Biographical Sketch

doc. Ing. Martin Vrbka, Ph.D.

- Associate Professor, Institute of Machine and Industrial Design (IMID), Faculty of Mechanical Engineering (FME), Brno University of Technology (BUT), Czech Republic.
- Head of the Biotribology research group at the IMID, FME, BUT.

Education and academic qualification

- 2012, Associate Professor (doc.), FME, BUT.
- 2004, Doctor of Philosophy (Ph.D.), FME, BUT.
- 2000, Master of Science in Mechanical Engineering (Ing.), FME, BUT.

Career overview

- Since 2012, Associate Professor, IMID, FME, BUT.
- 2004-2011, Assistant Professor, IMID, FME, BUT.

Main research areas

- Biotribology and biomechanics of artificial hip and knee joints.
- Biotribology of articular cartilage, eye and fascia.
- Lubrication, friction and wear of artificial hip joints.
- Elastohydrodynamic and mixed lubrication.
- Lubricating films under high contact pressures.
- Surface texturing within non-conformal contacts.
- Rolling contact fatigue.
- Finite element method analysis.

Academic internships abroad

- 2012, 2013 Kyushu University, Fukuoka, Japan.

Selection of the most recent research projects

- An investigation of synovial fluid viscosupplementation and its impact on friction and lubrication (20-00483S), Czech Science Foundation, 2020-2022. Principal investigator.
- Fascia lubrication and regeneration by hyaluronan (CZ.01.1.02/0.0/0.0/19_262/0020005), Operational Programme Enterprise and Innovation for Competitiveness, Ministry of Industry and Trade, 2020-2022. Principal investigator for BUT.
- Research and development of pharmaceutical ingredient to artificial tears for the treatment of dry eye syndrome (FW01010060), Trend programme, Technology Agency of the Czech Republic, 2020-2023. Principal investigator for BUT.
- The effect of tribological processes on the durability of knee joint replacements (LTAUSA17150), Ministry of Education, Youth and Sports of the Czech Republic, 2017-2020. Member of the research team.
- The influence of joint fluid composition on formation of lubricating film in THA (NT14267-3/2013), Ministry of Health of the Czech Republic, 2013-2015. Member of the research team.
- Development of international team for tribology research (CZ.1.07/2.3.00/20.0126), Ministry of Education, Youth and Sports of the Czech Republic, 2011-2014. Member of the research team.
- Study of the influence of friction surfaces defects on pressure distribution within lubrication films (101/06/P035), Czech Science Foundation, 2006-2008. Principal investigator.

Selection of the most recent peer reviewed publications related to the Biotribology

- VRBKA, M., D. NEČAS, M. HARTL, I. KŘUPKA, F. URBAN and J. GALLO. Visualization of lubricating films between artificial head and cup with respect to real geometry. Biotribology. 2015, 1-2, 61-65.
- VRBKA, M., D. NEČAS, J. BARTOŠÍK, M. HARTL, I. KŘUPKA, A. GALANDÁKOVÁ and J. GALLO. Determination of a Friction Coefficient for THA Bearing Couples. Acta Chirurgie Orthopaedicae et Traumatologie Čechoslovaca. 2015, 82(5), 341-347.
- NEČAS, D., K. SADECKÁ, M. VRBKA, J. GALLO, A. GALANDÁKOVÁ, I. KŘUPKA and M. HARTL. Observation of lubrication mechanisms in knee replacement: A pilot study. Biotribology. 2019, 17, 1-7.
- NEČAS, D., M. VRBKA, A. GALANDÁKOVÁ, I. KŘUPKA and M. HARTL. On the observation of lubrication mechanisms within hip joint replacements. Part I: Hard-on-soft bearing pairs. Journal of the Mechanical Behavior of Biomedical Materials. 2019, 89, 237-248.
- NEČAS, D., M. VRBKA, J. GALLO, I. KŘUPKA and M. HARTL. On the observation of lubrication mechanisms within hip joint replacements. Part II: Hard-on-hard bearing pairs. Journal of the Mechanical Behavior of Biomedical Materials. 2019, 89, 249-259.
- NEČAS, D., M. VRBKA, I. KŘUPKA and M. HARTL. The Effect of Kinematic Conditions and Synovial Fluid Composition on the Frictional Behaviour of Materials for Artificial Joints. Materials. 2018, 11(5), 1-12.
- NEČAS, D., M. VRBKA, F. URBAN, J. GALLO, I. KŘUPKA and M. HARTL. In situ observation of lubricant film formation in THR considering real conformity: The effect of diameter, clearance and material. Journal of the Mechanical Behavior of Biomedical Materials. 2017, 69, 66-74.
- NEČAS, D., M. VRBKA, I. KŘUPKA, M. HARTL and A. GALANDÁKOVÁ. Lubrication within hip replacements – Implication for ceramic-on-hard bearing couples. Journal of the Mechanical Behavior of Biomedical Materials. 2016, 61, 371-383.
- NEČAS, D., M. VRBKA, F. URBAN, I. KŘUPKA and M. HARTL. The effect of lubricant constituents on lubrication mechanisms in hip joint replacements. Journal of the Mechanical Behavior of Biomedical Materials. 2016, 55, 295-307.
- GALANDÁKOVÁ, A., J. ULRICHOVÁ, K. LANGOVÁ, A. HANÁKOVÁ, M. VRBKA, M. HARTL and J. GALLO. Characteristics of synovial fluid required for optimization of lubrication fluid for biotribological experiments. Journal of Biomedical Materials Research Part B: Applied Biomaterials. 2017, 105(6), 1422-1431.
- RANUŠA, M., J. GALLO, M. VRBKA, M. HOBZA, D. PALOUŠEK, I. KŘUPKA and M. HARTL. Wear Analysis of Extracted Polyethylene Acetabular Cups Using a 3D Optical Scanner. Tribology Transactions. 2017, 60(3), 437-447.
- CHOUDHURY, D., S. GHOSH, F. ALI, M. VRBKA, M. HARTL and I. KRUPKA. The Influence of Surface Modification on Friction and Lubrication Mechanism Under a Bovine Serum–Lubricated Condition. Tribology Transactions. 2016, 59(2), 316-322.
- CHOUDHURY, D., F. URBAN, M. VRBKA, M. HARTL and I. KRUPKA. A novel tribological study on DLC-coated micro-dimpled orthopedics implant interface. Journal of the Mechanical Behavior of Biomedical Materials. 2015, 45, 121-131.
- CHOUDHURY, D., H. AY CHING, A. B. MAMAT, J. CIZEK, N. A. ABU OSMAN, M. VRBKA, M. HARTL and I. KRUPKA. Fabrication and characterization of DLC coated microdimples on hip prosthesis heads. Journal of Biomedical Materials Research Part B: Applied Biomaterials. 2015, 103(5), 1002-1012.

Researcher identification

H-index: 12 (WoS); 13 (Scopus)
Total number of citations (WoS): 359; 233 (without self-citations)
Researcher ID: F-5568-2012
ORCID ID: 0000-0002-2845-3752
SCOPUS ID: 15043189700