

## Documents

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### **Processing of Cotton–Phenolic Bearing Retainers for Optimum Performance of Spacecraft High-Speed Rotating Systems**

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#### **Abstract**

Spacecraft high-speed rotating systems use ball bearings, which must work for many years under limited supply of lubricant. These bearings use a cotton–phenolic composite as the retainer material because of its superior tribological properties. The retainers are made by a series of manufacturing processes that impart the required quality to the retainer. A chemical treatment is performed to make the retainer clean and improve oil absorption. The acid etching done as part of the chemical treatment has some detrimental effect on the structural integrity of the material. This article presents various postmachining processes carried out on the retainers and their effects on the quality and performance of the retainers. A series of experiments is carried out to optimize the duration of acid etching and its effects on mechanical and tribological properties of the retainer material. The results show that a 15-s etching is sufficient to burn the cotton fibers without causing any damage to the structure. The study also proves that long soaking in oil improves the oil retention of the retainer rather than improving the surface porosity by long-duration acid etching. A short-term performance test of a 15-s etched retainer is done in spacecraft bearings at various operating conditions and the results confirm its stability in spacecraft environments. © 2015, Copyright © Society of Tribologists and Lubrication Engineers.

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