

## BioTribology Investigation

The field of BioTribology is rapidly growing and gaining interest from all over the world. Studies on the tribology of biological systems allows the use of existing tribology experimental techniques, with minor adjustments. The EHD2 film thickness rig and the Mini Traction Machine (MTM2), both manufactured by PCS Instruments have been used successfully to study tribological effects of biological systems, including: artificial hip joints, mouth feel and skin creams. These are highlighted here.

### EHD2 - Film thickness

The EHD film thickness rig can be used to measure lubricant film thickness with nanometer resolution between a steel ball and a glass disk (Figure 1). In the field of Biotribology, bovine serum and model protein solutions have been used to model synovial fluids, these have been studied using the EHD2 rig, with a steady state of load and speed (1).

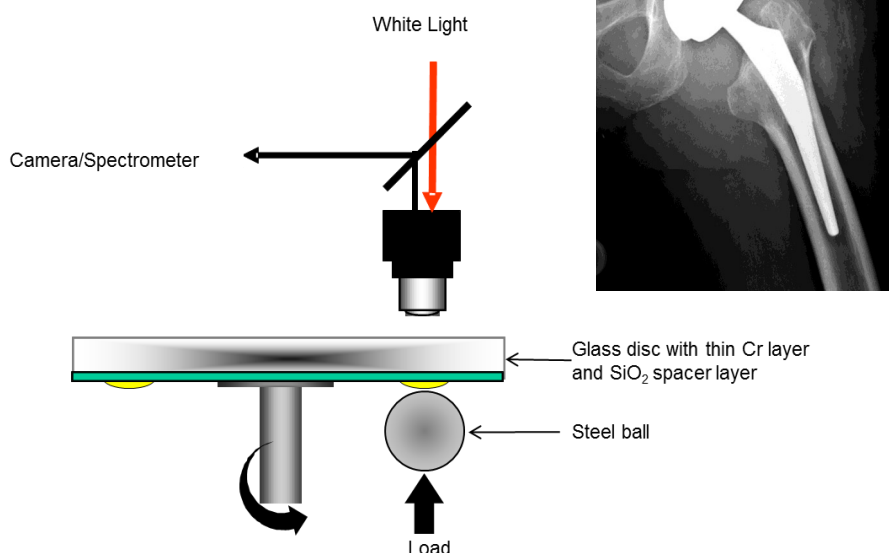


Figure 1: Schematic diagram of the contact between a steel ball and a glass disk in the EHD rig

The contact can be studied by using a spectrometer and a camera, utilising optical interferometry. A single value for the lubricant film thickness is taken from the centre of the contact, or a film thickness map can be generated by using the colours from the microscope image (Figure 2).

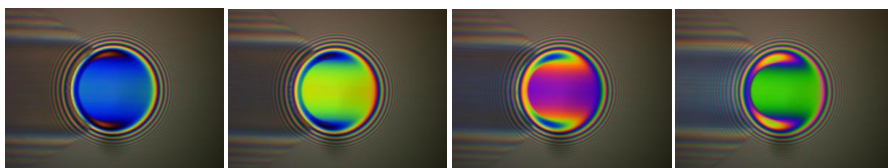


Figure 2: Example of optical interference images taken from the EHD2

Further reading:

(1) Tribology International, 44: 550-556, 2011

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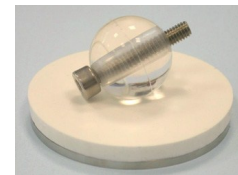
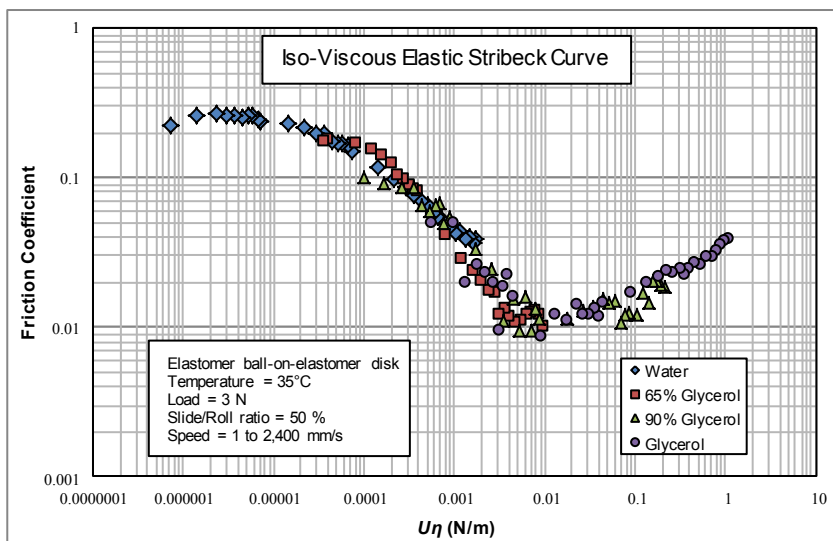
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# PCS Instruments

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## Mini Traction Machine (MTM2)

The MTM measures the friction generated between two test samples, a ball and a disk. The standard test specimens are steel, which are used to mimic engine parts, these can be replaced with soft elastomer and similar materials to simulate living tissues. The MTM allows a range of speeds, slide/roll ratios and loads to be studied, allowing the emulation of different biotribology conditions.



When soft samples are used, the lubrication regime can be described as Iso-Viscous Elastic. This has been investigated here by producing a Stribeck curve by using fluids with a range of viscosities (Figure 3). This is a useful tool for studying the lubrication regime of biotribology systems.

Figure 3: Iso-Viscous Elastic Stribeck curve, formed between an elastomer ball and an elastomer disk

Skin mimic materials can be used to create a skin-on-skin type contact within the MTM. The friction of this type of contact has been studied here in a pure sliding contact where the skin is

- (1) dry
- (2) lubricated with a shaving gel
- (3) lubricated with a skin cream (Figure 4)

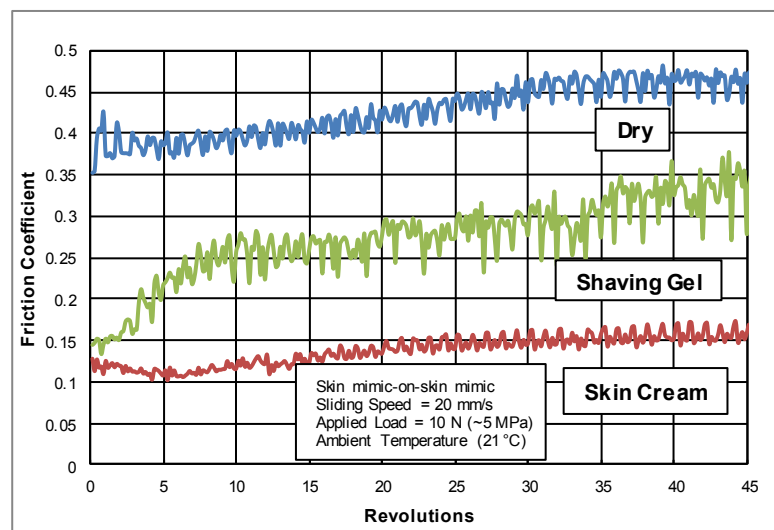
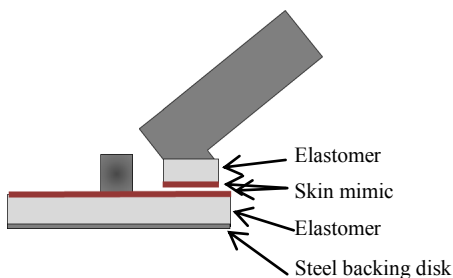


Figure 4: Sliding friction measured between skin mimic samples

Further reading:

- (2) Tribology International, 40: 1531-1542, 2007
- (3) Journal of Tribology, 128: 795-800, 2006