Theoretical and experimental research on the tribological characteristics of reciprocating seals

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Abstract

Reciprocating rod seals are vital in ensuring the safety and efficiency of hydraulic actuators, with their tribological characteristics significantly impacting operational lifespan and reliability. Utilizing mixed-lubrication theory, a fluid-solid-coupled model for these seals was developed. This model evaluates sealing performance across various working conditions, encompassing different system pressures and temperatures. It delves into the film thickness, film pressure, and asperity contact pressure within the sealing zone. Furthermore, the wear profile throughout the reciprocating process was simulated. A comparison between experimental and simulation results was conducted. This research offers a methodology for designing reciprocating seals and contributes to enhancing their sealing performance.

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