

WTC2005-63685

HIGH-TEMPERATURE HIGH-SPEED TRIBOMETER WITH COMPLEX MOTION

Hooshang Heshmat

Mohawk Innovative Technology, Inc.
1037 Watervliet-Shaker Road
Albany, New York 12205 USA

Michael J. Tomaszewski

Mohawk Innovative Technology, Inc.
1037 Watervliet-Shaker Road
Albany, New York 12205 USA

Crystal Heshmat

Mohawk Innovative Technology, Inc.
1037 Watervliet-Shaker Road
Albany, New York 12205 USA

James F. Walton, II

Mohawk Innovative Technology, Inc.
1037 Watervliet-Shaker Road
Albany, New York 12205 USA

Said Jahanmir

Mohawk Innovative Technology, Inc.
1037 Watervliet-Shaker Road
Albany, New York 12205 USA

ABSTRACT

Complex motions and wide variations in relative surface velocities are likely to be experienced in mechanical systems such as an engine (e.g., piston rings, wrist pins and crankshaft main bearings in a piston type engine). Currently available tribometers use simple motions and often a constant speed. A new tribometer is designed with the capability of three types of motions: (1) unidirectional rotary motion (similar to a conventional pin-on-disk tribometer), (2) reciprocating sliding motion, and (3) complex multi-directional motion that can be achieved when the disk rotates and the pin reciprocates along a linear path. Depending on the pin location with respect to the center of the disk, the reciprocation frequency, and the rotational speed of the disk, a wide range of complex motions are possible. Tribological testing can be performed at contact loads up to 400 N, at speeds up to 80m/s, and temperatures of 600 °C in superheated steam. Due to complex motions, the measurement of friction force becomes challenging. To properly monitor the normal force and the friction force along two orthogonal axes, three force transducers are used. This unique design allows for the determination of tribological performance of advanced materials and coatings under conditions that simulate those encountered in small steam engines currently under development.

Keywords: tribometer, high speed, high temperature, complex motion, steam engine.