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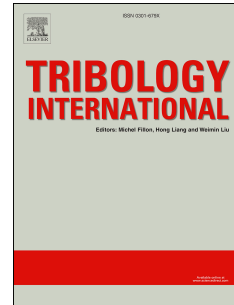
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## Viscosity Wedge Effect of Dimpled Surfaces Considering Cavitation Effect

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### Abstract

*A thermohydrodynamic model is developed to study the viscosity wedge effect associated with dimpled surfaces considering the cavitation effects. The Streamline-Upwind/Petrov-Galerkin (SUPG) finite element method was applied to solve the energy and Reynolds equations combined with the Jakobsson–Floberg–Olsson (JFO) cavitation boundary conditions. The performance of a slider surface with an array of dimples are studied and the geometrical parameters of the dimples are optimized for enhancing the load-carrying capacity (LCC) and coefficient of friction (COF). The film pressure and temperature distribution at different conditions are analyzed. The simulation results show that the viscosity wedge effect has a more pronounced influence on the LCC and COF than the cavitation effect. The dimples with dimensionless depth  $h_g/h_0=0.6$  and no more than 25% dimple area ratio are recommended.*

**Keywords:** Viscosity wedge effect; dimpled surface; cavitation effect; load-carrying capacity; thermohydrodynamic analysis

### Nomenclature

$a$	Dimple distance
$c$	Oil film specific heat
$f$	Friction coefficient
$F_o$	Dimensionless load-carrying capacity
$h, H$	Film thickness, $H=h/h_0$
$h_0$	The gap between slider and pad
$h_g, H_g$	Dimple depth, $H_g=h_g/h_0$
$k, K$	Oil film thermal conductivity, $K=\theta+(1-\theta)k_g/k_1$
$L$	The slider length
$p, P$	Film pressure $P=(p-p_c)/(p_a-p_c)$
$p_0$	Inlet and outlet pressure
$p_c$	Cavitation pressure of oil film
$q_p$	Local heat flow into the pad
$R$	Dimple radius

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