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COATINGS FOR HIGH TEMPERATURE FOIL BEARINGS

Hooshang Heshmat, Ph.D. (ASME/STLE Fellow)

hheshmat@miti.cc

Mohawk Innovative Technology Inc.
Albany, NY 12205

Said Jahanmir, Ph.D. (ASME/STLE Fellow)

sjahanmir@mitiheart.com

Mohawk Innovative Technology Inc.
Albany, NY 12205

James F. Walton II (ASME Fellow)

jwalton@miti.cc

Mohawk Innovative Technology Inc.
Albany, NY 12205

ABSTRACT

High operating speeds and temperatures required for advanced turbomachinery necessitate the development of bearings capable of continuous operation between 3 to 4 million DN at temperatures up to 820°C. Non-contact oil-free bearings such as compliant foil bearings, active magnetic bearings and hybrid foil and magnetic bearings are alternate solutions to the current liquid-lubricated hydrodynamic and rolling element bearings, which have limited life under these extreme conditions. A critical component in these oil-free bearings is the tribological coating system that must be used on the journal and the foil pads to ensure reliable operation during transient periods and start-stop cycles. The purpose of the present investigation was to assess the reliability of tribological coatings being implemented for a large (150 mm diameter) hybrid foil/magnetic bearing. In order to be suitable for use in large turbine engine type applications, the journal coating must accommodate the thermal and centrifugal growth experienced as well as providing the wear life and friction coefficient. Based upon the limitations identified in PS304, this coating is not yet suitable for demanding high temperature and high-speed applications. On the other hand an alternative nickel-chrome based coating applied to the foils versus a shaft with thin dense chrome or a nickel-chrome based coating has shown excellent characteristics under conditions up to 820°C.