Reduction of Contact Friction and Abrasion Between Materials

US-Semi is working with Herndon Development, LLC to license and implement a novel, patent pending method that has the potential to radically reduce static and kinetic friction and abrasion to a revolutionary degree in myriad applications.

In an ideal oil- or gas-supported fluid bearing, the actual bearing materials do not come into contact; however, many applications are not ideal. Lubrication to bearings may fail or design constraints may limit continuous film support. High temperature, biological, space or vacuum process applications may not allow a lubricant and may be intolerant of abrasion particles.

Oil-free piston, scroll, vane and screw gas compressors and vacuum pumps in myriad uses have moving contact surfaces that inherently lack lubrication. Gears frequently have high pressure, limited area contact surfaces that are difficult to fully support with lubricant; thereby generating significant friction, heat and wear under load.

High precision servo positioning applications and mechanical applications in space are compromised by high starting “static” friction (stiction). Hard plasma spray coatings evidence unexplained statistical scattering of friction and wear. Low friction ball and roller bearings under continuous or high periodic loads have fretting, brinelling wear and fail from resulting fatigue.

A consistent mode of failure in artificial hip joints has emerged. Regardless of the contacting materials, small abraded particles of critical size migrate from the bearing to the bone attachment causing the cells to lyse and detach. Mechanical lifetime tests conducted on the bench do not correspond to in vivo failure modes.

The method developed by Herndon Development is most easily, but not uniquely, applied to “tailored” materials including sintered and pressed metals, ceramics and spray coatings. The method works to minimize interpenetration and maximize support; avoiding the onset and increasingly complex cascade of failure characteristic of bearings.

The degree of improvement depends on the specific application and in many applications the reduction in static and kinetic friction can be revolutionary. In lubricated applications the consequence of lubrication loss can be mitigated and delayed, extending operation and recovery time.

The method is demonstrably scale independent. Control is dependent upon the specific materials and processes. Application likely requires at least detail change in contacting materials and manufacturing quality control.

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