Guidance - Adhesive Wear and Scuffing - Starved Contacts

The following arrangements can be used for:

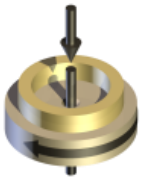
Friction measurement under boundary and potentially mixed lubrication

Adhesive wear tests

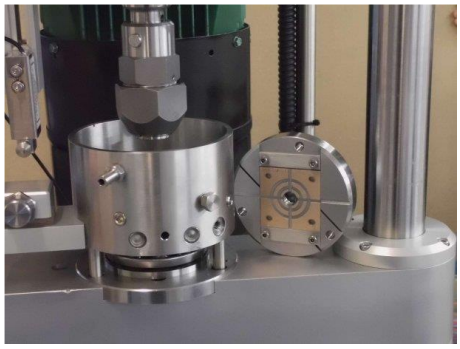
Scuffing tests

There may be the potential to run tests under hydrodynamic lubrication, but only with specially designed specimens and with adequate entrainment conditions.

Thrust Washer

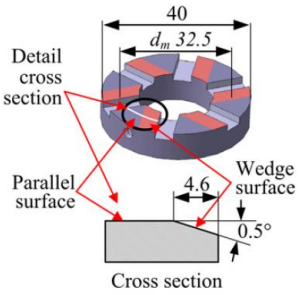


The thrust washer geometry is effectively a sliding face seal, in other words, a system designed to prevent lubricant from getting from one side of the contact to the other. For perfectly flat surfaces, lubricant entrainment is impossible, hence such a contact can only operate dry or under boundary lubrication.



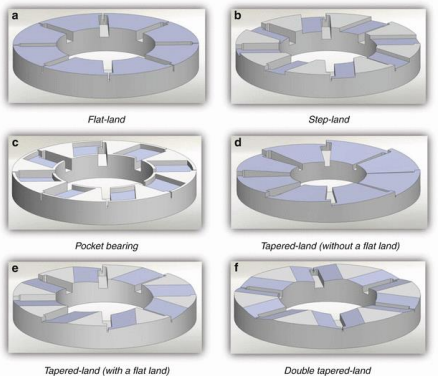
To facilitate lubricant entrainment, radial grooves must be machined in one surface, as in various designs of plain thrust bearing and in the JASO Suzuki test geometry. This arrangement will still only operate, at low speeds, under boundary lubrication and, at high speeds, potentially under a mixed regime.

To produce more predictable lubricant entrainment, grooves with a converging wedge profile are necessary. With this type of geometry, and sufficient entrainment velocity, it should be possible to generate mixed and hydrodynamic lubrication regimes.

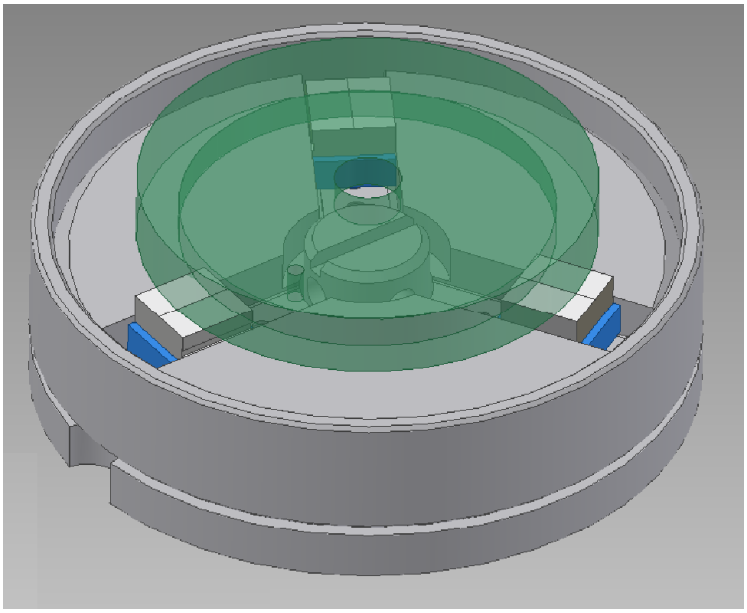


Tribological performance of thin overlays for journal bearings
F Grün, I Godor, W Gärtner, W Eichlseder
Tribology International44(2011)1271–1280

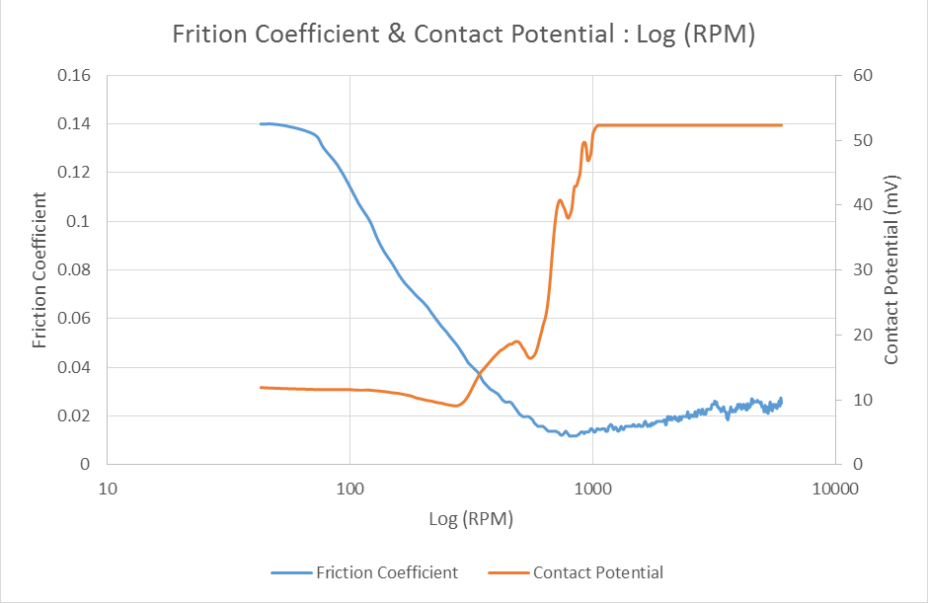
This arrangement is essential a "tapered land/flat land" thrust bearing arrangement. Other geometries could be considered, for example, "flat land" with radial flow restriction and central oil feed:



Three Pad Thrust Bearing (Stribeck) Test Adapter



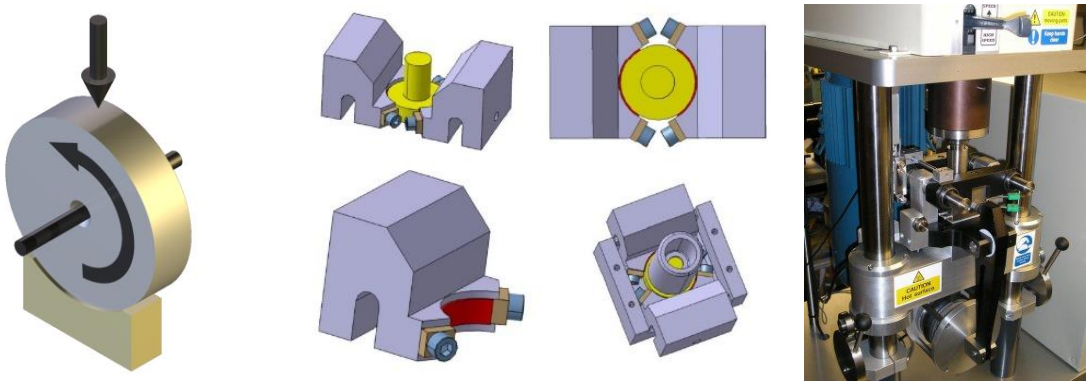
The three-pad adapter uses taper/flat-land pad specimens and allows a Stribeck Curve to be generated in under ten minutes, with less than 250 ml lubricant sample.



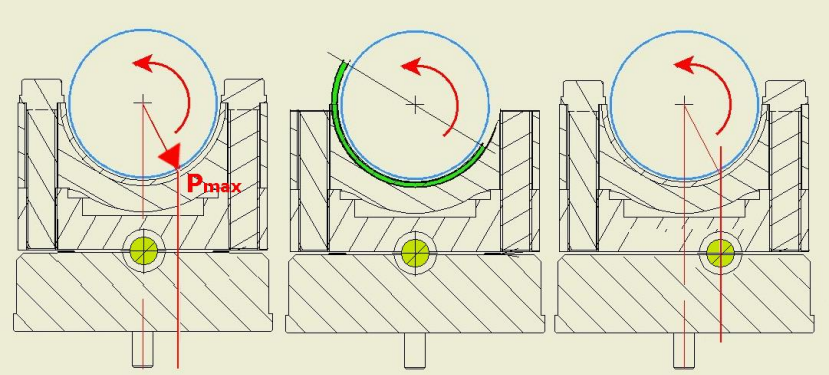
This test involved a speed sweep, from zero to 6,000 rpm, with data recorded at 10 rpm speed increments. The lubricant in this example was an ISO VG 68 oil, at 40°C and the load was 100 N, giving a contact pressure of 1.33 MPa.

The adapter allows friction and wear tests to be performed on coated bearing materials samples under different, well defined, lubrication regimes.

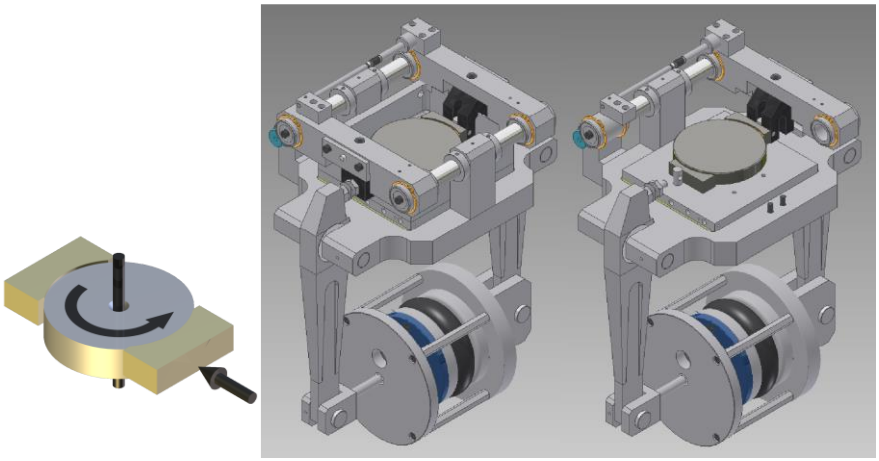
Partial Journal Bearing



This sort of arrangement (University of Leoben) looks promising for lubricated friction tests, however, it only works satisfactorily for tests requiring starved lubrication.



In a journal bearing, the point of peak pressure is not on the centre line. With a half journal bearing contact configuration (which includes conforming block on ring), this results in the inlet being closed, preventing lubricant entering the bearing contact. Designers of partial journal bearings address this problem by designing bearings with the required “pre-load” and “off-set”.



Pre-loading is achieved by adjusting the bearing radius relative to the journal, to ensure converging wedge entrainment conditions. It will be noted that the greater the pre-load, the closer the contact becomes to a line contact.