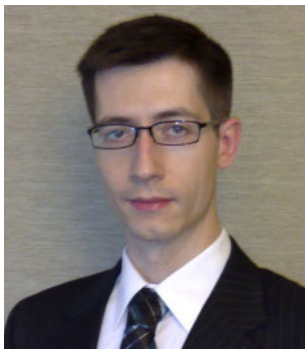
Guest editorial

FRETTING DAMAGE



Following the ASM handbook,[1] fretting is defined as *a special wear process that occurs at the contact area between two materials under load and subject to slight relative movement by vibration or some other force*. Fretting is not a novel problem for mechanical engineers, it was described for the first time in 1911[2] and the 'fretting-corrosion' term was coined in 1939.[3] More activity has been observed in the fretting area over the last three decades, which has been highlighted by an eminent book by Waterhouse in 1972[4] and launch of a series of International Symposia on Fretting Fatigue (ISFF) in 1993. The first meeting in that series took place at the University of Sheffield, UK, and the sixth one will be held in 2010 in China. Over the years, fretting damage has been identified across a wide range of industrial applications and is attracting much attention at the present time.

In the early times, there was no evident distinction in the literature between fretting-fatigue and fretting-wear processes and all forms of surface damage under fretting conditions were characterised by the 'fretting-corrosion' term. With time and with a larger amount of experimental data acquired, it became clear that surface damage through cracking has to be distinguished from wear damage. As a result, currently two streams of fretting research exist and they address fretting-fatigue and fretting-wear issues usually in a separate manner.

If no catastrophic damage occurs, fretting is difficult to detect as it affects hidden areas of mated components. Also fretting experiments are challenging as they are performed under specific loading conditions and high quality test protocols need to be satisfied to simulate real life situations. Due to its minute relative movement nature, fretting can be considered as a micro-tribology branch. This Special Issue of *Tribology – Materials, Surfaces & Interfaces* brings seven selected papers on fretting damage, which address some of the current challenges in that field.

The first paper by Hirsch and Neu sets the scene by presenting results for a steel/steel contact under a wide range of loading conditions covering both, fretting-fatigue and fretting-wear regimes. In the second paper, Ding *et al.* introduce a mathematical model, where they try to address the challenging problem of wear-fatigue interactions in aeroengine components. Different aspects of fretting-fatigue are reported in the next three papers. Mall *et al.* explain the effect of contact geometry on crack initiation in titanium alloys and analyse the data using approach, which helps to design components affected by fretting induced cracking. Impact of surface treatments is discussed by Elleuch *et al.* in their paper, where they compare cracking resistance of steel surfaces after shot-peening with two types of coatings. Finally Martins *et al.* introduce the concept of a modified fretting-fatigue apparatus and validate the methodology through a series of experiments on an aeronautical aluminium alloy. The closing two papers deal with fretting-wear issues in electrical connectors. These two contributions draw together a very interesting picture of a connector performance as they approach the problem from two different angles: McBride and Maul focus on electrical aspects of the connector performance, while Achanta and Drees focus more on mechanical issues and discuss impact of grease application.

As a Guest Editor of the Special Issue, I hope you will find this collection of papers interesting and absorbing and I wish you a stimulating read.

Tomasz W. Liskiewicz
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References

1. ASM Handbook Volume 19: Fatigue And Fracture, 1996, ISBN 10: 0-87170-385-8.
2. Eden, Rose, and Cunningham, 'The Endurance of Metals: Experiments on Rotating Beams at University College, London,' Proc. I. Mech. E., part 4, 1911.
3. Tomlinson, Thorpe. and Gough, 'An Investigation of the Fretting Corrosion of closely Fitting Surfaces,' Proc. I. Mech. E., Vol. 141, 1939.
4. Waterhouse, Fretting Corrosion, Pergamon Press,1972.