

FRICITION AND WEAR PROPERTIES OF TIN PLATED SLIDING CONTACTS UNDER OIL LUBRICATED CONDITION

Hiroyuki Nakagawa and Koei Matsukawa

Mitsubishi Electric Corporation Advanced Technology R&D Center
8-1-1, Tsukaguchi-honmachi, Amagasaki City, Hyogo 661-8661, JAPAN

ABSTRACT

The friction and wear properties of tin-plated sliding contacts under an oil lubricated condition were studied. Reciprocation friction and wear tests were made on pin-on-plate type apparatus for a normal load of 9.8 N to 98 N at 25 °C, 55 °C, and 75 °C. The coefficient of friction of tin-plated contacts for a normal load over 49 N was quite low at around 0.2, whereas the coefficient of friction of non-plated copper contacts was around 0.8. However, at temperatures of 55 °C and 75 °C, unstable and sudden increases in friction were often measured. This phenomenon of friction increase was not observed for tin-plated contacts at 25 °C, or for silver-plated contacts at 25 °C, 55 °C, and 75 °C. Moreover, the wear of tin-plated contacts significantly increased with increasing temperature.

In order to clarify the mechanism of the phenomenon exhibited by tin-plated contacts, the lubricity of oil and the lubricity of tin plating were analyzed individually. To investigate the effect of temperature on oil lubricity, the ratio of contact between metals of each contact under boundary lubrication was calculated. It was found that the calculated ratio of contact between metals of each contact significantly increased with increasing temperature. And, wear of tin-plated contacts was promoted by the softening of the tin plating at high temperature. Thus, it was cleared that the friction and wear properties of tin plated sliding contacts under oil lubricated condition were vulnerable to temperature effects on both oil and plating lubricities.