



Principal supervisor's final report on the PhD study

1. PhD candidate

Ing. Radovan Galas / Radovan.Galas@vut.cz

2. Name of PhD programme

Design and Process Engineering

3. Title of PhD thesis

Friction Modification within Wheel-Rail Contact

4. Principal supervisor

Prof. Martin Hartl / Martin.Hartl@vut.cz

5. Co-supervisor

Dr. Milan Omasta / omasta@fme.vutbr.cz

6. Stays at other institutions (min. 7 days)

Technical University of Munich / Germany / 06/06/2016 / 12/06/2016

7. Teaching activities

CAD (3CD) / 52 hours
Machine Design and Machine Elements (CKP) / 156 hours
Machine Design – Machine Elements (5KS) / 234 hours
Machine Design – Mechanical Drives (6KT) / 156 hours
Machine Design – Mechanisms (6KM) / 104 hours
Mechanical Design Project (ZKP) / 26 hours
Team Project (ZIP) / 13 hours
Tribology (ZTR) / 15 hours

8. List of main publications

GALAS, R., D. KVARDA, M. OMASTA, I. KRUPKA and M. HARTL. The role of constituents contained in water-based friction modifiers for top-of-rail application. Tribology International, 2018, 117C, 87-97. IF 2.903

GALAS, R., M. OMASTA, M. KLAPKA, S. KAEWUNRUEN, I. KRUPKA and M. HARTL. Case Study: the Influence of Oil-based Friction Modifier Quantity on Tram Braking Distance and Noise. Tribology in Industry, 2017, 39(2), 198-206.

OMASTA M., R. GALAS, J. KNAPEK, M. HARTL and I. KRUPKA. Development of an adaptive top-of-rail friction modification system, 2017. In Proceedings of the Stephenson Conference: Research for Railways, IMechE, London, UK, 2017, 325-332.

GALAS, R., M. OMASTA, I. KRUPKA and M. HARTL. Laboratory investigation of ability of oil-based

friction modifiers to control adhesion at wheel-rail interface. *Wear*, 2016, 368–369, 230-238.
IF 2.531

SVOBODA, P., D. KOŠTÁL, R. GALAS, I. KRUPKA and M. HARTL. Tribological behaviour of ultra-dispersed diamond- graphite in liquid lubricants. *Journal of the Balkan Tribological Association*, 2016, 22(4A), 4994-5009.
IF 0.737

GALAS, R., D. SMEJKAL, M. OMASTA and M. HARTL. Twin-Disc Experimental Device for Study of Adhesion in Wheel- Rail Contact. *Engineering Mechanics*, 2014, 21(5), 329-334.

9. Assessment of the supervision process

Very good

The supervision process and the candidate response were standard. The process was based on regular (two-month) meetings and other on-demand discussions with supervisor and specialist. The candidate was always adequately prepared and able to respond to the topics discussed. He was able to exploit new ideas as well as to reflect critical comments. Written work reports and other documents were prepared in time and in sufficient quality. Fulfillment of other obligations arising from the PhD, incl. teaching, leading of student projects and final theses, participation in other research projects etc., was excellent. The candidate was also active in publishing and attending conferences.

10. Assessment of the candidate's ability to work independently

Very good

The candidate's work was independent, based on discussion with supervisor and supervisor specialist as well as with other experts (oil technology; rail traffic operators; etc). The framework of the PhD thesis was partially directed by research and development grant under the Technology Agency of the Czech Republic entitled „Research and Development of System for Top-of-Rail Friction Management in Rail Transport” (2014-2017), a project that Radovan Galas has worked on. This direction is particularly relevant in field testing; nevertheless, the experiments were fully designed and managed by the candidate. Other directions, like the effect of FM constituents, were defined by the candidate based on the state of the art. The candidate independently planned and co-operated with master and bachelor degree students. In the relevant research topic, he supervised three bachelor and three diploma thesis. All the publications where he is listed as a first author were managed and prepared by him.

11. Assessment of the contribution that the research makes to knowledge in the field

Very good

The work covers a wide research area with different approaches, starting with basic tribology tests and ending with field tests. Different part carries different contributions on different levels. The part including detailed tribological investigation of the effect of different FM constituents undoubtedly shifts knowledge in the area and also extends into basic research. This is supported mainly by publication in *Tribology International*, Q1 IF journal targeting the papers with the highest scientific quality. The PhD work could be more systematically focused on this area. The second part of the work includes twin-discs and field tests with commercial oil-based top-of-rail products. The part is more oriented to practice, in line with the above-mentioned R&D project. Although there is a limited number of results in the public domain dealing with the influences of oil-based top-of-rail products and relevant safety issues, it cannot be assumed that the knowledge is new for rail industry. On the other hand, the number of relevant publications over the last two years increases, what the candidate's publications also contribute to.

12. Other comments

none

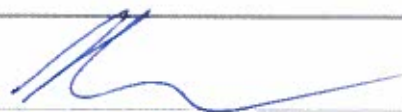
13. Conclusion

PhD thesis is an independent scientific work that presents a novel solution to a significant problem in the research area and demonstrates the candidate's ability to conduct independent research.

YES

16. Date and signature

02/02/2018



Please note

- A. Evaluate categories 9 to 11 using the following scale: unacceptable, acceptable, satisfactory, good, very good, excellent.
- B. In each category 9 to 11 explain reasons for evaluation using between 100–200 words.
- C. E-mail the completed form to: Klara.Javorcekova@vut.cz

