Application Profile

Vespel® Parts and Shapes: Anti-Wear Surfaces for Wind Turbine Mechanical Components

Improving reliability and longevity of wind turbine operation

Driving Toward Sustainability

The world is undergoing an Energy Transition to replace fossil fuel with sustainable and renewable energy to meet the 2050 net zero carbon emission goals. Rapid innovation and development is occurring in both onshore and offshore wind energy. Designed for a multi-year lifespan, Vespel® materials can be used as intricate stationary and rotating mechanical components to withstand extended wear and friction cycles in challenging environments.

Challenges and Requirements

Wear surfaces such as bushings, bearings, thrust washers, and yaw pucks are vital parts to wind turbine's operating mechanisms to ensure its safe and reliable operation over the life of the turbine. These parts exists in segmented wind blades, gearboxes, electric motors, and braking systems.

- Protection against dither at a wide range of frequencies and pressures
- Varying pressure load impact on wear liner
- Components need to withstand temperature swings in cold and hot climates
- Provides system dampening

Solutions and Benefits

Powered by toughened polymeric matrix and advanced filler packages, Vespel® S polyimide (Figure 1) and Vespel® CP composites (Figure 2) provide exceptional anti-wear and mechanical properties over the designed lifespan of the wind turbine while minimizing maintenance interruptions.

- Lower wear versus the competition in DuPont's proprietary testing (Figures 3 and 4) leading to longer life of mechanical components and an extended mean time between repairs
- Vespel® materials are available with a range of Coefficient of Friction (COF) for varying use cases
- Our Vespel® material can be manufactured or machined into many different shapes and sizes for your specific installation needs

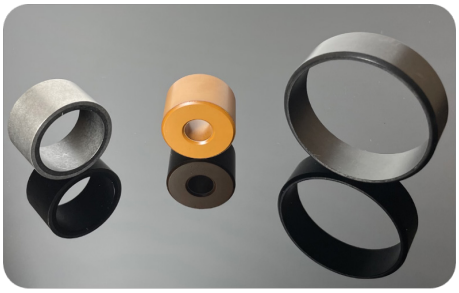


Figure 1.

Bushings made using Vespel® S polyimide

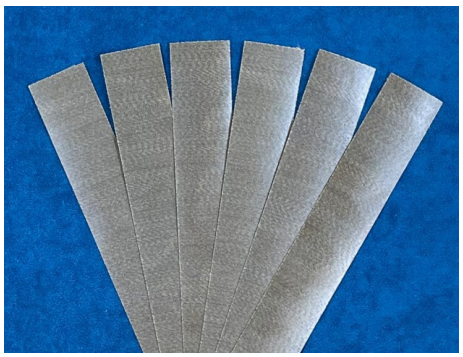
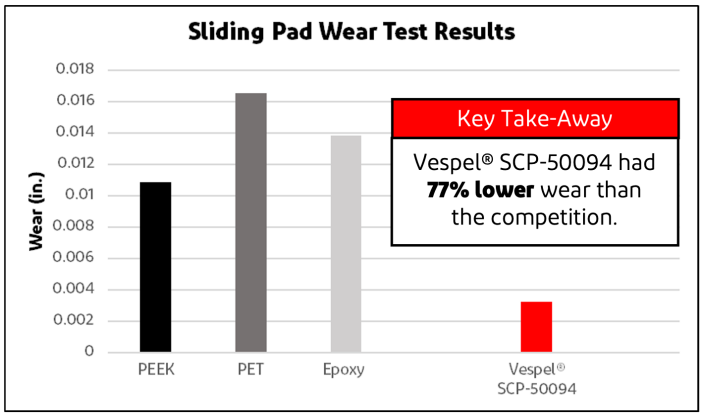


Figure 2.

Vespel® CP wear liner

Vespel® S Polyimide vs. Competition

Compared to other materials commonly used in sliding pad and wear applications, Vespel® SCP-50094 has shown to have 77% lower wear, translating to decreased mean time between repairs and other costs associated with frequent replacement of these wear materials.



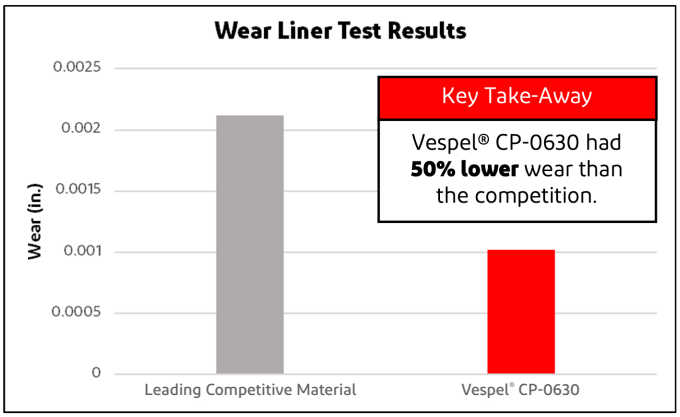
Test Conditions

- Linear Reciprocating Wear Test
- Pressure: 7,000 psi (48 MPa)
- Frequency: 1 Hz
- Duration: 100,000 cycles

Figure 3. Sliding pad wear testing using DuPont's proprietary test stand.

Vespel® CP Composite vs. Competition

Vespel® CP-0630 experienced 50% less wear than the leading competitive material at the same conditions, leading to longer run time and an extended maintenance cycle.



Test Conditions

- Linear Reciprocating Wear Test
- Pressure: 3,700 psi (26 MPa)
- Frequency: 0.1 Hz
- Duration: 96 hours

Figure 4. Wear liner wear testing using DuPont's proprietary test stand.

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