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## Study Demonstrates Pennzane® Lubricants Outperform PFPE in Loaded, Oscillatory Devices

A study conducted at Nye Lubricants, Inc., on an SRV-4 Tribological System showed that *Pennzane*® lubricants, compared to perfluoropolyether (PFPE) lubricants, extend component life under loaded or oscillatory motion in vacuum or atmospheric environments.

Nye conducted step load and wear tests using a 10 mm, 52100 steel ball against a 24 mm, 52100 steel test disc. Several formulations of *Pennzane* lubricants with and without additives were compared to a linear PFPE oil of the same viscosity.

In step load tests at 75°C, load was increased in increments of 100N every two minutes until seizure. The results showed the *Pennzane* oil formulated with a 3% antiwear additive outperformed the PFPE by five times. *Pennzane* fluids without additives survived almost twice the load of the PFPE.

Wear tests were conducted under a continuous load of 200N for two hours at 50°C. Results showed the steel balls lubricated with PFPE had wear scars that were almost double the size of scars on the steel balls lubricated by *Pennzane* fluid with antiwear additive, and 20 percent larger than the neat *Pennzane* oil.

“These tests confirm results of similar studies conducted under vacuum conditions that *Pennzane* outperforms PFPE for oscillatory motion, where the lubrication regime is boundary to mixed,” Nye Director of Technology Dr. Joe Braza said. “Reduced wear and greater load-carrying capability mean longer life for mechanisms subjected to oscillatory motion. Whether in space or in a semiconductor manufacturing system, increased component life is a clear benefit for OEMs and their customers.”

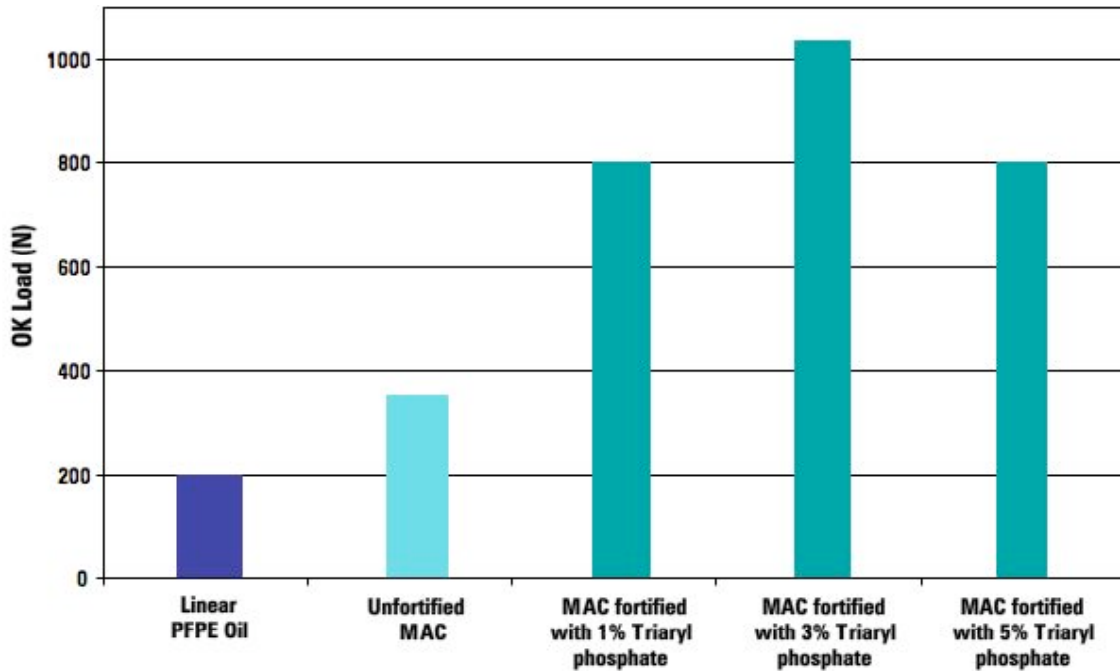
Because of low outgassing, PFPE lubricants are commonly used for vacuum applications. However in loaded, metal-on-metal conditions and oscillatory motion PFPEs sometimes polymerize, resulting in shorter bearing life.

(continued)

# ASTM D5607 Step Load Test

load increased 100N every two minutes until seizure

Multiply Alkylated Cyclopentane (MAC) vs. PFPE



Pennzane synthetic hydrocarbons, chemically classified as a multiply alkylated cyclopentane (MAC), were developed specifically to extend the life of loaded, metal-on-metal applications in a vacuum. Unlike PFPEs, whose inertness prevents solubility of most additives, Pennzane fluids readily accept additives to further extend component life.

Nye Lubricants, Inc., formulates vacuum-rated lubricants from several base oils. It has been involved in developing lubricants for NASA since early in the space program, and more recently has provided Pennzane, PFPE and ester-based lubricants for OEMs of semiconductor manufacturing equipment.

*For more information, contact Nye at 508-996-6721 or [pennzane@nyelubricants.com](mailto:pennzane@nyelubricants.com).*