

Performance and Durability of High Temperature Foil Air Bearings for Oil-free Turbomachinery

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Summary

The performance and durability of advanced, high temperature foil air bearings are evaluated under a wide range (10 to 50 kPa) of loads at temperatures from 25 to 650 °C. The bearings are made from uncoated nickel based superalloy foils. The foil surface experiences sliding contact with the shaft during initial start/stop operation. To reduce friction and wear, the solid lubricant coating, PS304, is applied to the shaft by plasma spraying. PS304 is a NiCr based Cr_2O_3 coating with silver and barium fluoride/calcium fluoride solid lubricant additions.

The results show that the bearings provide lives well in excess of 30,000 cycles under all of the conditions tested. Several bearings exhibited lives in excess of 100,000 cycles. Wear is a linear function of the bearing load. The excellent performance measured in this study suggests that these bearings and the PS304 coating are well suited for advanced high temperature, oil-free turbomachinery applications.