APPLICATION SOLUTIONS

Thrust Bearings for Electric Submersible Pumps

Electric submersible pumps (ESPs) operate in small-diameter boreholes at significant depths and high ambient temperatures, placing unusually high demands on the bearings.

Waukesha Bearings® offers a range of solutions to maximize bearing life and optimize bearing performance in these harsh conditions – increasing the efficiency, production and operating life of your pump.

HIDRAX™ POLYMER BEARINGS

Polymer-lined tilt pad thrust (TPT) bearings like the Hidrax™ bearing from Waukesha Bearings are the standard for ESP operating temperatures up to 200°C (392°F) and loads up to 8 MPa (1160 psi). They are widely used in both the seal/protector section and the motor of ESPs.

The high temperature and load capabilities of the engineered polymer lining are complemented by the tilt pad design's tolerance for misalignment and ability to accommodate a wide range of loads and speeds.

Hidrax and Hidrax HT bearings are available with a center or offset pivot

As an additional benefit in the motor, the polymer provides electrical insulation, protecting the bearings from stray currents without a separate insulating layer between the bearing and housing.

HIDRAX™ HT CERAMIC BEARINGS

For the higher temperatures in steam-assisted gravity drainage (SAGD) wells, the greater temperature and load capabilities of ceramic or ceramic-metallic composite (cermet) materials are needed. Hidrax™ HT thrust bearings feature durable ceramic/cermet materials that retain their surface hardness and a load capacity of 8 MPa (1160 psi) at lubricating oil temperatures of 300°C (572°F) and higher.

The superior strength and hardness of ceramic/cermet materials also provide the ability to crush abrasive debris that may enter the system through damage to a mechanical seal or contamination of the lubricating oil.

Hidrax HT bearings use the well-proven Hidrax platform, making them ideal for drop-in replacement of existing polymer bearings as ESPs are updated with SAGD technology.

Polymer Hidrax™ bearing

Ceramic Hidrax™ HT bearing

BRONZE BEARINGS

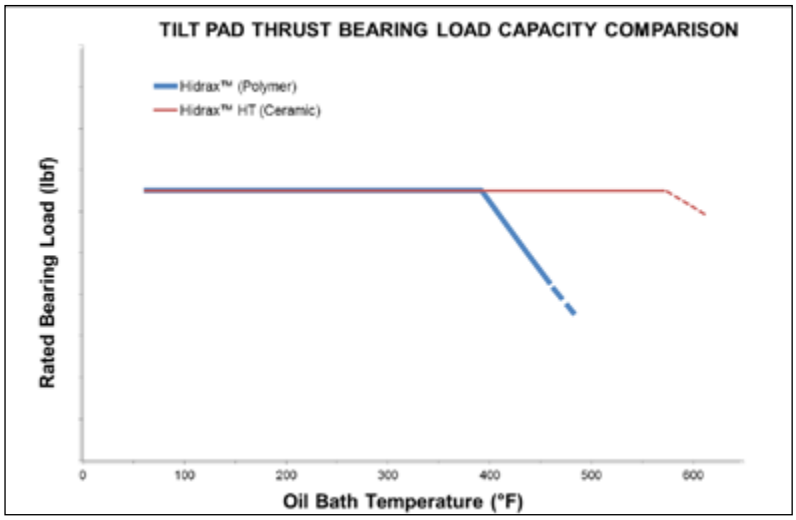
For ESPs operating under low loads and for upthrust bearings, Waukesha Bearings offers a selection of bronze bearing designs. Bronze bearings can withstand elevated temperatures under relatively low loads.

Fixed geometry designs for bronze include cast bronze, taperland and threaded OD thrust bearings; these options all eliminate pad flutter on the upthrust bearing.

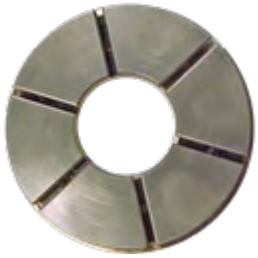
The Waukesha Bearings Deflection Pad® thrust bearing provides some of the benefits of a tilt pad for increased load capacity using bronze. Successful operational experience for the Deflection Pad bearing includes lubricating oil temperatures above 150°C (302°F) with unit loads of 2 MPa (290 psi) and higher.

Bronze bearings may be sensitive to misalignments, though, and are designed for use in clean environments.

	POLYMER HIDRAX BEARINGS	CERAMIC/CERMET HIDRAX HT BEARINGS	BRONZE DEFLECTION PAD BEARINGS
Temperature Capability	200°C (392°F)	300+°C (572+°F)	150+°C (302+°F)
Load Capability	8 MPa (1160 psi)	8 MPa (1160 psi)	2 MPa (290 psi)
Contaminants	Embeds dirt	Resistant; grinds debris	Very little acceptance
Conformability	High	Very Low	Low



Load capacity at increasing temperatures for polymer Hidrax versus ceramic Hidrax HT center pivot TPT bearings



Cast bronze thrust bearing with babbitt pads

Deflection Pad thrust bearing with bronze pads and steel carrier ring

Solid bronze threaded OD upthrust bearing