



PUMP SOLUTIONS



For more than 150 years, Greene, Tweed's customers have relied on the company's materials expertise and collaborative approach to the design and manufacture of elastomeric, thermoplastic, and thermoplastic composite solutions that deliver proven performance in extreme and demanding operating environments.

A global company with facilities across North America, Europe, and Asia, Greene, Tweed serves customers throughout a diverse range of markets, including energy, aerospace, defense, industrial, life sciences, and semiconductor.

Greene, Tweed pump components

Greene, Tweed offers pump components engineered from our high-performance thermoplastic composite materials for centrifugal pumps and magnetic drive pumps. End-users throughout the world specify our products for their refineries, petrochemical plants, and power generation plants.

Composites

Why use composites in pumps?

Greene, Tweed's best-in-class thermoplastic composite [wear- and abrasion-resistant components](#) are often installed to extend the mean time between repair (MTBR) and reduce the total cost of ownership. End-users rely on our thermoplastic composite solutions to ensure their critical application pumps will function reliably and more efficiently for longer periods of time when replacing traditional OEM-installed metal, ceramic, and rubber solutions.

Composite wear- and abrasion-resistant parts are light-weight sacrificial pieces that safeguard the rest of a machine's components better and longer than metal wear parts for two main reasons: efficiency and reliability. Metal parts in high-speed contact with other metallic parts are prone to galling and seizing, particularly when not enough lubricant is present. Composite parts by their very nature are non-galling and non-seizing, eliminating the major operational risk of wear part failure.

Greene, Tweed's line of high-performance thermoplastic composites offers wear and abrasion resistance in a variety of materials, temperature ranges, and operating pressures to meet different application requirements.

Considerations for wear part reliability

METALS	COMPOSITES
Galling and seizing	Non-galling and non-seizing
Shorter intervals between routine maintenance tasks	Longer intervals between routine maintenance tasks
Shorter time to part failure	Longer time to part failure
Not impact resistant	Impact resistant
Larger clearance causes extra vibration and lessens equipment efficiency	Optimized clearance minimizes vibration and increases equipment efficiency

Problem solved.

Is your facility spending too much time and money replacing metal wear parts in your pumps, such as wear rings, bearings, and bushings?

Have failing metal parts caused catastrophic damage to expensive pump components, such as the shaft or impeller?

Does your system suffer from excessive vibration?

If so, Greene, Tweed's composite solutions could be the answer to your problems.

Customers who upgrade to composite wear parts from metal wear parts in their pumps experience reliability improvements and report:

- Improved MTBR and routine maintenance tasks
- Minimized chance of catastrophic damage
- Reduced vibration
- Improved reliability and efficiency of older equipment
- Reduced total cost of ownership for the equipment

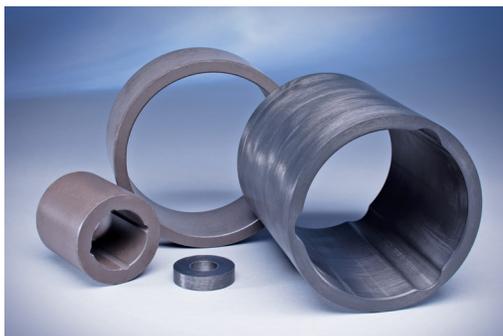
End-users throughout the world specify our products for their refineries, petrochemical plants, and power generation plants.

Greene, Tweed provides innovative composite materials and products for refineries, chemical plants, and power generation, water, and wastewater facilities.



WR[®] materials family

Greene, Tweed's WR[®] (Wear Resistant) line offers excellent wear and friction properties, along with superior non-galling and non-seizing performance. The WR[®] material portfolio enables extended MTBR and improved reliability. Offering extended dry-run performance and exceptional chemical resistance, our WR[®] materials can often reduce running clearances by more than 50 percent. These reduced clearances minimize recirculation, which maximizes rotor stability (reducing vibration) and overall efficiency.



AR[®] materials family

Traditional, lower-grade, non-metallic or rubber wear parts in pumps require frequent replacement due to the abrasive environments in which they operate. Pumps must be overhauled earlier or more frequently because rubber and non-metallic wear parts abrade quickly due to handling entrenched particles. Greene, Tweed has engineered a pair of Abrasion-Resistant (AR[®]) composite material offerings to help you increase your intervals between overhauls and improve pump reliability.



Xycomp[®] materials family

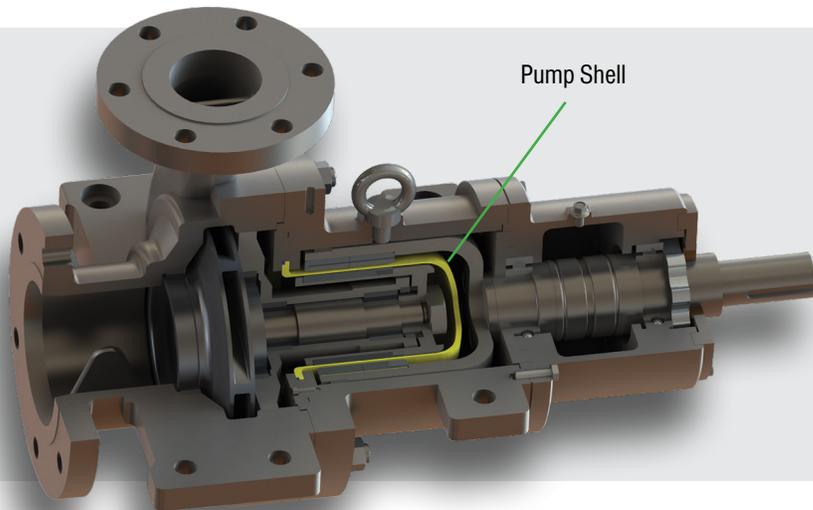
The Xycomp[®] materials family delivers high strength, low weight, corrosion resistance, and dimensional stability. Xycomp[®] materials could be used in the most demanding applications with continuous operations up to 40 bar (600 psi) at 250°F (121°C).

Where pump shells are used

For magnetic drive pumps, Xycomp[®] composites are used to eliminate corrosion issues and eddy current losses inherent to metallic shells to improve pump efficiency and reliability. Xycomp[®] composites are also non-brittle and can withstand higher pressure and vibration levels than ceramic shells.

<u>CHEMICAL AND HYDROCARBON</u>	<u>POWER GENERATION</u>	<u>WATER AND WASTEWATER</u>
<p>In these challenging environments, components must withstand aggressive media across a wide range of application parameters. With abrasive and/or corrosive liquids, and slurries often leading to machinery failure and costly downtime, pump users require components that can help maintain consistent production capabilities. Our composite materials have performed successfully in these demanding environments for more than two decades and have been used in most API 610 pump configurations.</p>	<p>Fluids containing sand and other abrasives continue to be an issue for the power industry, creating expanded running clearances and reduced pump efficiency. Ultimately, equipment failure and unit shutdowns occur, lowering plant production. Greene, Tweed's composites last up to five times longer than traditional materials for dramatically longer lifetimes, as well as reduced downtimes and maintenance requirements.</p>	<p>Enabling the collection, purification, and distribution of safe drinking water is a critical function of this industry's operations. Pump components must be thoroughly vetted to ensure they do not contaminate the water supply prior to use in any drinking water application. Our composite materials have received Water Regulations Advisory Scheme (WRAS) approval and have been proven safe and effective for drinking water pumps.</p>

Greene, Tweed's composites last up to five times longer than traditional materials for dramatically longer lifetimes, as well as reduced downtimes and maintenance requirements.



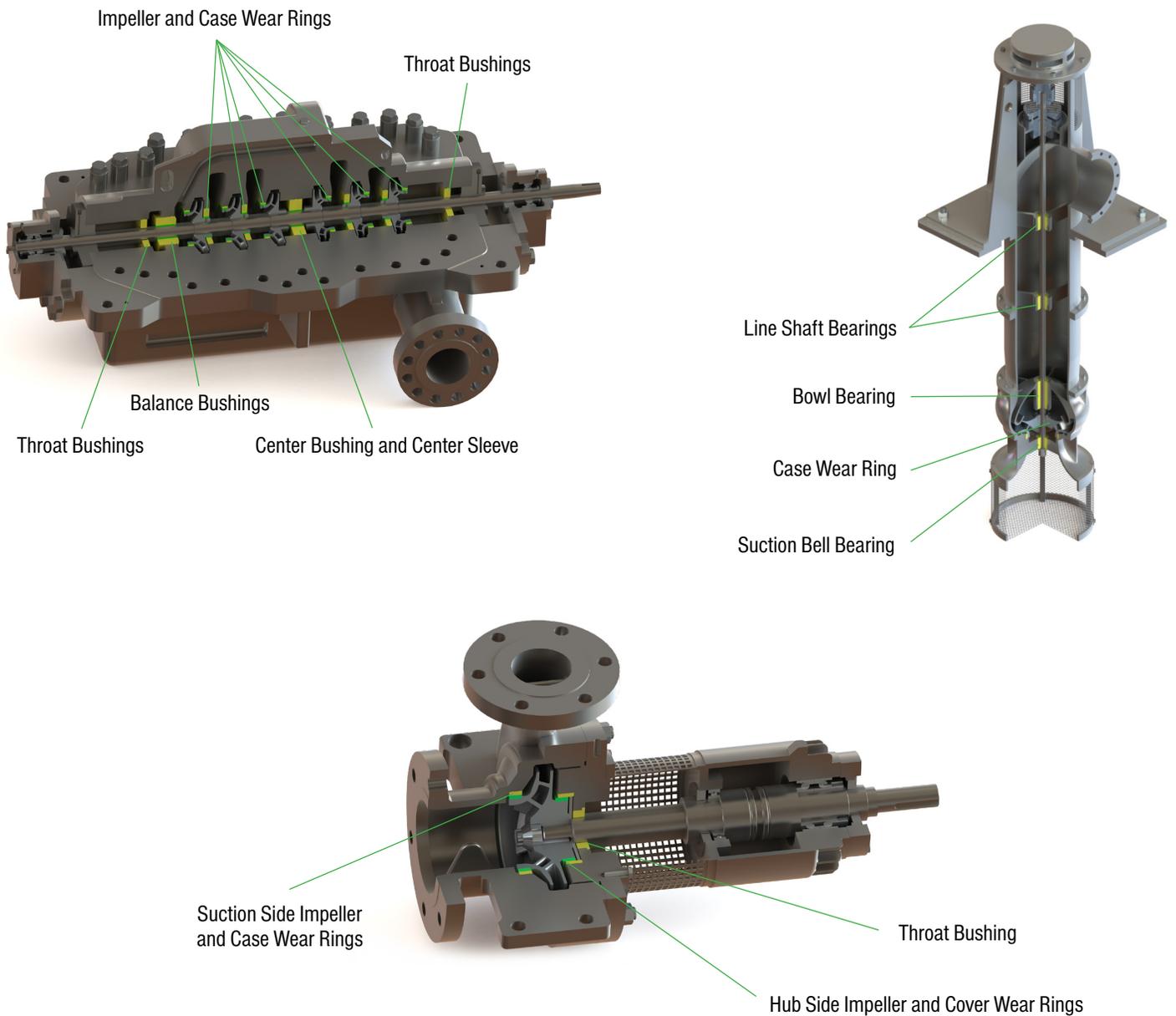
Leading magnetic drive pump OEMs have approved Greene, Tweed's Xycomp® shell as a default product. Our shell successfully performs in severe applications such as methyl tert-butyl ether (MTBE) column reflux pumps or amine circulation pumps in refineries. Other applications include pumps for liquefied petroleum gas (LPG) storage facilities, phenol plants, low-density polyethylene (LDPE) plants, gasification plants, and petrochemical plants worldwide.

Where composites are used

Composites are used in overhung pumps and between bearing pumps to improve system and shaft reliability, eliminate secondary damage, enhance efficiency, and make equipment safer.

With between bearing multistage pumps, composites are used to improve system reliability, reduce the chance of cavitation, eliminate secondary damage, enhance efficiency, and make equipment safer.

In vertical pumps, composites are used to improve system and shaft reliability, reduce chance of cavitation, extend life pumping solids, and make equipment safer.



In the field

A U.S. refinery underwent an expansion, during which time Greene, Tweed's [WR[®]](#) and [AR[®]](#) composites were installed in 421 centrifugal pumps. Over the course of four years, the refiner reported that the pumps successfully operated for more than 14 million hours, and collateral damage was eliminated.

A major U.S. refinery monitors rotating machinery reliability on a regular basis, and has analyzed the reliability impact of [WR[®]](#) and [AR[®]](#) composites in centrifugal pumps. As a result, the refinery operator specifies [WR[®]](#) and [AR[®]](#) composite products in every pump candidate.

The Delaware Bay power generation station was experiencing premature failure of cutlass rubber bearings after 2 to 2.5 years of operation. Associated costs were \$150K to pull the pump and \$150K to \$200K to repair it. Greene, Tweed inserted [AR[®] 1](#) composites into existing bearing housings, and the bearing life exceeded six years. Overall, seven pumps were upgraded, and the station saved \$1.5 million to \$2.1 million on pull-out and repair costs.

In a urea plant, lean carbamate solution circulation pumps developed serious vibration problems after three months, in one case breaking a shaft between two impellers and consistently revealing severe rubbing on the inter stage bush and impeller wear rings and bends in the shafts. It was determined that under-design of the shaft was leading to high deflection and severe rubbing, resulting in galling and damage of the metal wear parts. The decision was made to replace metal wear parts in one pump with PEEK [WR[®] 300](#) products and reduce the clearance, which was expected to support the shaft against bending forces. After eight months of successful operation in the trial pump, the facility replaced metal parts in the other pumps with PEEK [WR[®] 300](#), and declared the recurring vibration problems were solved.

For water desalination, leading pump OEMs routinely specify our [WR[®]](#) and [AR[®]](#) products as the default material in reverse osmosis applications such as high-pressure membrane feed pumps, booster pumps, and vertical water intake pumps. [WR[®]](#) and [AR[®]](#) products drive higher efficiency due to reduced running clearances, non-galling and non-seizing material, and no corrosion due to seawater or brackish water. The fluid being pumped lubricates the wear part, eliminating the need for oil lubrication systems.

[WR[®] /AR[®] quick reference guide](#)

The following list of selected material properties are from the [WR[®]](#) and [AR[®]](#) families of composite materials. Other materials are also available.

[WR[®] 300](#)

Material: PEEK reinforced with short, random carbon fibers

Temperature: Subzero/+275°F (135°C)

Application: General wear resistance

[WR[®] 525](#)

Material: PEEK reinforced with continuous hoop-wound carbon fibers

Temperature: Subzero/+525°F (274°C)

Application: HPHT stationary & rotating applications

[WR[®] 575](#)

Material: PEEK-reinforced woven carbon fiber

Temperature: Subzero/+480°F (249°C)

Application: Thruster pads for high-speed machinery

[WR[®] 600](#)

Material: Carbon fiber-filled PFA

Temperature: Cryogenic temperatures/+500°F (260°C)

Application: Creep resistant; almost universal chemical compatibility

[WR[®] 650](#)

Material: Carbon fiber-filled PFA

Temperature: Cryogenic temperatures/+500°F (260°C)

Application: Extended dry run capability; almost universal chemical compatibility

[AR[®] 1](#)

Material: Filled PTFE

Temperature: Subzero/+120°F (49°C)

Application: General abrasive resistance

[AR[®] HT](#)

Material: Proprietary blend of PTFE and PEEK

Temperature: Subzero/+250°F (121°C)

Application: Higher temperature abrasive resistance

[Xycomp[®]](#)

Material: Carbon-fiber and PEEK composite

Temperature: Cryogenic temperatures/+482°F (250°C)

Application: Containment shells and pressure vessels

This information is proprietary and confidential to Greene, Tweed. Redistribution is forbidden without consent from Greene, Tweed.



Global Presence, Local Service.

With more than 1,600 employees across 11 countries, Greene, Tweed offers material, design, engineering, and manufacturing expertise worldwide, collaborating with customers to meet their critical challenges through the development of custom-designed, leading-edge components.

Contact Greene, Tweed today to discuss how we can help maximize the life of your pumps.



Houston, TX, USA

Tel: +1.281.765.4500 | Fax: +1.281.821.2696

gtweed.com