Curriculum vitae

Name	**prof. Ing. Martin Hartl, Ph.D.** **identifier vedidk (IS VaVaI): 8892822**
Affiliation to BUT	**Faculty of Mechanical Engineering,** **Director of Institute of Machine and Industrial Design**
Role in the project	**Main project executor**
Position in team	**Excellent and key member**
Role and tasks in the project	• Coordinates and leads the project. • Guarantees research plan and timetable including declared outputs. • Ensures effective cooperation between partners, coordination or research activities within the project, penetration of research activities and their complementarity regarding all planned activities in the project. • Leads and manages the team, organizes regular meetings, holds talks with domestic and foreign organizations (research/commercial), makes and updates plan of activities and outcomes, makes proposals of sub-projects, participates in making of interim reports and of final report. • Transfers know-how and technologies into practice. • Research specialization: machine design (smart systems for adhesion control in rail transport, predictive and proactive lubrication systems, sliding and rolling bearings); tribology (very thin lubricant films, elastohydrodynamic and mixed lubrication); biotribology (lubrication and friction of artificial hip joints); lubricant rheology. • Presentation of research: publications, patents, utility models, function samples, lecturing. • **Internationally renowned expert is key for solving of research goals in the field of mechatronics, smart technologies and virtual twins and for achieving of set goals, outputs and results of the projects.**

1. Education and academic qualification

- 1990, Engineer's degree (Ing.), Design of Production Machines and Equipment, Faculty of Mechanical Engineering, Brno University of Technology
- 1997, Doctoral degree (Ph.D.), Design and Process Engineering, Faculty of Mechanical Engineering, Brno University of Technology
- 2002, Associate professor (doc.), Design and Process Engineering, Faculty of Mechanical Engineering, Brno University of Technology
- 2006, Professor (prof.), Design and Process Engineering, Brno University of Technology

2. Career overview

- 1993 - 2002, academic - assistant professor, Institute of Machine and Industrial Design, Faculty of Mechanical Engineering, Brno University of Technology
- 2003 - 2006, academic - associate professor, Institute of Machine and Industrial Design, Faculty of Mechanical Engineering, Brno University of Technology
- since 2003, director, Institute of Machine and Industrial Design, Faculty of Mechanical Engineering, Brno University of Technology
- since 2006, academic - professor, Institute of Machine and Industrial Design, Faculty of Mechanical Engineering, Brno University of Technology

- since 2010, Head of Division of Virtual Modeling and Testing, NETME Centre, Faculty of Mechanical Engineering, Brno University of Technology

3. Research and development, experience

- Research interest: machine design (smart systems for adhesion control in rail transport, predictive and proactive lubrication systems, plain and rolling bearings); tribology (very thin lubricant films, elastohydrodynamic and mixed lubrication); biotribology (lubrication and friction of artificial hip joints); lubricant rheology
- Publications and other R&D activities:
  - more than 100 research articles in peer reviewed journal papers (e.g. *Tribology International, Tribology Transaction, Tribology Letters, Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology* or *Journal of the Mechanical Behavior of Biomedical Materials*),
  - more than 200 outcomes registered in RIV – Register of information and outcomes (peer reviewed journal papers, monographs, chapters in books, function samples etc.).
- Conception maker, proposer and executor of R&D projects.

4. Activities related to R&D (pedagogic activities, supervisor in PhD study)

- Implementation of research-oriented teaching with an emphasis on utilization of intellectual potential of students and their integration into research teams (especially in master degree programmes).
- Guarantor of master degree programme Mechanical Engineering Design.
- Guarantor of key courses and lecturer in bachelor, master and doctoral degree programmes.
- Supervisor in PhD study programme Machines and Equipment (6 defended Ph.D. theses, 2 current Ph.D. students).
- Head of team of translators and scientific editorial board (with doc. Ing. Miloš Vlk, CSc.) of Czech translation of the publication Shigley, Joseph E.; Mischke, Charles R.; Budynas, Richard G. Mechanical engineering design. 1st ed. Brno : Brno University of Technology, publisher VUTIUM, 2010. 1300 s. ISBN 978-80-214-2629-0.

5. Relevance and interconnection of current research activities with goals, programmes and activities of the project, potential for successful realization of the project

- Leader of cutting-edge research and development, cooperation with industry and public sector in applying of innovation and transfer of knowledge from research to degree programmes at the level of regional research and development centre NETME Centre and of university institute (Institute of Machine and Industrial Design)
- Main executor of the project National Sustainability Programme I (2013-2020) NETME CENTRE PLUS focused on fundamental and applied research in the field of energy industry, process engineering, environmental technologies, mechatronics, virtual design and testing, aircraft and automotive engineering and progressive metal materials.
- Cofounder (together with Prof. Křupka) of tribology research team at the Faculty of Mechanical Engineering of Brno University of Technology. Team is internationally recognised especially in the field of elastohydrodynamics.
- Extraordinary results in transfer of findings from basic and applied research to industry, especially in development of new experimental approaches and applications in the field of tribology.

6. Sum of citations (according to WoS) total/without self-citations

1612/1180

7. h-index:

19 (WoS)
22 (Scopus Author ID: 7005196946)

8. 5 most significant results

- HARTL, M., I. KRUPKA, R. POLISCUK AND M. LISKA An automatic system for real-time evaluation of EHD film thickness and shape based on the colorimetric interferometry. *Tribology Transactions*, APR 1999, 42(2), 303-309 (IF 1,685; 60 citations).
  Development and implementation of method of colorimetric interferometry for measurement and visualisation of thickness distribution of lubrication film in elastohydrodynamic contact. This method is worldwide used by many significant organizations, e.g. K.K. IRISU (C. ILLIES & CO., LTD.), Fakultät für Maschinenwesen Technische Universität München or Kyutech Kyushu Institute of Technology.
- HARTL, M., I. KRUPKA, R. POLISCUK, M. LISKA, et al. Thin film colorimetric interferometry. *Tribology Transactions*, Apr 2001, 44(2), 270-276 (IF 1,685; 111 citations).
  Extension of method of colorimetric interferometry for measurement of very thin films up to 1 nanometre. This method helped to clarify many phenomena in elastohydrodynamic contacts, especially effect of surface irregularities or lubricant rheology.
- KRUPKA, I. AND M. HARTL The effect of surface texturing on thin EHD lubrication films. *Tribology International*, Jul 2007, 40(7), 1100-1110 (IF 2,903; 63 citations).
  One of the first papers on the effect of surface texturing on lubrication film formation in elastohydrodynamic contacts.
- Adaptive system of wheel flange track vehicle lubrication. Development and verification of prototype of new on-board system for optimal flange track vehicle lubrication of all standard types (trams, underground, commuter trains, locomotives, high-speed rail). Developed in cooperation with company TRIBOTEC, spol. s r.o. within project MPO-TIP. Used by Brno Public Transport Authority.
- Experimental devices for research of sliding and rolling bearings. Development and production of unique experimental devices based on findings of fundamental and applied research for many significant companies, e.g. Daido Metal Co., Ltd. or K.K. IRISU (C. ILLIES & CO., LTD.).

9. Publications, monographs and chapters in books (selection)

Five most recent articles in peer reviewed journals:

- GALAS, R., D. KVARDA, M. OMASTA, I. KRUPKA, et al. The role of constituents contained in water-based friction modifiers for top-of-rail application. *Tribology International*, Jan 2018, 117, 87-97.
- FRYZA, J., P. SPERKA, I. KRUPKA AND M. HARTL Effects of lateral harmonic vibrations on film thickness in EHL point contacts. *Tribology International*, Jan 2018, 117, 236-249.
- ZAPLETAL, T., P. SPERKA, I. KRUPKA AND M. HARTL The effect of surface grooves on transition to mixed lubrication. *Tribology International*, Oct 2017, 114, 409-417.
- KOSTAL, D., P. SPERKA, P. SVOBODA, I. KRUPKA, et al. Influence of Lubricant Inlet Film Thickness on Elastohydrodynamically Lubricated Contact Starvation. *Journal of Tribology-Transactions of the Asme*, Sep 2017, 139(5), 6.
- GALANDAKOVA, A., J. ULRICHOVA, K. LANGOVA, A. HANAKOVA, et al. Characteristics of synovial fluid required for optimization of lubrication fluid for biotribological experiments. *Journal of Biomedical Materials Research Part B-Applied Biomaterials*, Aug 2017, 105(6), 1422-1431.

Ten most cited articles in peer reviewed journals:

- HARTL, M., I. KRUPKA, R. POLISCUK, M. LISKA, et al. Thin film colorimetric interferometry. *Tribology Transactions*, Apr 2001, 44(2), 270-276.
- KRUPKA, I. AND M. HARTL The effect of surface texturing on thin EHD lubrication films. *Tribology International*, Jul 2007, 40(7), 1100-1110.

- HARTL, M., I. KRUPKA, R. POLISCUK AND M. LISKA An automatic system for real-time evaluation of EHD film thickness and shape based on the colorimetric interferometry. *Tribology Transactions*, APR 1999, 42(2), 303-309.
- LIU, Y., Q. J. WANG, W. WANG, Y. HU, et al. EHL simulation using the free-volume viscosity model. *Tribology Letters*, Jul 2006, 23(1), 27-37.
- VRBKA, M., O. SAMANEK, P. SPERKA, T. NAVRAT, et al. Effect of surface texturing on rolling contact fatigue within mixed lubricated non-conformal rolling/sliding contacts. *Tribology International*, Aug 2010, 43(8), 1457-1465.
- KRUPKA, I., S. BAIR, P. KUMAR, M. M. KHONSARI, et al. An Experimental Validation of the Recently Discovered Scale Effect in Generalized Newtonian EHL. *Tribology Letters*, Feb 2009, 33(2), 127-135.
- KRUPKA, I., M. VRBKA AND M. HARTL Effect of surface texturing on mixed lubricated non-conformal contacts. *Tribology International*, Nov 2008, 41(11), 1063-1073.
- KRUPKA, I., P. KUMAR, S. BAIR, M. M. KHONSARI, et al. The Effect of Load (Pressure) for Quantitative EHL Film *Thickness. Tribology Letters*, Mar 2010, 37(3), 613-622.
- HARTL, M., I. KRUPKA, V. FUIS AND M. LISKA Experimental study of lubricant film thickness behavior in the vicinity of real asperities passing through lubricated contact. *Tribology Transactions*, Jun-Sep 2004, 47(3), 376-385.
- SPERKA, P., I. KRUPKA AND M. HARTL Experimental study of real roughness attenuation in concentrated contacts. *Tribology International*, Oct 2010, 43(10), 1893-1901.

Chapters in book:

- HARTL, M. Lubricant Film Thickness Measurement: Colorimetric Interferometry. *Encyclopedia of tribology*. 2013. New York: Springer, 2013, 2023-2029. ISBN 978-0-387-92896-8.
- KOUTNY, D., I. KRUPKA AND M. HARTL. Behavior of lubrication films contaminated by water. *Advances in automotive engineering*. Brno: Tribun EU, 2008, 186-194. Librix.eu. ISBN 978-80-7399-496-9.
- KRUPKA, I., M. HARTL AND M. LISKA. Some insights into lubricant film thickness in mixed EHD point contact. *Tribological research and design for engineering systems*. Tribology series 41. Boston: Elsevier, 2003, 549-558. ISBN 0-444-51243-8.

10. Projects and grants (executor or co-executor, selection)

- 2018 – 2020, Thermo-Elastohydrodynamics of Coated Polymer Gears, GA18-26849J, GAČR - Grant Agency of the Czech Republic, GC - International projects (2007-), 4 688 000 CZK
- 2017 – 2019, Nonlinear dynamics of rotating systems considering fluid film instabilities with the emphasis on local effects, GA17-15915S, GAČR - Grant Agency of the Czech Republic, GA – Standard projects (1993 - 2030), 8 557 000 CZK
- 2017 – 2020, The effect of tribological processes on the durability of knee joint replacements, LTAUSA17150, MŠMT - Ministry of Education, Youth and Sports of the Czech Republic, LT - INTER-EXCELLENCE (2016 - 2024), 4 217 000 CZK
- 2016 – 2020, Research and Development of Lubrication System with Proactive Control, FV10474, MPO - Ministry of Industry and Trade of the Czech Republic, FV - TRIO (2016 - 2021), 15 894 000 CZK
- 2014 – 2018, NETME CENTRE PLUS, LO1202, MŠMT - Ministry of Education, Youth and Sports of the Czech Republic, LO - National Sustainability Programme I (2013-2020), 606 105 000 CZK
- 2014 – 2017, Research and Development of System for Top-of-Rail Friction Management in Rail Transport, TA04030528, TAČR - Technology Agency of the Czech Republic, TA – Support of applied research and experimental development - programme ALFA (2011 - 2019), 12 142 000 CZK
- 2012 – 2014, Research and development of progressive sanding rail vehicle system, TA02030850, TAČR - Technology Agency of the Czech Republic, TA - Support of applied research and experimental development - programme ALFA (2011-2019), 15 655 000 CZK
- 2011 – 2013, Research and development of adaptive wheel flange lubrication system, FR-TI3/442, MPO - Ministry of Industry and Trade of the Czech Republic, FR - TIP (2009-2017), 12 041 000 CZK

- 2009 – 2012, Complex System for Attracting, Education and Continuing Involment of Talented Individuals to Research Centers of AS CR and FME BUT, EE2.3.09.0228, MŠMT - Ministry of Education, Youth and Sports of the Czech Republic, EE - OP Education for Competitiveness (2007-2015), 14 426 000 CZK
- 2009 – 2012, Mechanical Engineering Cooperative Network, EE2.4.12.0030, MŠMT - Ministry of Education, Youth and Sports of the Czech Republic, EE - OP Education for Competitiveness (2007-2015), 22 066 000 CZK

11. Patents, applied results and other forms of protection of intellectual property

Technically realized outcomes:

- 2014, Wheel/rail simulator for the study of lateral slip, RIV/00216305:26210/14:PR27967, G/B – Function sample (Gfunk)
- 2011, Wheel flange - rail contact test rig, RIV/00216305:26210/11:PR25979, G/B - Function sample (Gfunk)
- 2011, Module for the study of lubricated wheel flange - rail contact using an optical method, RIV/00216305:26210/11:PR25994, G/B - Function sample (Gfunk)
- 2009, Hertzian contact simulator, RIV/00216305:26210/09:PR23972, G/B - Function sample (Gfunk)

12. Cooperation with industry and with other users of outcomes of R&D (selection)

- Since 2017, Research of degradation of grease in rolling bearings, Schaeffler AG
- 2015 – 2016, Development of experimental device for study of thickness and temperature of lubricant films based on combination of colorimetric interferometry and infrared radiometry, K.K. IRISU (C. ILLIES & CO., LTD.)
- 2014 – 2016, Development of device for testing of sliding bearings for automotive industry, Daido Metal Co., Ltd.
- 2013, Study of lubricant characteristics of unconventional lubricants for use in refrigeration industry, United Technologies
- Since 2011, Development of systems for adhesion control in rail transportation (wheel flange lubrication, sanding, top-of-rail), TRIBOTEC, spol. s r.o.
- Since 2010, Development of application for design of rolling bearings BigBertha, Koyo JTEKT CORPORATION

13. Awards and membership in international and national organizations, platforms

Awards:

- 2017, Captain Alfred E. Hunt Memorial Award – awarded by Society of Tribologists and Lubrication Engineers for the most significant publication in tribology
- 1993, Talent 92 – awarded by Minister of Education, Youth and Sports of the Czech Republic for remarkable achievements in research during Ph.D. study

International organizations membership:

- Since 2013, member of Society of Tribologists and Lubrication Engineers (STLE)

Member of editorial boards of journals:

- 2018 *Frontiers in Mechanical Engineering* (Frontiers, ISSN: 2297-3079)
- Since 2016, *Bearing World Journal* (VDMA Verlag GmbH, ISSN: 2513-1753)
- Since 2013, *Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology* (SAGE Publications, ISSN: 1350-6501)
- Since 2013, *Friction* (Springer, ISSN: 2223-7690)

14. Invited talks at major international conferences (selection)

- SPERKA, Petr, Ivan KRUPKA AND Martin HARTL. Lubricant rheology and lubrication of rough surfaces. In: *WTC 2017 Sixth World Tribology Congress*. Beijing, 2017.

- SPERKA, Petr, Ivan KRUPKA AND Martin HARTL. The Effect of Roughness Features on Lubricant Flow Inside EHL Contact. In: *42th Leeds-Lyon Symposium on Tribology*. Lyon, 2015.