



INNOVATIVE THINKING, RELIABLE PERFORMANCE.

Aerospace & Defense

Chemical Processing

Industrial Operations

Life Sciences

Oil & Gas

Power Generation

Semiconductor

Who We Are, What We Do.

Greene Tweed is an industry leader in the design and manufacture of high-performance materials and custom-engineered solutions for the aerospace & defense, chemical processing, industrial operations, life sciences, oil & gas, power generation, and semiconductor industries.

Our solutions advance our customers' technological capabilities. Today, our thermoplastic composites help the aerospace industry meet global emissions targets by developing lighter aircraft. Our plasma-resistant sealing systems enable semiconductor fabs to be more productive during chemical processes to manufacture smaller chips. The oil & gas industry is challenged to expand into extreme environments, and our solutions enable them to do so with greater efficiency, prevention of hazardous leakage, and the maintenance of high safety standards.

From engineering to manufacturing, Greene Tweed uses the latest technologies to assess challenges, recommend solutions, and bring them into reality.



OUR SOLUTIONS ADVANCE OUR CUSTOMERS'
TECHNOLOGICAL CAPABILITIES.

Markets We Serve



Aerospace and Defense

Greene Tweed entered the aerospace and defense industry over 50 years ago with sealing systems for landing gears. Today our seals, including the G-T® seal, are relied upon for safe operations on more than 80 percent of aircraft. Our Xycomp® DLF™ composites deliver dramatic weight savings, leading to more fuel-efficient aircraft and reduced emissions.

Chemical Processing

Greene Tweed has been pushing the limits of materials science for decades to develop high-performance solutions for the chemical and petrochemical processing industries. Chemraz® perfluoroelastomers lead the way for critical sealing applications, while our Xycomp® pump shells eliminate emissions and optimize efficiency in magnetic drive pumps. Our Arlon® 4020 labyrinth seals have increased compressor efficiency by 1%.

Greene Tweed has been pushing the boundaries of materials science for decades to develop high-performance solutions.

Industrial Operations

From heavy equipment in construction and mining operations to cargo ships and railcars transporting the world's harshest chemicals, Greene Tweed's sealing systems optimize reliability, minimize emissions, and provide the ultimate in safety. Chemraz® perfluoroelastomers and Arlon® and Avalon® thermoplastics are extensively used in high-performance valves and hydraulic cylinders to improve equipment safety.

Life Sciences

For more than 30 years, customers have depended on our seals to protect against contamination, product leakage, waste, and to ensure plant safety in the Medical Devices, Food & Beverage, Personal Care, and Analytical Equipment markets. Our portfolio includes materials certified with the U.S. Food & Drug Administration (FDA) for continuous contact with food and drug products. Surgeons use our radiolucent Orthtek® composites in pin/nail guides and fixation tools to confirm alignment when working through orthopedic trauma.

Power Generation

For over 20 years, Greene Tweed has been providing reliable, abrasion-resistant AR® bearings for a variety of pump applications, including circulating water pumps, condensate pumps, heater drain pumps, and boiler feed water pumps at power generation facilities. The use of AR® bearings in pumps at nuclear generation or combined cycle plants have increased the mean time between repairs (MTBR) by >3X, leading to significant savings in annual maintenance costs.



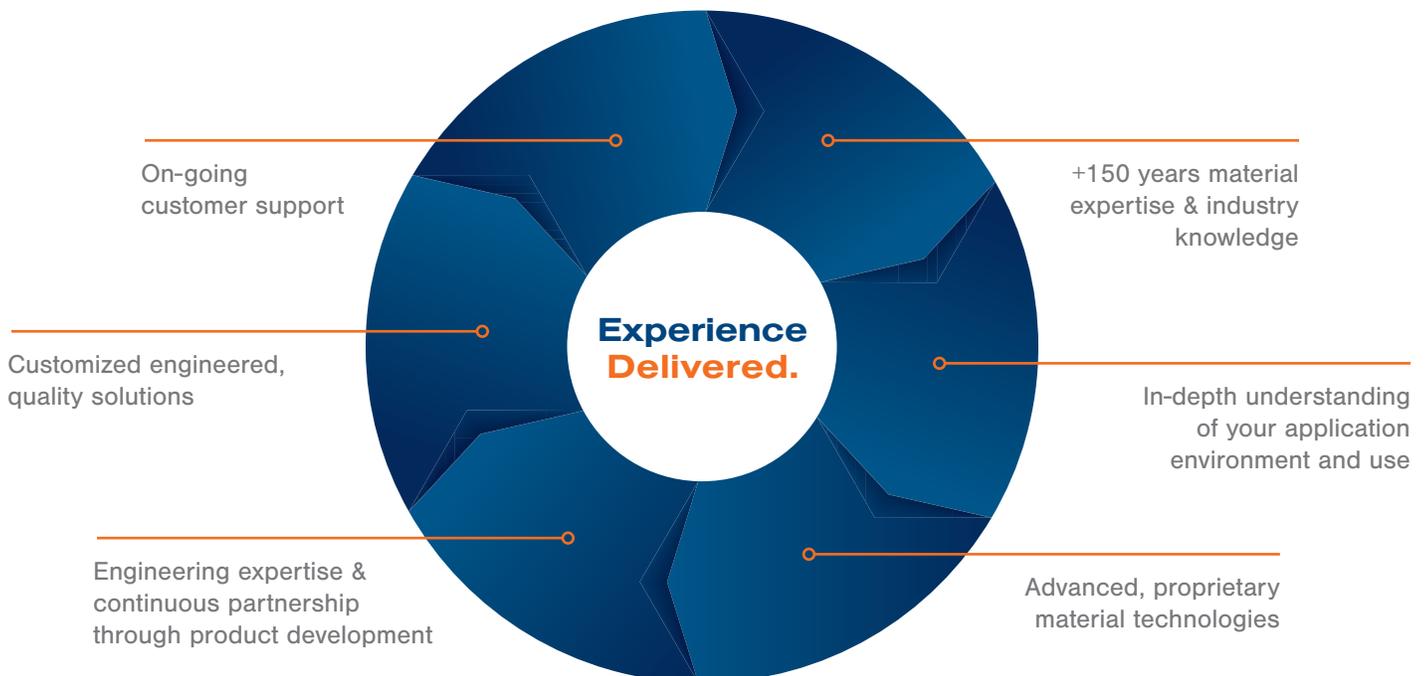
Oil & Gas

Greene Tweed collaborates with customers to mitigate risk and operate safely with innovative materials and design. From the HPHT (high-pressure, high-temperature) conditions of the deepest offshore wells to refineries, our products are specified into drilling and completion tools, pumps, valves, compressors, and mechanical seals.

Our AR® and WR® composites increase pump reliability and efficiency, while Seal-Connect® electrical connectors safeguard communications. Our Chemraz® and Arlon® materials provide reliable sealing performance at high pressures and temperatures and resistance to aggressive media.

Semiconductor

Seals manufactured from our Chemraz® materials portfolio are designed to resist a variety of harsh plasmas and extreme temperatures, reduce particulates and ensure cleanliness. In addition, our range of integrated solutions leverage bonding, encapsulation, and coating capabilities to provide an optimum mix of properties in a single part. With each solution we enable our customers to advance their technological capabilities so that together we can contribute to the next generation of technology.



Greene Tweed Materials and Products



Elastomers

Chemraz® – This high-performance perfluoroelastomer is used in o-rings and other sealing elements. It is characterized as having the highest chemical compatibility and highest temperature resistance of all elastomers up to 615°F/324°C.

EPDM – Ethylene propylene diene monomer is used in o-rings and other sealing elements that require outstanding resistance to hot water, steam and polar solvents and provides excellent ozone resistance.

Fluoraz® – This versatile FEPM compound delivers excellent performance in a variety of harsh environments and outperforms fluorocarbon and other conventional elastomers in the most severe environments.

Fusion™ – This fluoroelastomer is used in a wide variety of markets for chemical compatibility and temperatures up to 450°F/232°C. It is primarily used as o-rings and other sealing elements; other applications include boot kits for connectors.

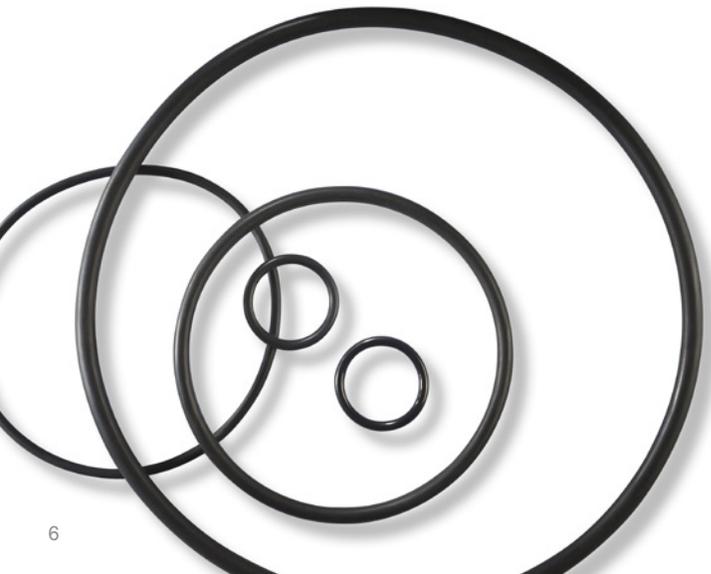
Nitriles – Are used in a wide variety of applications, including o-rings and features good resistance to water and oil.

Xyfluor® – Our proprietary fluorinated elastomer is primarily used in seals and has excellent low temperature capability (-76°F/-60°C).

Advanced Engineering Thermoplastics

Arlon® – Our PAEK family of materials is a tough, semi-crystalline, advanced engineered thermoplastic used for machined parts, including backup rings. They are used to meet chemical compatibility and temperature requirements in high-pressure environments.

Avalon® – Advanced engineered thermoplastics (constructed from proprietary high-performance reinforced PTFE) are used for machined parts, including “jackets” for spring-energized seals. They offer near universal chemical compatibility and temperature range. Some grades have been optimized to minimize friction.





Thermoplastic Composites – Wear & Abrasion Solutions

AR® – This abrasion-resistant line of thermoplastic composites is used as a metal replacement in rotating equipment to increase reliability and operational efficiency with excellent chemical compatibility properties.

WR® – Wear-resistant components made from carbon-fiber reinforced thermoplastic composite material are used as a metal replacement in rotating equipment. They provide increased reliability and operational efficiency and feature excellent wear properties and dry run properties.

Thermoplastic Composites – Structural Components

ONX® – This line of thermoplastic composites is used in severe service applications such as wafer handling and withstands strong acid chemistries at high temperatures. Component sizes up to 14 inches in diameter can be accommodated.

Orthtek® – This high-strength, low-weight, corrosion-resistant structural composite is used in Life Sciences for its dimensional stability for steam or autoclave sterilization.

Xycomp® – With excellent strength and chemical compatibility, this carbon fiber-reinforced PEEK composite with high fiber content (70% fibers by weight) are used for structural metal replacement applications. Xycomp® is ideal for part consolidation and fastener reduction through near net molding.

Coatings

Enduro® – LF10 PTFE-based coating is applied to elastomeric, thermoplastic, or metal components to improve performance. It reduces sticking force between interfaces, reduces wear caused by friction, and provides excellent conformality for complex surfaces.

Electrical & Fiber Optic Connectors – Seal Connect®

Electrical Connectors – move electrical signals in applications for dependable and reliable performance in extreme or harsh environments. (Available in Arlon®; can be paired with Chemraz® and Fusion™ o-rings or boot kits; other o-ring materials available upon request)

Fiber-Optic Connectors – Adapters, connectors, dust caps, and feedthroughs for use in critical applications, including wellhead outlets and rotary joints in wind turbines.

Making It All Happen



Design Capabilities

- **Research & Development** – Our scientists work collaboratively with customers to develop solutions that deliver lasting benefits for next-generation technologies.
- **Application Engineering** – With industry and material expertise across a range of technologies, our application engineers enable design for manufacturability (DFM) capabilities for our customers.
- **2D/3D CAD Modeling** – Ensures proper form, fit, and function and that dimensional requirements are met.
- **3D Rapid Prototyping** – Creates a acrylonitrile butadiene styrene (ABS) plastic 3D model from a computer-aided design (CAD) in just hours for a visual design prototype.
- **Finite Element Analysis (FEA)** – Analyzes the stress of plastics and elastomers under pressure and dynamic movement conditions to ensure that the material is specified correctly and not overstressed.

Material Certifications

Some of our materials are qualified to the following stringent industry standards. Please consult with a Greene Tweed engineer on which material will best meet your application needs.

- 3-A sanitary
- API 6A
- EC1935-2004
- FDA CFR 21 177.2400
- FDA CFR 21 177.1550
- FDA CFR 21 177.2600
- NORSOK M-710/ISO 23936-2
- USP Class VI (87 and 88)
- Water Regulations Approval Scheme (WRAS)

Molding Techniques

- Automatic transfer molding
- Composite molding
 - Plate, net, and complex contour compression molding
 - Techna3™ tubular molding
 - Thermoplastic fiber placement
- Compression molding
- Injection molding
- Isostatic molding

Quality Standards

- ISO 9001
- ISO/IEC 17025
- AS/EN 9100
- AS9145
- Infinity QS (automated SPC & statistical analysis)
- Wonderware (automated equipment data acquisition & monitoring)

Process Capabilities

- Braided packing
- Cleanroom manufacturing
- Cleanroom packaging
- CNC milling/turning
- Composite fiber placement
- Elastomer to metal bonding
- Induction brazing
- Laser cutting
- Laser welding (metals)
- Mold design & manufacturing
- Precision tolerancing
- Surface grinding
- Waterjet

State-of-the-Art Manufacturing

- **Facilities** – United Kingdom, United States, Switzerland, Taiwan
- **Certifications** – ISO 9001, ISO/IEC 17025, AS/EN 9100, AS9145™
- **Cleanrooms** – Class 100 & 1000
- Compression and injection molding capabilities
- **Extensis®** – Our proprietary manufacturing process enables the development of very large, custom seal designs.

Testing Qualifications

- **Materials Lab** – Quality control of raw materials
- **Plasma Lab** – Semiconductor parts testing using process gases
- **Accredited Testing Lab** – ISO 17025
- **Product Testing Lab** – Pump wear rig, landing gear rig, sealing pressure vessel test rig, structural composites testing
- **Finite Elements Analysis (FEA)**
- Mold flow prediction and thermal analysis software

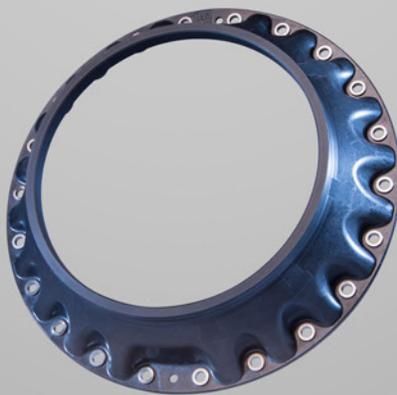
Where We Are



Headquartered outside of Philadelphia, PA, USA, Greene Tweed maintains a presence throughout the Americas, Europe, and Asia. Our worldwide network of commercial, design, engineering, and manufacturing resources delivers local support on a global scale.



As a world-class leader in the design and manufacture of high-performance materials and customized-engineered components, we leverage our expertise in a variety of markets and products to give our customers the most innovative and cost-effective solutions to their demanding applications.



OUR BRAND PROMISE.

Partnership.

Deep understanding.

Discovery.

Innovation.



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Statements and recommendations in this publication are based on our experience and knowledge of typical applications of this product and shall not constitute a guarantee of performance nor modify or alter our standard warranty applicable to such products.