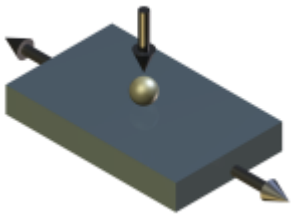
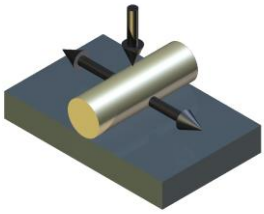
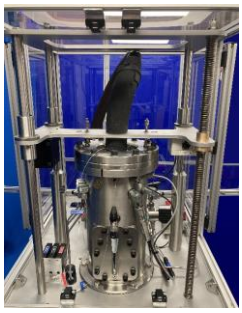
TRIBOLOGY UPDATE: *ISSUE 41 – March 2022*

This is the latest issue of our **Tribology Update** newsletter.

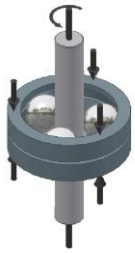
WORK IN PROGRESS – DEVELOPMENT

TE 60 High Pressure Hydrogen Reciprocating Tribometer

We have made a number of changes to the TE 60 design, to address a number of limitations and unnecessary features. Firstly, we have modified the tooling to allow line contact specimens to be mounted, including O-ring material sections. With line contact specimens, a higher load is more appropriate, hence the load range has been increased from a maximum of 50 N to 100 N. We have reduced the operating pressure to 100 bar from 150 bar, because having higher pressures seems to make little difference, but adds significantly to the cost. Finally, we have removed the wear displacement sensors, as the wear generated with such a light load device is rarely sufficient to generate useful on-line wear measurements.

RCF 6 Multi-station Three Ball on Rod Machine

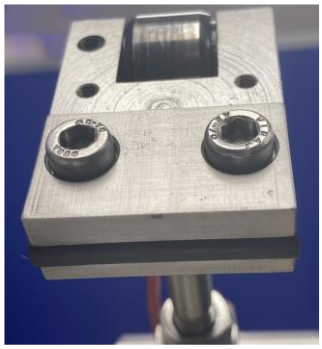


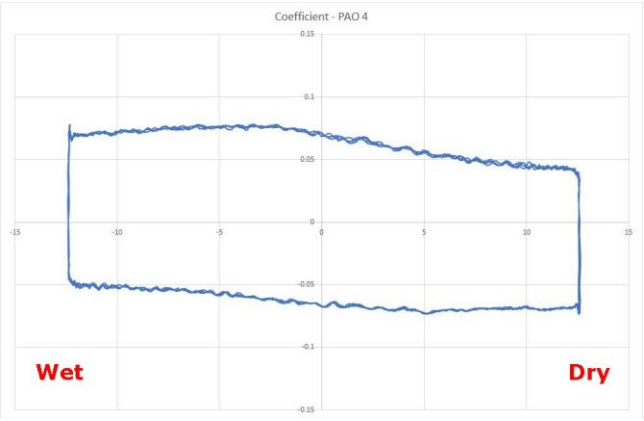
Having successfully run a standard ball on rod rolling contact fatigue test geometry, on a TE 92HS, at 10,000 rpm, we are now looking to increase the maximum speed of RCF 6 to 20,000 rpm.

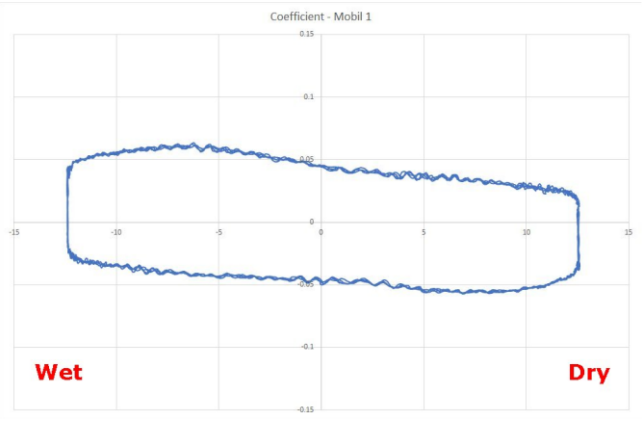
COMPLETED PROJECTS – DEVELOPMENT

TE 77 High Frequency Friction Machine

We have designed and tested a tool for mounting a straight length of 6 mm diameter O-ring material.





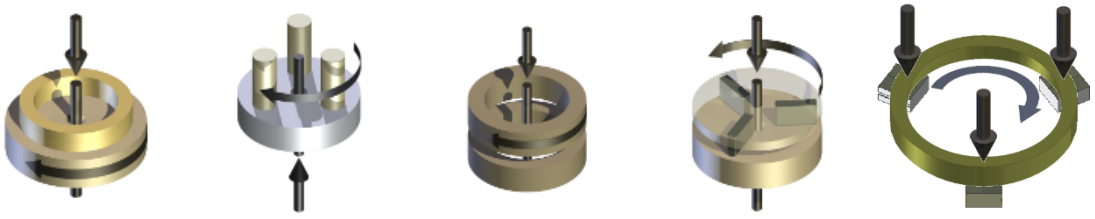


Edge effects are avoided by running on a curved edge plate specimen, with the O-ring sample overlapping the curved edge. The curved edge specimen also makes it possible to apply lubricant to just one side of the contact; there is no path for the lubricant to flow past the O-ring.

The high-speed friction loops readily indicate different levels of friction; the direction around the loops is clockwise, with the wet side of the contact on the left-hand side of the graphs. What is interesting is that the instantaneous friction is more or less identical in both sliding directions, whether sliding from wet to dry, or dry to wet.

TE 92 Rotary Tribometer - Area Contact Specimens

Rationalisation



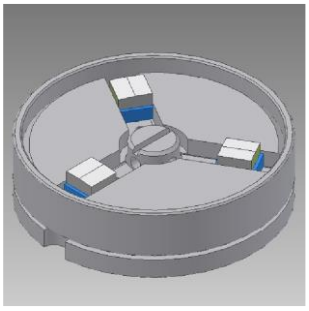
The number of different specimen configurations that qualify as area contacts has grown over the years. In the past, we used to offer a single test bath with the option to include a capacitance probe for wear displacement measurement. In practice, sensible wear measurements can only be made with specimens and test conditions that generate a significant amount of wear, which really limits the usefulness of the capacitance probe to dry sliding tests using materials such as polymers. We have therefore decided to make things simpler and clearer by offer two type of specimens mounting:

- TE 92/AREA-L: A heated test bath and shaft hub for lubricated tests, without capacitance probe, to be used with any of the six current tooling inserts.
- TE 92/AREA-D: A specimen mount with capacitance wear sensor and shaft hub, for dry tests using either three pin-on-disc or thrust washer tooling.

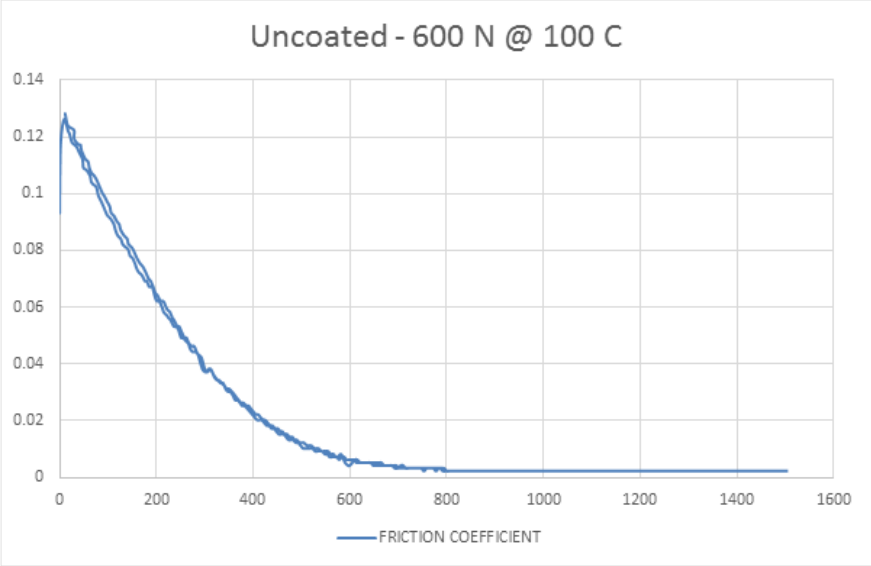
Tooling inserts now comprise the following:

- TE 92/AREA/1 Three Pin on Disc Tooling
- TE 92/AREA/2 ASTM D3702 Thrust Washer Specimen Tooling
- TE 92/AREA/3 LVFA (small) Specimen Tooling
- TE 92/AREA/4 Vane Pump Specimen Tooling
- TE 92/AREA/5 Suzuki Test Specimen Tooling
- TE 92/AREA/6 Three Pad Thrust Bearing (Stribeck) Tooling

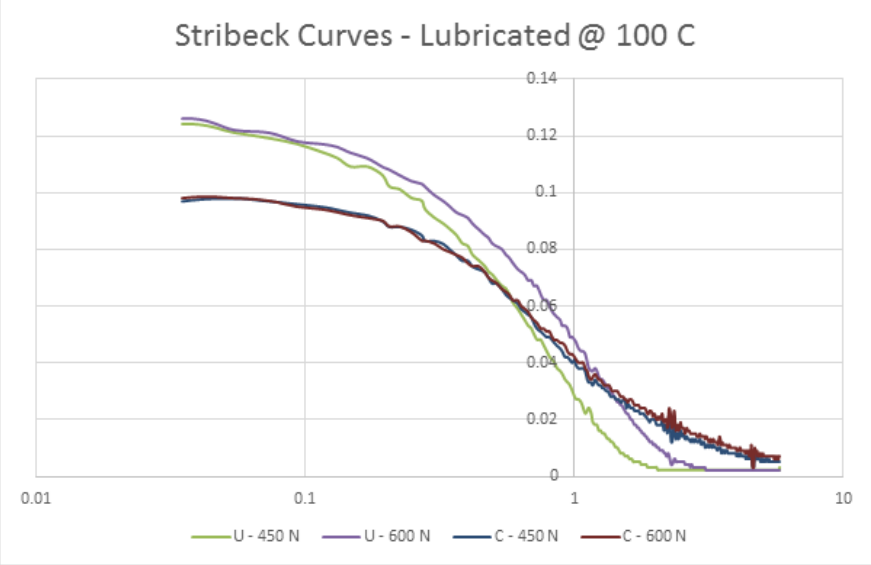
Stribeck Curve



We have now optimised the taper wedge angle and surface finish of our taper land/flat land specimen pads, with encouraging results.



The first effect is to allow us to run continuous speed ramps with both increasing and decreasing speeds, generating up and down curves that are pretty much identical.



When it comes to curves with different materials, we begin to see some interesting behaviour. In this case, a coated and an uncoated test ring are compared, demonstrating much reduced friction in the boundary regime with the coated specimen, but delayed arrival at the hydrodynamic regime. Furthermore, in the hydrodynamic regime, the coated ring produces slightly higher friction than the uncoated ring.

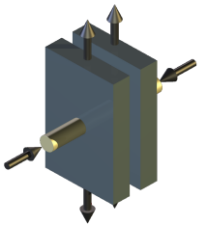
USLIM Motherboard

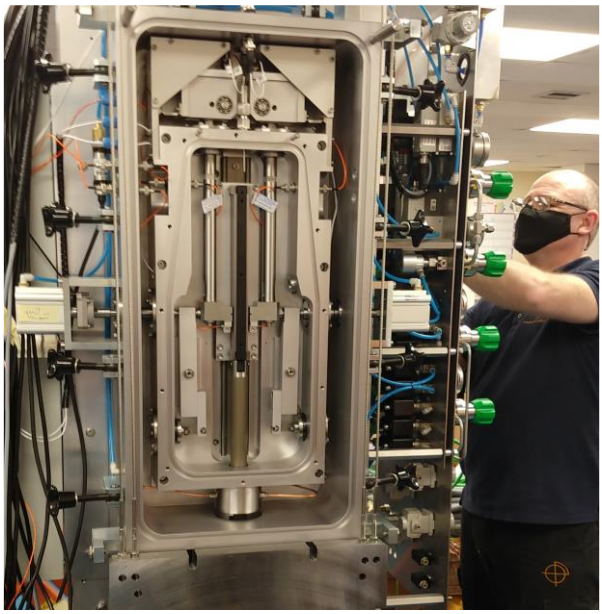
We have now designed a motherboard for our latest USB compatible serial link interface module.

This is designed to be an exact plug-in replacement for older SUPERSLIM based systems, thus allowing easy upgrade of legacy systems.

WORK IN PROGRESS – PRODUCTION

TE 104 Long-stroke Hydrogen Reciprocating Rig

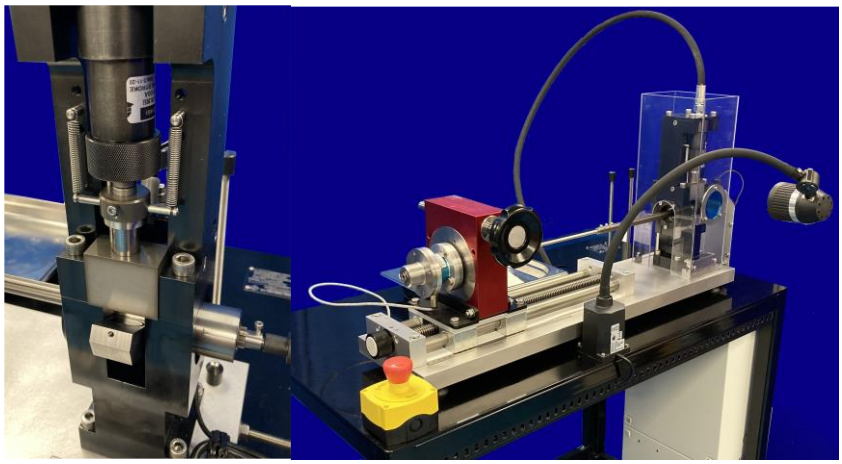




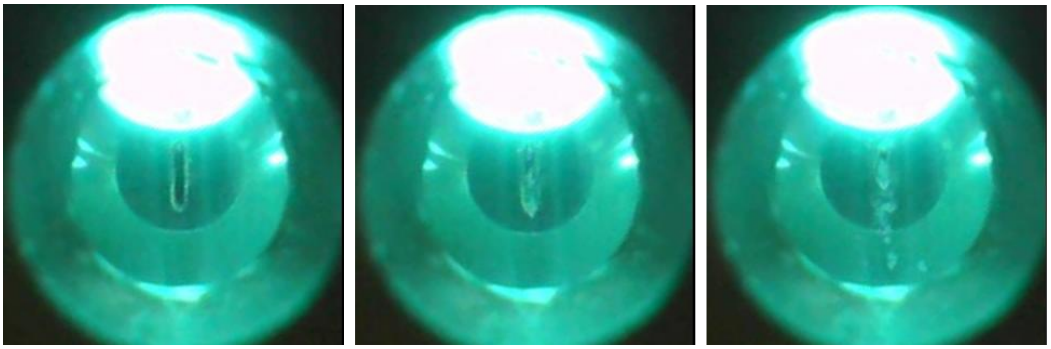
The first of the much modified and performance enhanced TE 104 High Speed Reciprocating Machine is currently being assembled. The four-station machine, designed to run at strokes up to 200 mm, frequencies up to 20 Hz and loads up to 500 N, comprises an inner hydrogen test chamber, rated to 5 bar pressure, inside an outer nitrogen chamber, rated to 10 bar. Instrumentation includes friction, wear and non-contact temperature sensors on each test station.

COMPLETED PROJECTS – PRODUCTION

TE 43 Impact Sliding Tester

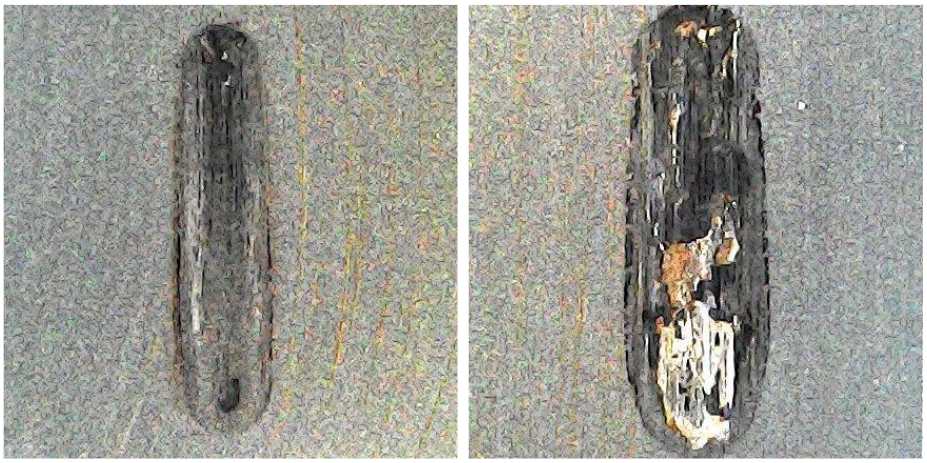


We have now completed the first production TE 43 unit (Tribology Update 40) and implemented on-line image capture during the wear process.

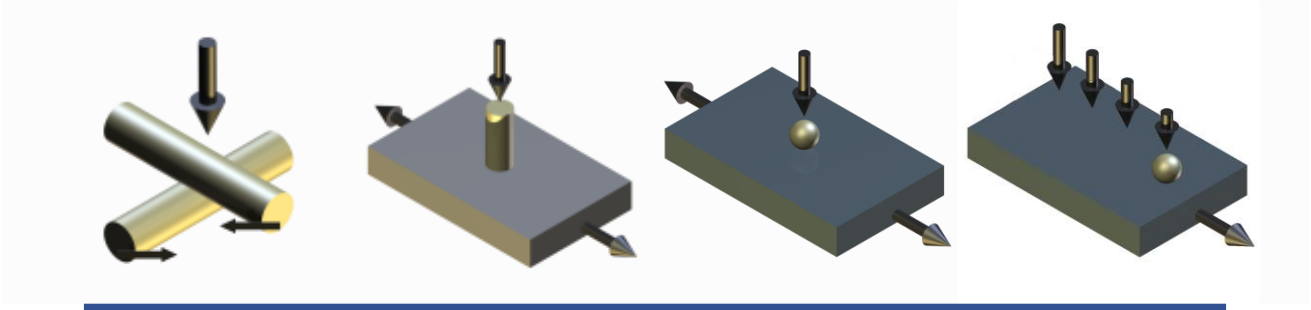


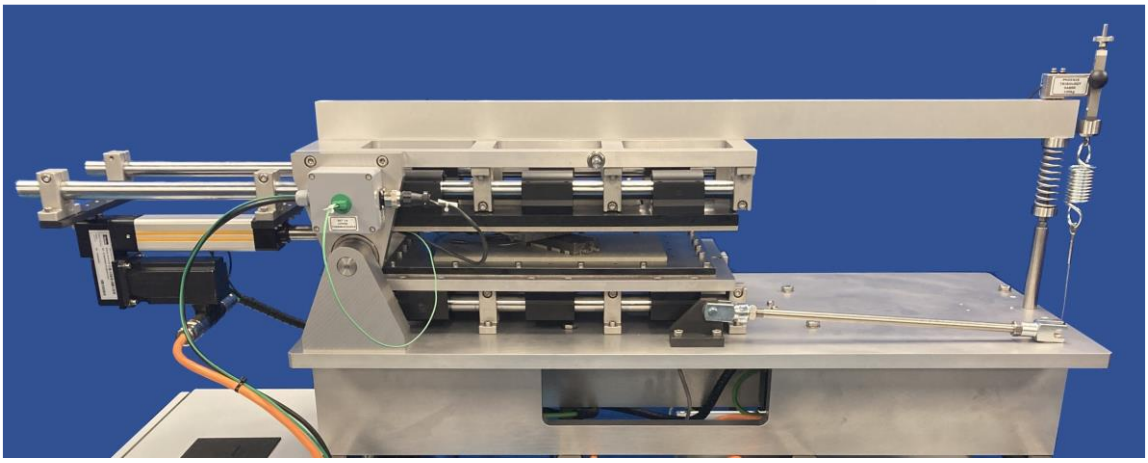
Impacts: 1100 1150 1200

Obviously not as clear as the post-test images, the real-time images do allow the user to identify the point during the test at which debris first appears.

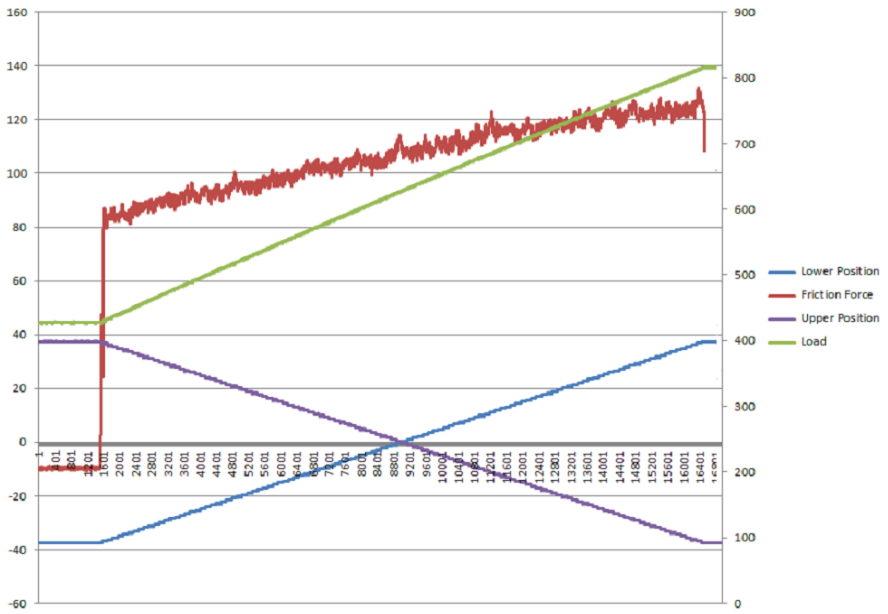


TE 69 Load Scanner





The original load scanner was developed by Professors Sture Hogmark and Staffan Jacobson at Uppsala University, Department of Materials Science, Sweden. The original design used one actuator to generate sliding motion, while at the same time tensioning a spring, to apply load. With the latest version of the TE 69, the samples are indexed and the load applied by three independently controlled, but synchronised motion, actuators. This provides a significant increase in the functionality of the machine.



In addition to the original load scanner test configuration, with the upper specimen carriage parked, the upper sample can be replaced by a pin or an indenter.

The machine can then be used in reciprocating pin on plate mode. Independent control of the load allows tests to be run with a steady state load, or with a ramped load, as in a conventional scratch test.

OTHER NEWS

On-line Tutorials

Slides and scripts for all tribology tutorials can be downloaded from our web site, including the two most recent editions:

Friction Force Measurement in Reciprocating Tribometers

Wear and Friction in Sliding Point Contact Tests

Conferences and Exhibitions

We are planning to attend both STLE and WTC this year.

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