Corso di Dottorato in Ingegneria Meccanica

A V V I S O D I S E M I N A R I O

Giovedì 24 Settembre 2009 – Ore 10.30

Aula Piano terra
Dipartimento di Ingegneria Meccanica Nucleare e della Produzione
Via Diotisalvi, 2

prof. Mitjan Kalin

Faculty of Mechanical Engineering
University of Ljubljana, Slovenia

terrà un seminario dal titolo:

Chemical and Physical Interactions in Boundary Lubrication of DLC Coatings

---

Summary:

DLC coatings possess high hardness, good elastic properties, low adhesion and anti-stiction properties, high wear resistance and, very important for machine components, low friction against many different materials. In recent years they became one of the most advanced coating solutions for many applications, such as gears, bearings, cams, piston rings, pumps, etc., but their use continue to grow rapidly. As evident, not only dry contact conditions, but also excellent lubricated performance is expected from these coatings.
In about a decade, since the interest on boundary lubrication properties of diamond-like carbon (DLC) coatings exists, several chemical aspects of DLC lubrication were investigated. Studies have focused on interactions between various additives and coatings, effects of contact temperature and pressure, influence of doping elements, base oils and other parameters. However, due to a broad subject area and relatively new field, fundamental mechanisms are still unclear. What is more, physical aspects of coating-oil interactions were not investigated or discussed in a greater extent, so far.
In existing research, DLC and/or steel wear reduction is typically observed under lubricated conditions; in many cases also friction reduction, but friction results are more contradictory and appear more complex. Several explanations for higher or lower friction and wear were proposed in different studies, but due to focus on apparently larger influence of chemical interactions between DLC coatings and additives, physical interactions between the oils, additives and coatings are broadly neglected. Accordingly, the proposed mechanisms of friction and wear reduction due to use of DLC under lubricated conditions still miss the information from a broader range of aspects, to be able more comprehensively and trustworthy define the actual lubrication mechanisms.
A review of the interactions between DLC coatings and lubricants, some of the proposed mechanisms and examples of relevant effects will be presented, summarizing previous studies, and including some recent results on physical aspects in DLC lubrication.