
**04-5 IUTAM Symposium on Elastohydrodynamics and Microelasto-hydrodynamics
Cardiff, UK, September 01-03, 2004**

a) Scientific Committee

R.W. Snidle (Chair, UK), L. Chang (USA), H.P. Evans (UK), M. Kaneta (Japan), T. Knudsen (Denmark), T. Lubrecht (France), F. Sadeghi (USA), C.H. Venner (The Netherlands), K. Walters, FRS (UK) and D.H. van Campen (The Netherlands).

b) Short summary of scientific progress achieved

The symposium focused on theoretical, experimental and computational issues in elastohydrodynamic lubrication (EHL) both in relation to smooth surfaces and in situations where the film is of the same order or thinner than the surface roughness (micro-EHL). The last IUTAM Symposium in this general area of contact of deformable bodies was in 1974. The emphasis in the Symposium was upon fundamental issues such as: solution methods; lubricant rheological models, thermal effects; both low and high elastic modulus situations; human and replacement joints; fluid traction; dynamic effects, asperity lubrication and the failure of lubrication; surface fatigue and thermal distress under EHL conditions.

The opening lecture was given jointly by Professor Duncan Dowson, FRS and Sir Gordon Higinson, the distinguished partnership which produced some of the most important numerical solutions to the fundamental EHL problem which led to the first reliable film thickness formula for isothermal, Newtonian conditions. Their presentation reviewed the early developments in the subject and included some fascinating details of the difficulties overcome and the scientific personalities involved.

A total of 32 oral presentations were delivered over a period of three days. A particularly thought-provoking presentation was given by Dr Scott Bair (Georgia Institute of Technology, USA) on the ongoing challenges posed by lubricant rheology. If we are to understand lubricant behaviour under the very severe conditions of a real EHL contact we need to draw upon sources outside conventional tribology such as molecular dynamics simulations, and pursue improved techniques for high pressure measurements. Other papers were on state of the art developments in rough surface lubrication, journal bearing solution techniques, and natural and replacement human joints. The importance of experimental validation techniques was emphasised in a number of papers on thin film methods.

This Symposium on the specialised topic of EHL was attended by leading experts in the field and was judged by the delegates to have succeeded in: attracting stimulating presentations on basic EHL research, encouraging lively and informative discussion, and identifying future goals for the subject.

c) Countries represented and number of participants

The meeting attracted 45 participants from ten countries (China, Czech Republic, Egypt, France, Germany, Italy, Japan, The Netherlands, USA, UK).

d) Publication of Proceedings of the Symposium

The proceedings of the Symposium will be published by Springer Science and Business Media (former Kluwer Academic Publishers) in 2005. Editors are R W Snidle and H P Evans.

e) Financial supports

The Symposium was sponsored by the International Union of Theoretical and Applied Mechanics and the School of Engineering, Cardiff University.
We are grateful for the support of our sponsors.

f) Scientific program**Wednesday, September 1****Session 1**

D. Dowson and G. R. Higginson, *Reflections on early studies of elasto-hydrodynamic lubrication*

Scott Bair, P. Gordon, *Rheological challenges and opportunities for EHL*

Session 2

D. Hart, C. E. Goodyer, P. K. Jimack, M. Berzins, L. E. Scales, *Adjoint error estimation and spatial adaptivity for EHL-like models*

C. H. Venner, C. J. Hooke, *Surface roughness attenuation in line and point EHL contacts under conditions of starved lubrication*

J. F. Booker, S. Boedo, *Unsteady EHL: "nodal" versus "modal" formulations*

P. Yang, J. Cui, *The influence of spinning on the performance of EHL in elliptical contacts*

Session 3

X. Y. Chen, H. Y. Sun, X. J. Shen, *Review and prospect of developments in EHL of finite line contacts*

H. Y. Sun, X. Y. Chen, *Thermal EHL analysis of cylindrical roller under heavy load*

E. Saber, H. A. El-Gamal, *Effect of elastic deformation of the journal bearing shell on its dynamic stability*

Session 4

M. Fox, *A possible molecular dynamic structure contribution to elasto-hydrodynamic lubrication*

I. I. Kudish, R. G. Airapetyan, M. J. Covitch, *Modelling of lubricant degradation and elasto-hydrodynamic lubrication*

D. Rh. Gwynllyw, T. N. Phillips, *The effect of viscoelasticity on the performance of dynamically loaded journal bearings*

Thursday, September 2

Session 5

D. Himmel, I. Jubault, J. L. Mansot, P. Vergne, *Spectroscopic mappings in static and dynamic sphere-plane contacts using Raman microspectrometry*

M. Kaneta, H. Nishikawa, K. Matsuda, *Behaviour of transverse ridges passing through a circular EHL conjunction*

P. Vergne, F. Ville, A. A. Lubrecht, *Experimental investigations on the pressure distribution for pure sliding EHL contacts with dented surfaces*

Session 6

M. Hartl, I. Krupka, D. Zhu, *EHL film thickness behaviour under high pressure – comparison between numerical and experimental results*

H. Baly, G. Poll, P M Cann, A A Lubrecht, *Correlation between model test devices and full bearing tests under grease lubricated conditions*

I. Lee-Prudhoe, C. H. Venner, P. M. Cann and H. A. Spikes, *Experimental and theoretical approaches to thin film lubrication studies*

P. L. Wong, F. Guo, *Extension of conventional optical EHL technique*

Session 7

F. Sadeghi, *Surface modifications for piston ring and liner*

F. Guo, P. L. Wong, *Variations of an EHL film under boundary slippage*

D. Dowson, *EHL in “soft-on-soft” natural synovial joints; “hard-on-soft” cushion and “hard-on-hard” metal joint replacements*

Session 8

I. C. Faraon and D J Schipper, *Stribeck curve for starved concentrated contacts*

A. Polacco, G. Pugliese, E. Ciulli, G. M. Bragallini, M. Facchini, *Investigation on thermal distress and scuffing failure under micro-EHL conditions*

A. Nakajima, T. Mawatari, *Effect of slip ratio on rolling contact fatigue of bearing steel rollers lubricated with traction oil*

H. Qiao, M. J. A. Holmes, H. P. Evans, R. W. Snidle, *Prediction of contact and fatigue damage in rough surface EHL*

Friday, September 3

Session 9

K. J. Sharif, H. P. Evans, R. W. Snidle, *Wear modelling of worm gears*

F. C. Wang and Z. M. Jin, *Lubrication modelling of artificial hip joints*

F. M. Borodich, *Fractals and surface roughness in EHL*

Session 10

C. J. Hooke, *Roughness attenuation and pressure rippling in EHL contacts*

C. Zhang, *Application of parallel programming techniques in analysis of mixed-EHD contact*

C. K. Gao, X. M. Qi, H. P. Evans, R. W. Snidle, *Effect of film thickness ratio on gearing contact fatigue life*

Report composed by Ray Snidle