

NordTrib 2012

Key-note lectures programme

June 12th 2012 – NTNU Gløshaugen (13:40)

Associate Prof. Takeshi Yamaguchi

Title: Tribology and Biomechanics of Gait: to prevent Slips and Falls during Walking

Abstract:

Falling accidents in daily life and at the work place have become an increasingly serious problem. Slips are the most frequent event leading to such accidents. Whether a slip occurs or not is determined by the relationship between the traction coefficient and the friction coefficient at the shoe/floor interface during walking. The traction coefficient is influenced by gait biomechanics and the friction coefficient is affected variables such as the contact conditions between the shoe and the floor, their materials, etc. Therefore, it is important to understand the biomechanics of gait as well as the tribology of the shoe/floor interface in order to prevent slips and falls. In this lecture, I will present our research and development for the prevention of slips and falls, which have been conducted based on tribology and biomechanics.

June 13th 2012 – Rica Nidelven Hotel (08:40)

Prof. Nicholas Spencer

Title: Lubricating Surfaces with Polymer Brushes

Abstract:

Various polymers are involved in all natural lubrication processes, all of which are based on an aqueous base fluid. The mechanisms of natural lubrication can be imitated by surface functionalization with polymer brushes. Both "grafting from" and "grafting to" approaches can be used to place polymer chains on surfaces, and brush-mediated lubrication has been successfully applied in both aqueous and oil environments. Recent studies in our laboratory have also involved the use of crosslinking within the brushes and the fabrication of layered brush-gel structures.

June 14th 2012 – Rica Nidelven Hotel (08:40)

Prof. Rob Dwyer-Joyce

Title: Ultrasonic Oil Film Measuring – thinner, smaller, and faster

Abstract:

Thinner, smaller and faster – these are the three challenges that face the thin layer of oil that separates the components in our machine elements. The drive for fuel efficiency means we want to use low viscosity oil and so run our films thinner. We want to transmit the maximum amount of power through an element – and this means higher speeds and smaller contacts.

In 2002 the Leonardo Centre developed a method for measuring oil films using reflected sound waves. Piezo-electric sensors are bonded to the component and discrete pulses of sound are sent out to the oil film. The reflected waves are collected and compared to the incident waves. A simple bit of analysis relates the ratio of these two to, amongst other things, the thickness of the oil. This method was initially applied to large hydrodynamic machine bearings with nice big contacts and slow changing film thickness.

Moving to smaller bearings with highly dynamic contacts has been the challenge of the last decade. This talk describes how we have modified the techniques to measure thinner, smaller, and faster contacts in rolling element bearings, piston rings, and mixed lubrication EHL contacts.

June 15th 2012 – Rica Nidelven Hotel (08:40)

Assistant Prof. Karthikeyan Subramanian

Title: Microstructural and chemical changes during sliding interactions: experiments and simulations

Abstract:

The high strain-rate, stress, strain and temperature experienced near sliding interfaces result in microstructural and chemical changes resulting from several dynamic, interacting and mechanically-driven phenomena. In this lecture, salient experimental results and the current state of understanding of these phenomena will be presented. Results and insights into these dynamic events, gained from molecular dynamics (MD) simulations on model and realistic tribopair systems will be reviewed.

Results pertaining to adiabatic and structural flow localization, severe plastic deformation, nanocrystallization and dynamic recrystallization, vorticity, amorphization and mechanical mixing, material transfer and role of heat of mixing will be presented.