S. K. Vij[2]

Dr. Prakash and Mr. Sinha are to be congratulated for their excellent contribution in explaining the discrepancies between the experimental results and the theoretical results obtained from the classical Newtonian theory, for the case of fluid flow in narrow passages.

Needs [6], in his detailed experimental study for the case of squeeze film between two optically-plane parallel circular plates, observed that for values of film thickness less than 0.00127 mm., the actual response time of the squeeze film was more than that predicted by the Newtonian theory. This indicates that in such thin films, the effective viscosity of the lubricant increases from its Newtonian value. In fact, as observed by Needs, the effective viscosity in the boundary film (thin film) might even be five times the bulk value. However, no satisfactory explanation for this increase in the effective viscosity was offered.

A successful attempt to explain the increase in effective viscosity in the boundary film has been made by Dr. Prakash and Mr. Sinha. They have shown that in the boundary film, the fluid behaves no more as a Newtonian fluid; rather it behaves as a micropolar fluid. To verify their statement, they have analyzed squeeze film between parallel circular plates using micropolar fluid theory, and compared the results with the corresponding experimental results by Needs [6]. As an example, they have calculated the time for the film thickness to reduce from 0.00406 to 0.00127 mm., taking $L = 7$ and $N^2 = 0.1$; the result is 4692 sec which is almost the same as that measured experimentally by Needs (4680 sec). However, the similar time as calculated using the Newtonian theory is 4296 sec.

In my opinion, the work done by Dr. Prakash and Mr. Sinha is a positive contribution in the theory of hydrodynamic lubrication in general and in squeeze films in particular.

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