TRIBOLOGY UPDATE: *ISSUE 27 - SEPTEMBER 2012*

This is the latest issue of our **Tribology Update** newsletter. The last six months have been exceptionally busy for us, so we have a lot to report. For further information, we can be contacted by e-mail at ***info@phoenix-tribology.com***.

ADMINISTRATIVE DETAILS:

After struggling with the limited space at Woodham House, we finally decided we could not continue as before and at the beginning of August moved into new facilities, with four times the workshop area. Our new address and telephone number:

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Kingsclere Park
Kingsclere
Hampshire
RG20 4SW
UNITED KINGDOM
Telephone Phone: +44 1635 298279

UNDER CONSIDERATION:

Fifty Station Reciprocating Pin on Plate Wear Generator

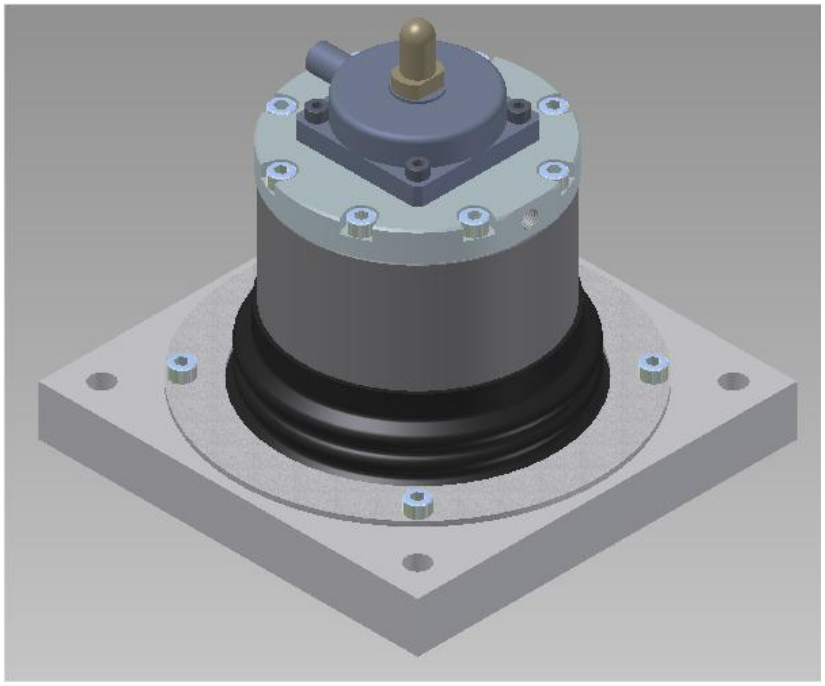
The *TE 87 Circular Translation Pin on Disc Machine* comes in two versions, one with fifty test stations and one with one hundred test stations. The pin sample motion is orbital following either a circular, elliptical or reciprocating path. We have realized that we could use the fifty pin test head from the TE 87 to create a cost effecting fifty station reciprocating pin on plate machine, with a maximum stroke of 50 mm, without producing overlapping wear tracks. So, should anyone wish to have a 50 station, 50 mm stroke, reciprocating pin on plate wear generator, with a maximum load per pin of 100 N, we have the resources to produce such a device.

High Pressure Rotary Tribometer

We are currently working on a design proposal for a high pressure rotary tribometer, with provisional maximum chamber pressure of 15 MPa, to allow tests to be run with refrigerants under pressure.

WORK IN PROGRESS – PRODUCT DESIGN & DEVELOPMENT:

Compact "half-wave pulse" load hydraulic actuator



The design for the simple half-wave pulse load hydraulic actuator is now complete and prototypes are being manufactured and tested. The idea is to produce a compact, cheap and simple alternative to a conventional servo hydraulic dynamic loading system. With a single acting actuator (push only as opposed to push and pull) the full pressure area of the piston can be used. Two sizes of actuator are currently under development, one with a 50 mm diameter piston, which generates 60 kN at 315 bar operating pressure, and a 75 mm diameter piston unit, which generates 143 kN.

The hydraulic pulse is generated by a standard radial hydraulic piston pump. A conventional hydraulic radial piston pump will typically have three or five pistons driven by a common cam shaft. The outputs from each piston are normally ganged together and connected to an accumulator to smooth out what would otherwise be a pulsating flow, allowing a steady pressure to be delivered to a hydraulic system. For the pulse actuator system, instead of ganging the outputs together, each output is connected either directly to a piston or, if not required, to a by-pass. A simple pressure relief valve is fitted downstream of the piston, which controls the peak pressure, with one pulse being generated per actuator, per rotation of the pump. Hence, pulse frequency is controlled by pump rotational speed and pulse magnitude by setting the pressure relief valve. The pulse shape, which is not controlled, depends on the dynamics of the system; it may be possible to control this by adjusting the hydraulic "stiffness" of the system.

The actuators are currently design to be just less than 150 mm high, so should fit conveniently into a test rig where loading is provided by conventional, steady sate loading, pneumatic bellows. The purpose of the actuators is, obviously, to provide a cheap and simple means of generating dynamic loads.

Rolling Contact Fatigue 3

This development is the third in a recent series of rolling contact fatigue test rigs and is aimed at testing rolling element bearings in pairs, "back to back", with combined axial and radial loading. The latter is to be dynamic and it is this requirement that has stimulated development of the pulse actuator. A three-station test rig, hence with three actuators connected to a single three piston hydraulic pump, is envisaged. The project is currently pending UK government funding approval.

Vacuum Reciprocating Tribometer

Following the success of the *TE 91 Rotary Vacuum Tribometer*, we have been asked to produce a design study for a two station 25 mm stroke reciprocating vacuum tribometer, with a load range from 1 to 100 N and a temperature range from -50°C to 150°C.

WORK IN PROGRESS – MODIFICATIONS:

TE 34 Piston Ring Micro-welding

The piston ring micro-welding adapter has until recently been offered as an adapter on the standard TE 77 High Frequency Friction Machine. This never made a great deal of sense, as the machine was used simply to provide motive power. We have therefore decided to offer the micro-welding adapter as a free-standing unit in future.

TE 77 Gas Enclosure

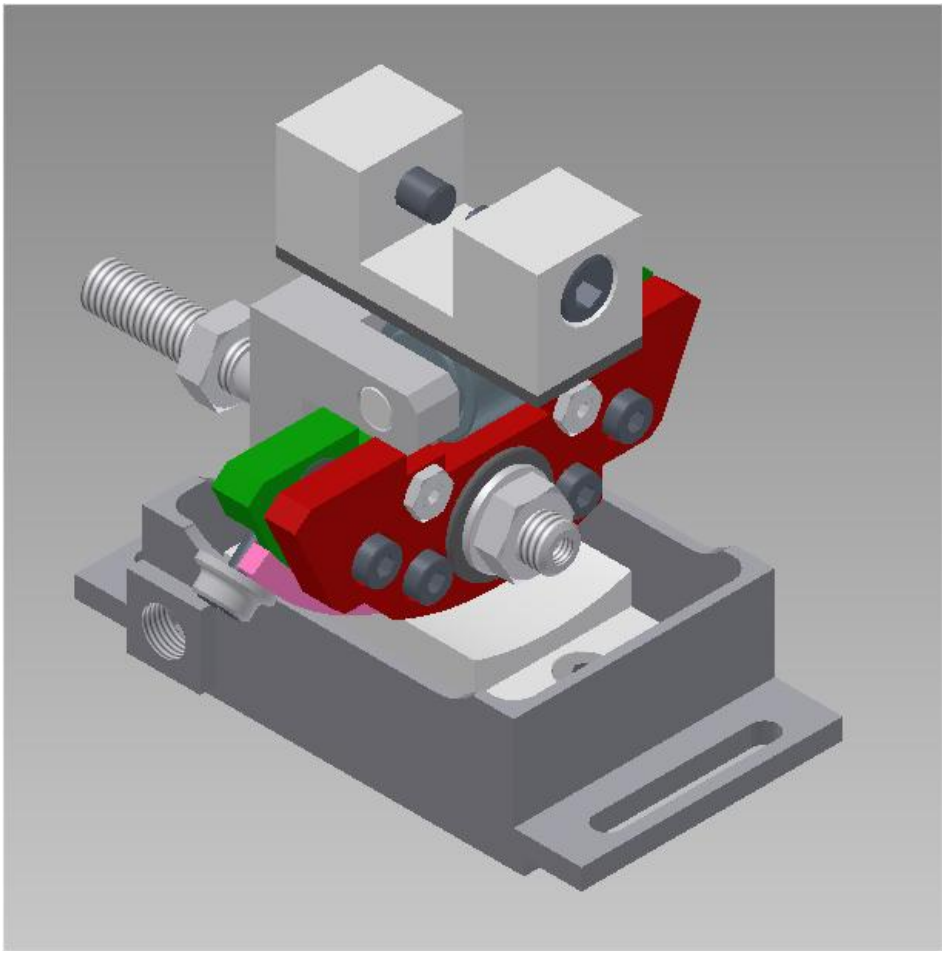
The current TE 77 High Frequency Friction Machine gas enclosure fits over the complete test assembly, thus covering transducers, cables and other sensitive components. We are working on a design for a much smaller enclosure that fits directly to the specimen bath, thus excluding sensitive components from the enclosure. We hope this will allow us to run tests in more challenging environments.

TE 77 Impact Wear Adapter

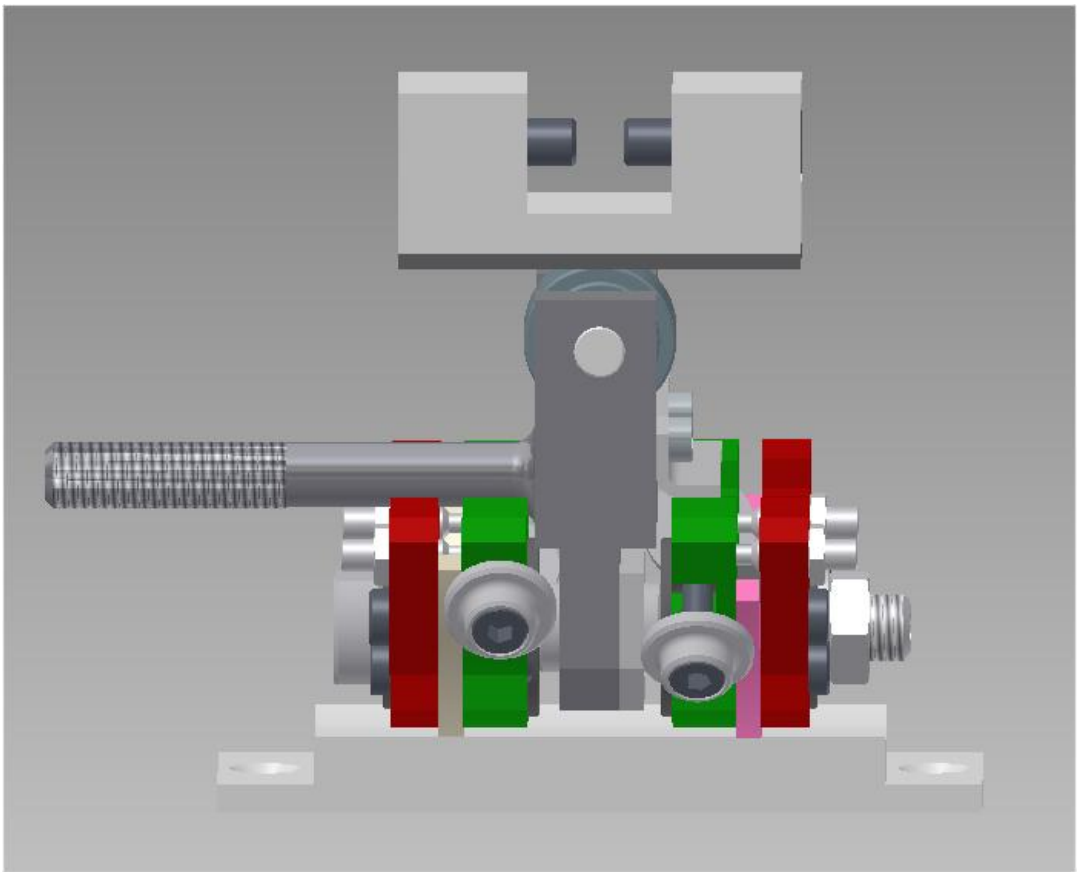
We are working on a design for an impact sliding test adapter for the TE 77 High Frequency Friction Machine. The idea is to use the reciprocating motion to drive a ball or cylinder (in line contact) between to inclined plates, sprung loaded inwards, thus providing resistance to sliding motion, once contact is made. By adjusting the point of impact to the mid-stroke position of the reciprocating motion, the velocity of impact can be maximized. This is a speculative development, but we are hoping that it may prove useful in modeling impact sliding contacts such as occur in forming processes and in valve seats.

WORK COMPLETED:

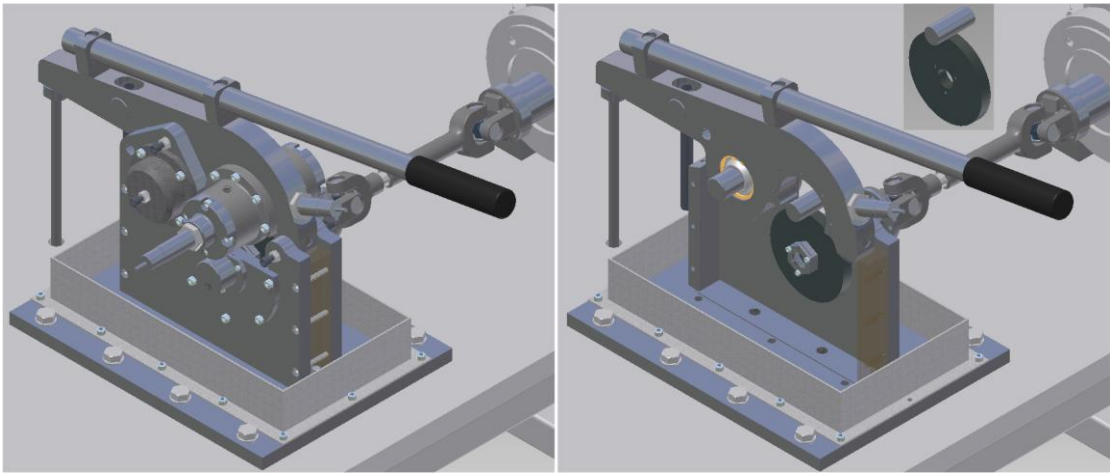
Single and Twin Piston Ring Adapter



Design of a new piston ring clamp with ring diameter adjustment has been completed and can be used on both the TE 77 High Frequency Friction Machine and the TE 33 Engine Tribometer. The clamp can be used either singly or two clamps can be mounted in tandem allowing two ring samples to be used simultaneously.

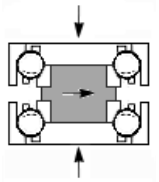


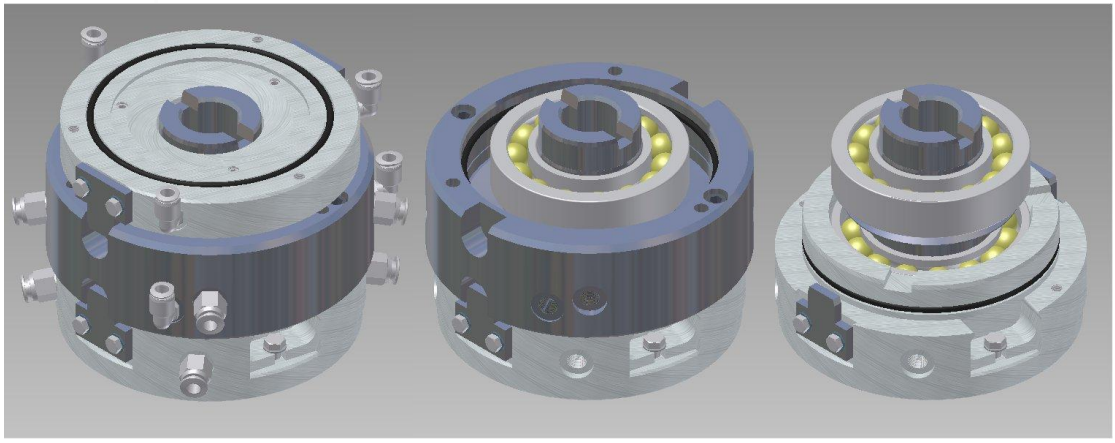
Rolling Contact Fatigue 1



Development of the RCF 1 rig is now complete and details have been added to the web site.

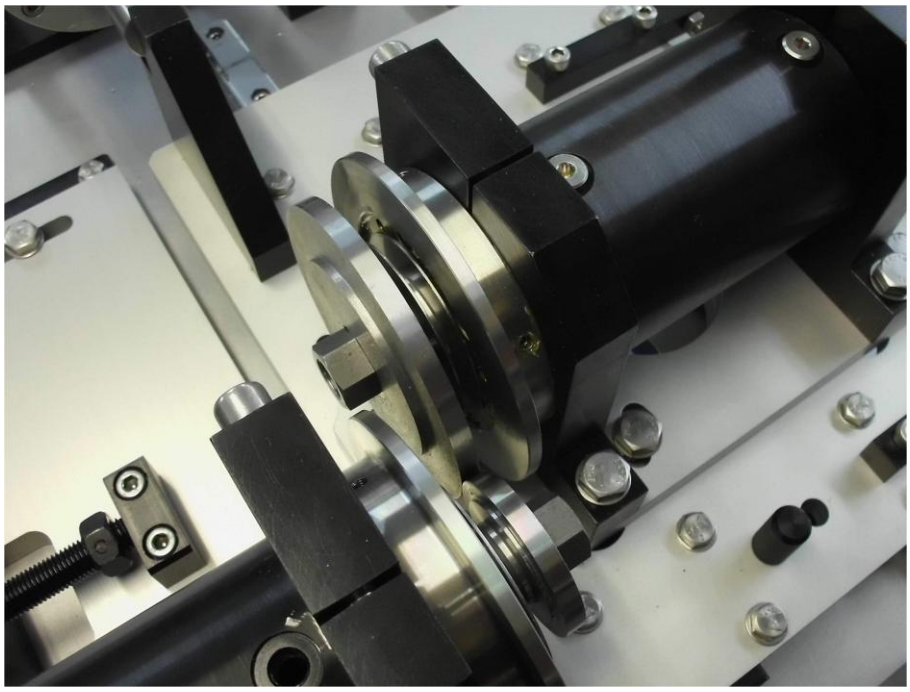
Rolling Contact Fatigue 2





Development of the RCF 2 rig is now complete and details have been added to the web site.

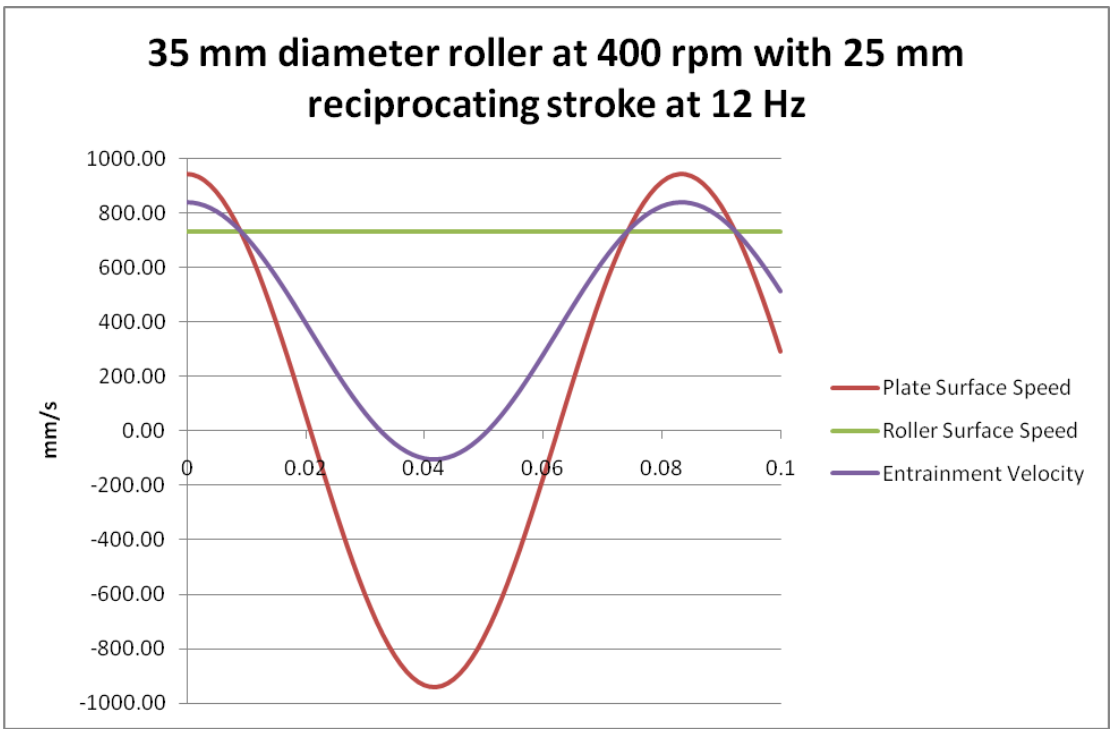
TE 72 Two Roller Machine



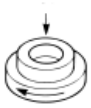
The TE 72 Two Roller Machine design, which is an arrangement with rollers mounted on shaft ends, has been resurrected and updated. This is a lower capacity machine than the TE 74 Two Roller Machine, where the rollers are mounted on shafts between bearings, but allows much greater flexibility with regard to the choice of roller diameters, as the shaft centre distances are fully adjustable.

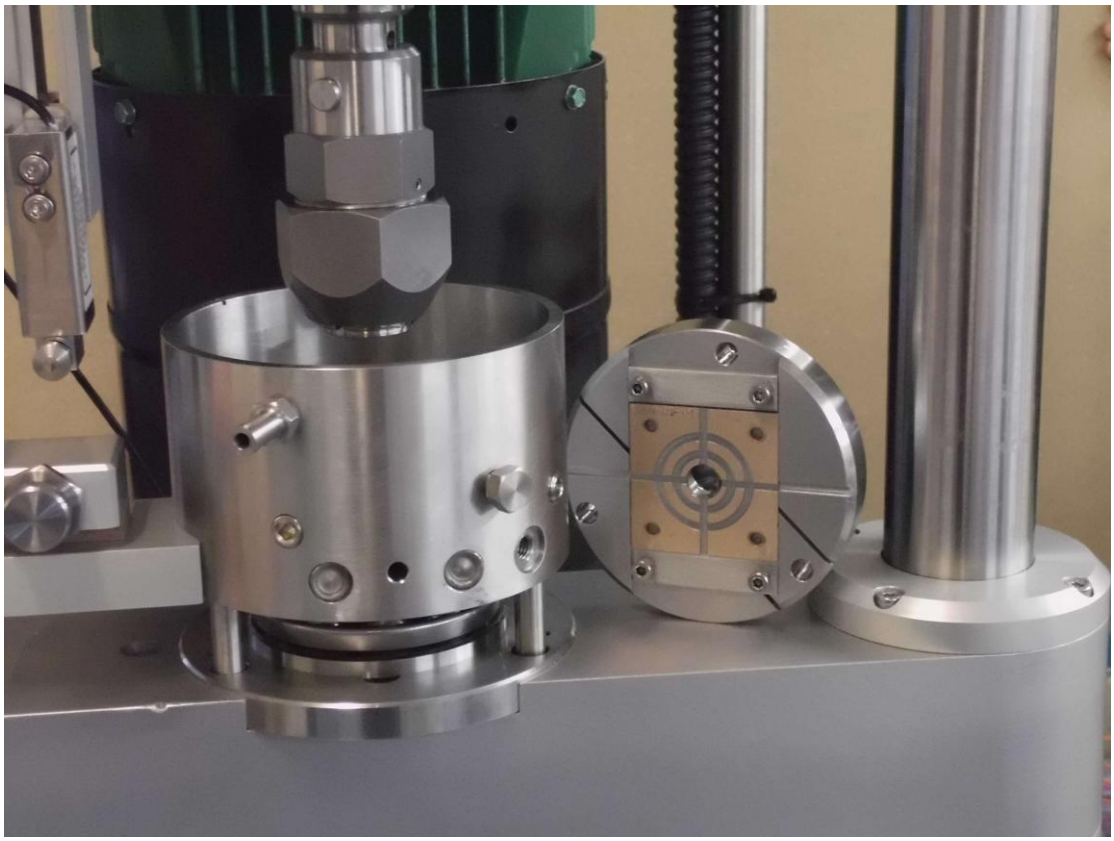
TE 77 Slide/Roll Adapter

The original TE 77 High Frequency Friction Machine Energy Pulse (Slide/Roll) Adapter provided a reciprocating plate on rotating roller arrangement, with both reciprocating motion and rotational speed driven by machine's motor. A new adapter has been designed incorporating a second motor, thus allowing independent control of frequency of reciprocating and rate of rotation, hence real-time adjustment of the entrainment velocity in the contact, including generating regions of negative entrainment.



TE 92 Suzuki Test Adapter





A modified version of the standard TE 92/6 Thrust Washer Test Adapter has been produced to accommodate standard “Suzuki” test samples.

OTHER NEWS:

TE 80 Head Repair and Replacement Service

The TE 80 Two Station Fuel Lubricity Wear Test Machine is a very simple device that, unlike other products, incorporates nothing that needs calibration. As the stroke is set mechanically, it can only change if there is wear or damage. The latest design allows easy removal of the reciprocating head, which can then be returned to us for checking and repair.

The Cambridge Tribology Course 2013

The course will take place from 16th to 18th September 2013..

George Plint and David Harris
Phoenix Tribology Ltd