

PROCEEDINGS

Dual-Sided Replenishment Design for Grease Interfaces in Confined Clearances: Lubrication Under Water Intrusion

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ABSTRACT

Marine equipment bearings frequently operate under harsh conditions characterized by elevated humidity, subzero temperatures, and inevitable seawater intrusion. The operational reliability and durability are paramount to advancing offshore technologies. When water invades the contact area, it significantly alters the physical and chemical properties of the lubricating grease, leading to a drastic reduction in its film thickness forming capability. This degradation causes the lubricant's load-carrying capacity to drop, forcing bearings into a starvation lubrication, which accelerates wear and corrosion. Although extensive research has focused on oil replenishment mechanisms within bearing contacts, active dewatering strategies remain notably underdeveloped. To address these dual challenges, this study proposes a novel functional surface that synergizes femtosecond laser-induced micro-textures with a polytetrafluoroethylene (PTFE) coating to achieve significant lubrication enhancement under water intrusion.

KEYWORDS

Film thickness; load-carrying capacity; oil replenishment; lubrication enhancement; water intrusion

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