

Exploration of Graphite Nano-Particles as Anti-Wear Additive for Performance Enhancement of Oil

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Abstract : Additives in lubricating oils are the focus of research attention since the further reduction in friction and wear properties of oils would lead to the further saving of tribo-materials and energy apart from improving their efficiency. Remarkable tribo-performance enhancement is reported in the literature due to addition of particles of solid lubricants in lubricating oils; especially that of nano-sizes. In the present work graphite nano-particles (NPs) in various amounts (1, 2, 3 and 4 wt. %) were used to explore the possible anti-wear (AW) performance enhancement in Group III oil. Polyisobutylene succinimide (PIBSI- 1 wt. %) was used as a dispersant for dispersing these NPs and to enhance the stability of these nano-suspensions. It was observed that PIBSI inclusion enhanced the stability of oil almost by eight times. NPs in all amounts enhanced the AW performance of oil considerably. The optimum amount was three wt. %, which led to the highest enhancement under all loads. The extent of benefits, however, were dependent on load. At the lowest (392 N) and highest loads (784 N), the benefits were not profound. At moderate load (588 N), highest improvement (around 60 %) was recorded. The SEM and AFM studies were done on the worn ball surfaces to reveal the detailed features of films transferred and proved useful to correlate the wear performance of oils.

Keywords : dispersant, graphite, nano-lubricant, anti-wear additive

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