Center for Surface Engineering and Tribology (CSET)

Northwestern University and Georgia Institute of Technology

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Design of Energy-Saving Lubricants

Research at Center for Surface Engineering and Tribology (CSET) has solved a problem that has eluded tribologists for 40 years: the prediction of elastohydrodynamic traction (friction) from measured properties of a lubricating liquid. This development has great industrial significance since it should enable the design of lubricants that provide large savings in energy. Determination of lubricant parameters and behavior under pressure is important to the determination of the lubricating film between rolling element-bearing components. Understanding the bearing lubrication permits determination of the mechanism of fatigue and bearing degradation that is likely to occur and how long the bearing surface will last. Experimental results and computer software from CSET have been used to improve lubrication in commercial products by several companies, including Timken, manufacturer of roller taper bearings; Eaton, automotive parts manufacturer; and Lubrizol, manufacturer of lubricant additives for heavy machinery applications. For more information, contact Leon Keer, 847-491-4046; e-mail: l-keer@northwestern.edu or Michael Hoeprich, e-mail: hoeprich@timken.com.

High-Speed Surface Stress Analysis

CSET researchers have developed a high-speed numerical method of surface contact stress analysis. It was based upon programs from Northwestern University that led to evaluations of the effect of lubricant debris dents on reduction of fatigue life of rolling element bearings. By mapping bearing surfaces that have been dented with various sizes of debris particles and then analyzing these dented surface geometries with the stress analysis programs, the researchers developed a predictive tool for lubricants of various cleanness levels. This work has been used on customer applications. DuPont EKC Technology says that CSET research resulted in advances in numerical approaches to solving shaft seal, ring seal, and mechanical wear problems. For more information, contact Leon Keer, 847-491-4046; e-mail: l-keer@northwestern.edu.

Nanolayered Super-Lattice Coatings for Tribological Applications

Enhanced performance capabilities in terms of lifetime and wear were achieved through design of nanolayered coatings. These coatings also appear to have promise in use for cutting tools. In October 2001, the Tribology Division of the American. Society of Mechanical Engineers awarded to Y.W. Chung and L.M. Keer of the tribology center their Innovative Research Award. For more information, contact Leon Keer, 847-491-4046; e-mail: l-keer@northwestern.edu.