprietary blends of high-temperature polyimide resins reinforced with carbon or glass fiber. These unique, high-temperature materials provide outstanding mechanical strength and wear resistance up to 600 °F/315 °C.

**Vinyl Ester & Polyester** – Fiberglass-reinforced vinyl ester and polyester composites with unusual toughness and excellent retention of physical properties over a wide range of temperatures.

**Phenolic** – Designed to meet the most demanding technical performance requirements. Outstanding dimensional stability and resistance to creep and static loads at elevated temperatures are combined with the advantages of compression-molded complex three-dimensional geometry in comparatively short cycle times.

ESC® Materials Summary

<table>
<thead>
<tr>
<th>Resin Matrix</th>
<th>Reinforcement</th>
<th>Carbon Fiber (PAN Based)</th>
</tr>
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<tbody>
<tr>
<td>Vinyl Ester &amp; Polyester</td>
<td>QC-7753, QC-7810FR, QC-8560, QC-8700, QC-8705, QC-8777, QC-8800</td>
<td>AMC-8590, AMC-8592, AMC-8593, AMC-8575, AMC-8595</td>
</tr>
<tr>
<td>Lytex®</td>
<td>9063</td>
<td>4149, 4197, 4181</td>
</tr>
<tr>
<td>Phenolic</td>
<td>QC-2150, QC-2150LD</td>
<td>AMC-2593</td>
</tr>
<tr>
<td>BMI (Bismaleimide)</td>
<td>HTC-9510</td>
<td>HTC-9593</td>
</tr>
</tbody>
</table>

Specific Tensile Strength and Modulus of Elasticity
We Thrive on Tough Challenges. What’s Yours?

Centrally located in North America, our proximity to MBS International Airport allows us to be accessible from all major geographic points.

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