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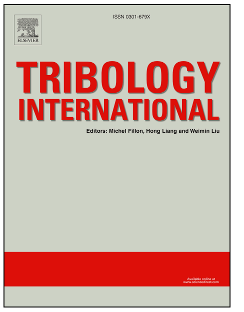

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Effect of Flash Temperature on Engine Valve Train Friction

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Abstract

This paper describes the development of a numerical approach based on friction and lubrication analysis to predict the flash temperature and its effects on friction at cam/follower interface. Simulation results showed that the rise in flash temperature resulted in decrease of friction and oil film thickness at cam/tappet contact particularly at high camshaft operating speeds. The flash temperature for direct acting valve train was found significantly higher than roller follower configuration due to higher sliding velocity and friction force. In direct acting valve train, the temperature of lubricant approached the fire point of lubricant and may lead to failure of oil film thereby promoting scuffing and polish wear of tribological components.

Keywords: Flash temperature, cam/tappet friction, oil film thickness, camshaft speed

Nomenclature

A	distance between the centre of rotation of the follower and the centre of curvature of the follower face in contact with the cam
A_a	apparent area of contact
A_r	real/asperity area of contact
a	heat flux form factor
B	distance between the centre of rotation of the follower and the centre of curvature of the follower face in contact with the valve
b	half width of Hertzian line contact
bb	thermal contact coefficient
C, ń	viscosity-pressure equation constants
c	specific heat per mass
c_1, c_2	constants for lubricant thermal conductivity at pressure P
D	distance between the centre of rotation of the follower and the cam axis of rotation
É	elastic modulus
E	equivalent elastic modulus, $2/\{[(1-ύ_c^2)/É_c]+[(1-ύ_f^2)/É_f]\}$
F	total friction force
F_B	boundary friction force