Titel: To grease or not to grease
Datum: 3 November 2016
Tijd:13:30 - 18:00
Locatie:Delft University of Technology, building 3 ME

Speaker 1: Ron van Ostayen (TU Delft)

Title: Associate Professor Mechatronic System Design and Tribology

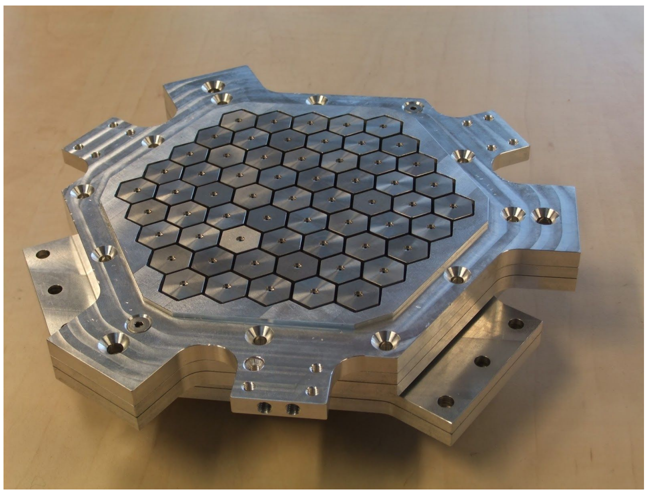
Biography:

Subject: Contactless Handling of Thin Substrates using Air Bearing Technology

Summary:
In high precision industry there is a need to carry, position and transport thin, fragile substrates, such as Si-wafers, solar cells, FPD-glass, and polymer foils and sheets, without any mechanical contact. Current technologies however are mostly still based on (some) mechanical contact.

Air bearings are commonly used in high precision industry for applications where friction is to be avoided. Surfaces are separated by a thin film of air from an external pressure source and slide almost without friction relative to each other. The little friction that these bearings exhibit is the result of viscous shear in the thin air film. The working principles of these bearings are well understood, and based on the thin film theory that originated with the first derivation of the Reynolds' equation in 1886, by Osborne Reynolds.

At TU Delft Mechatronics System Design group a new, innovative technology is being developed to carry these types of products on a thin film of air, fully and close to uniformly distributed between the system and the substrate. The viscous traction that is so small in traditional air bearing designs has been amplified using a clever design of the surface geometry and the use of push-pull, a critical balance between high pressure supply and low pressure vacuum. This viscous traction is then used to accelerate and control the substrate. A.B.U. a TUDelft start-up company is currently introducing a first product using this concept to the market.



In this presentation different generations of this concept are presented, explained and demonstrated, and future developments and challenges are illustrated.

The photo shows the 'flower-bed' the 2nd generation embodiment of the concept."

speaker 2:Lionel Gaillard (ESTEC)

Title: Head of Mechanism and Tribology Group at ESTEC Noordwijk

Biography:

Master in Quality management in 1994
Work Experience:
More than 20 years of experience in Space Mechanisms design and testing
Joined The European Space Agency (ESA) in 2001
Became the Head of the Mechanisms Section at ESA in 2014

Lionel graduated at the "Ecole Nationale Supérieure des Arts & Métiers" as Mechanical Engineer and developed himself during his career in Space Mechanisms directly in his first job. Initially it was to develop space mechanisms for military purposes but quickly moved to satellite space mechanisms. After 7 years in industry, Lionel moved to the European Space Agency and continued his career within R&D in the field of mechanisms.

Subject: The challenges of tribology in space mechanisms

Summary:

Development of space mechanisms, cannot be properly done without having a clear understanding of Tribology. Tribology is significantly impacting the design and performances of space mechanisms and also often the reliability of a complete space mission. A big part of the R&D for Space mechanisms at ESA is dedicated to Tribology. Activities in the field of space tribology started some more than 40 years ago in Europe and a lot of experience has been acquired in the meantime. Unfortunately, mastering space tribology is still a big challenge for us !
Tribology for space is a very specific field of science. Deep Vacuum, radiation, harsh thermal environments are for example parameters making the use of lubricant developed for ground application inappropriate for space.
On the other hand, the successful operation of mechanisms in space (and therefore also the space mission), is highly depending on the good tribological performance of its lubricants. Of course, the magical lubricant that could satisfy all needs does not exist. This means that the selection of the most appropriate lubricant for a particular space application is a very important decision that shall be supported by proper engineering background and experience. The presentation will provide some examples of the know limits of the existing space lubrication solutions, the challenges related to their proper selection, and the ongoing work to develop the next generation of space lubricants.

Foto

Speaker 3: Rob Duivis (KLM)

Title: program manager GE90 and CFM56-7B at KLM Engineering & Maintenance, Engine Services.

Biography:
Rob is KLM employee since 1975 in several functions, related to aircraft engine maintenance.

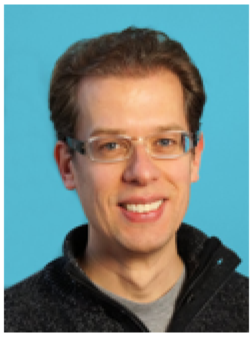
Educated as powerplant engineer, at engineering Engine Services, responsible for the test process and engine work scoping. In addition to my engineering activities I am trained as a Lean Six Sigma Black Belt and involved in several quality and process improvement projects. Another field of activities is the counseling of students from technical schools and universities, this involves interim and graduate students as well as Ph-D students.
Lecturing gas turbine knowledge and maintenance practices is one of my other activities as well as frequent writing articles about developments in aircraft propulsion.

Apart from above described activities I am program manager for the GE90 and CFM56-7B engine, involved in managing the contractual aspects of the engine shop maintenance activities of both engine models.

Subject: Lubrication Systems of modern aircraft gasturbines

Summary:
- General overview of current Gasturbines in Aviation
- Gasturbine oil lubrication systems description and layout
- Gasturbine oil types overview
- Challenges of gasturbine engine oils
- Q&A

Speaker 4: Dr. Ivan Buijnsters (TU Delft)

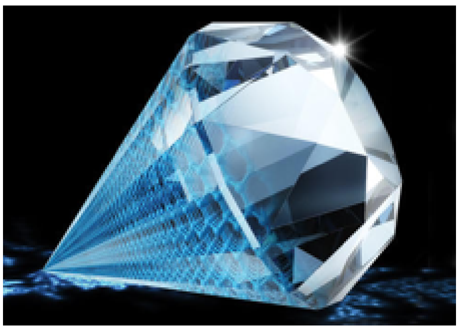


Title: Assistant Professor Micro and Nano Engineering group 3ME Department.

Biography:
Ivan Buijnsters (1975) is assistant professor at the Department of Precision and Microsystems Engineering (Faculty 3mE) of Delft University of Technology since 2014. He has a Master's degree in Chemistry, holds a PhD in Applied Physics, and has worked for more than 10 years on the synthesis and application of thin-film diamond materials. He has published over 50 peer-reviewed scientific journal papers and holds 2 patents.
His research interest is the development of functional materials and surfaces for micro and nano engineering applications. He focuses on a variety of (nano) materials, e.g. diamond nanoparticles, thin films of diamond and nanoporous anodic aluminium oxide. Among others, the tribology of diamond coatings is studied as well as the use of carbon nanomaterials as catalyst supports and for electrochemical electrodes.

Subject: Synthetic Diamond for small tribology Solutions.

Summary:
Diamond is an exceptional engineering material with outstanding properties such as extreme hardness, high elastic modulus, high thermal conductivity at room temperature and chemical inertness. The rapid development of chemical vapor deposition techniques for the synthesis of diamond thin films in the 1990s resulted in various successful tribological applications such as wear-resistant coatings on cutting tools and low-friction pump seals. More recently, boron-doped diamond has become the ultimate material for applications on the small scale, such as in microelectromechanical systems (MEMS) and as electrical probes for atomic force microscopy (AFM), which require both highly wear resistant and electrically conductive films and microstructures.
In this presentation, the development and performance of synthetic diamond thin-film materials for MEMS and AFM tribology solutions are addressed. First, the wear response of polycrystalline diamond films with varying boron-doping level, microstructure and film thicknesses will be discussed based on sliding wear tests on the macro scale. In the second part, we will present new processes and designs to create entire MEMS actuators out of ultrananocrystalline diamond (UNCD). In collaboration with Argonne National Laboratories (US), UNCD MEMS tribotesters were developed to assess the tribological merits of this material on the small scale. At low loads, wear is unmeasurable, whereas at higher loads, after a run-in period, a protective tribofilm is formed that prevents



further wear of the contacting surfaces. Using this material appears to be an excellent approach to prevent early wear-out failures in micromachine technology.