

The research on tribological behaviors of lubricating oil in TFL

Jie ZHANG

(Center of Lubricants Research and Development, Petrochina, Dalian China 116031)

Abstract: On the basis of thin film lubrication theory, the influence of fluid film (disordered film), ordered film and adsorbed film on tribological behaviors of lubricating oil in TFL was studied. The μ -L (friction coefficient versus load) curves of different viscosity and additive dosage were obtained by a high frequency reciprocating test rig and the adsorption capacity of additive on steel surface were measured by QCM-D. Based on Stribeck curve and thin film lubrication theory model, some conclusions can be drawn that (1) when film thickness declines to a certain value, hydrocarbons in base fluid tend to form ordered-orientation layer on surfaces by the effect of adsorptive and intermolecular force;(2) the lower viscosity makes base fluid enter into TFL more easily and keeps friction coefficient in a lower degree;(3) additive molecules produce high-ordered , stable and thinner adsorbed layer on surface by means of their functional groups,and in TFL, molecule polarity of additive and saturation level on surface can influence anti-wear performance greatly.

Key words: thin film lubrication (TFL), adsorption film, quartz crystal microbalance (QCM), Stribeck curve