



HIGH PERFORMANCE PEEK POLYMERS

Rolling-Element Bearings for Demanding Applications

The performance and reliability of the rolling-element bearings and bearing cages are dependent on the bearing component materials. VICTREX® PEEK polymer replaces metal, to reduce cost and save weight, and standard polymers, which cannot meet increasing temperature and chemical resistance performance requirements.

Bearing cages are mechanically stressed by friction, tension and inertia forces and are exposed to external influences due to lubricants, lubricant additives and their decomposition products which can be corrosive, as well as organic solvents and coolants. The extent of these factors depends on such parameters as temperature, impact resistance, vibrations or a combination of these and other unknown factors.

Bearing cages made from VICTREX PEEK polymer are characterized by their balanced combination of strength and elasticity. The low coefficient of friction of the polymer on a steel surface produces minimal friction between the cage surface and the balls so that there is very little heat and wear inside the bearing. Moreover, the low density of the material reduces the weight which, in turn, has a positive effect on the moment of inertia force of the bearing.

Tribologically optimized compounds allow the bearings to run dry for a brief period without the danger of friction wear or damage. As a result of these emergency running properties the amount of applied grease can be reduced to an absolute minimum, thereby making a favorable environmental contribution.

Victrex polymers offer the ability to injection mold parts with tight tolerances that require no post machining, and the ability to produce complex shapes. Therefore, bearings made out of Victrex polymers benefit from a reduction in part costs compared with metals.

BENEFITS FOR BEARING APPLICATIONS

- ▲ Lower cost
- ▲ Lower weight
- ▲ Reduced noise and vibration
- ▲ Higher energy efficiency
- ▲ Lower maintenance costs
- ▲ Improved lifetime
- ▲ No "blocking" due to good dimensional stability



Bearing cages made with VICTREX® PEEK polymer

Silver/Copper Plating Replaced by VICOTE® Coatings in Needle Roller Bearings



Roller bearings are widely used in crankshaft and connecting rod mechanisms in engines. Their purpose is to reduce the friction between two rotating surfaces. As a result, they

are subject to extreme wear especially on the outer surface. Current solutions are expensive and do not provide adequate wear relative to the demands of the application. When tested at 9,000 rpm for 100 hours, VICOTE Coatings, with a 50% lower thickness, outperformed traditional silver/copper plating, which wears away under the same test conditions causing damage to the cage and premature failure of the bearing.

APPLICATIONS

- ▲ Helicopter gearboxes
- ▲ Dryer drum bearings (replaced bronze)
- ▲ Pump rotors (replaced metals)
- ▲ Pneumatic drills (replaced brass)
- ▲ Wind turbines
- ▲ High speed oil-free centrifugal compressors
- ▲ Liquid cooled car alternators
- ▲ Needle roller bearings

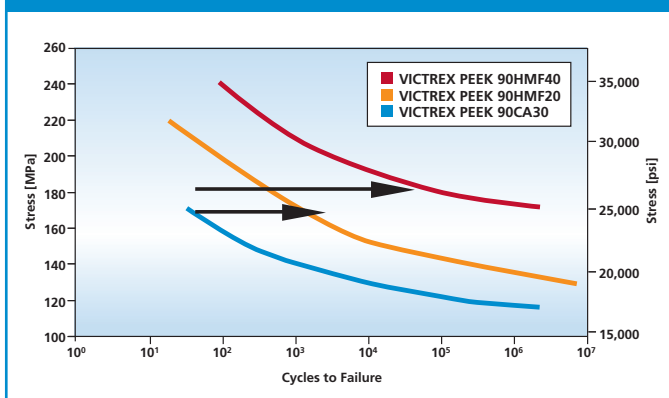
For Higher Performance and Reliability

Victrex Polymer Solutions, a division of Victrex plc, is the world's leading manufacturer of Polyaryletherketones, high performance polymers, which are sold under the brand names VICTREX® PEEK polymer, VICOTE® Coatings, APTIV® films and VICTREX Pipes™. With production facilities in the UK backed by sales and distribution centres serving more than 30 countries worldwide, our global market development, sales, and technical support services work hand-in-hand with OEMs, designers and processors offering assistance in the areas of processing, design and application development to help them achieve new levels of cost savings, quality, and performance.

All moving applications require the dynamic strength of the materials to be taken into account. For this purpose Victrex offers materials that contain special carbon fibers which at a higher reinforcement fiber level withstand higher dynamic stresses (Figure 1). A secondary effect is higher ductility and greater extension to favor ball or cylinder snap-in during assembly.

VICTREX PEEK polymer features no significant signs of aging as a result of bearing temperatures at 150°C (302°F) for more than 5,000 hours. The continuous use temperature of the polymer is around 260°C (500°F). Applications close to the material's melting temperature of 343°C (649°F) for VICTREX PEEK polymer, 373°C (703°F) for VICTREX HT™ polymer and 387°C (729°F) for VICTREX ST™ polymer are currently possible with due consideration to the loss of strength and more rapid aging.

FIGURE 1 – Dynamic Tensile Fatigue at 120°C (248°F) with Carbon-Filled VICTREX PEEK Compounds



SUMMARY

Regardless of format, VICTREX PEEK polymer as a bearing cage material provides the following benefits:

- ▲ Accommodates high continuous temperatures and very high speeds
- ▲ Reduces heat generated by the bearing
- ▲ Reduces energy consumption
- ▲ Accommodates shock forces and high centrifugal forces
- ▲ Enables bearing to survive longer under poor lubrication conditions
- ▲ Extends bearing service life

Detailed information on Victrex polymers is available upon request from a Victrex Market Developer or by emailing Victrex.

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