

Selected Technical Papers

STP 1548



# Bearing Steel Technologies:

9th Volume,  
Advances in Rolling  
Contact Fatigue  
Strength Testing and  
Related Substitute  
Technologies

*Editor:*  
John M. Beswick

**Selected Technical Papers STP1548  
Bearing Steel Technologies, 9th Volume:  
Advances in Rolling Contact Fatigue  
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# Foreword

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THIS COMPILATION OF *Selected Technical Papers, 1548, Bearing Steel Technologies, 9th Volume: Advances in Rolling Contact Fatigue Strength Testing and Related Substitute Technologies* contains peer-reviewed papers published that were presented at a symposium in Tampa, FL on November 17–18, 2011. This symposium was sponsored by ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys.

The Symposium Chairman and STP Editor is John Beswick, SKF Group Technology Development, Nieuwegein, The Netherlands.



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## Overview

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Overview Bearing Steel Technologies: 9th Volume, Advances in Rolling Contact Fatigue Strength Testing and Related Substitute Technologies—STP 1548:

The 9th International Symposium on Bearing Steels, sponsored by ASTM Committee A-1 on Steel, Stainless Steel and Related Alloys was held November 17–18, 2011, in Tampa, Florida. Previous ASTM bearing steel symposia in this series have dealt with various aspects of bearing steel technologies and papers from these symposia have been published in the JAI and as ASTM Special Technical Publications (STP's):

ASTM STP 575 “Bearing Steels—The Rating of Nonmetallic Inclusions,” 1975

ASTM STP 771 “Rolling Contact Fatigue Testing of Bearing Steels,” 1982, J. J. C. Hoo, Ed.

ASTM STP 987 “Effect of Steel Manufacturing Processes on the Quality of Bearing Steels,” 1988, J. J. C. Hoo, Ed.

ASTM STP 1195 “Creative Use of Bearing Steels,” 1993, J. J. C. Hoo, Ed.

ASTM STP 1327 “Bearing Steels into the 21<sup>st</sup> Century,” 1998, J. J. C. Hoo and W. B. Green Jr., Eds.

ASTM STP 1419 “Bearing Steel Technology,” 2002, J. M. Beswick, Ed.

ASTM STP 1465 “Bearing Steel Technology—Advances and State of the Art in Bearing Steel Quality Assurance,” 2007, J. M. Beswick, Ed.

ASTM STP 1524 “Bearing Steel Technologies—Development on Rolling Bearing Steels and Testing 8th Volume,” 2010, J. M. Beswick Ed.

The international nature of the ASTM bearing steel symposia makes them a unique forum for the presentation and discussion of global bearing steel technologies. The 9th symposium continued the tradition with 25 presentations, 22 of which are being published in this ASTM STP 1548.

Bearing steel rolling contact fatigue properties remain of overriding importance to the service life of practically all automotive products, aerospace main line bearings, industrial machines, rotating equipment in non-industrial industries such as medical, food & beverage etc., in almost all manufacturing and processing industries, and energy generation equipment. The improvements in steel metallurgical quality, heat treatment and raceway finishing have had a profound effect on the rolling bearing endurance life which has necessitated a significant reappraisal of traditional bearing steel rolling contact fatigue testing methods. The cost of full bearing testing can be prohibitive to steel technology changes when considering the statistical nature of the rolling contact fatigue



process and, for example, high temperature condition simulation is very demanding for full bench testing.

Numerous methodologies exist for direct, or substitute, rolling contact fatigue testing for quality assurance and equivalence testing, and papers were presented reviewing user experience of various tests, or substitute test, methods as well as original work papers on the subject. In addition a paper dealing with the treatment of the statistical nature of the rolling contact fatigue process was given.

The two day symposium program was divided into six (6) sessions namely:

1. Advances in the Understanding of the Rolling Contact Fatigue Process and Related Test Methods
2. Material Quality Related Rolling Contact Fatigue Testing
3. Structural Testing as a Substitute to Contact Fatigue Testing
4. Substitute RCF Metallurgical Test Methods
5. Material Response Analysis and Rolling Contact Fatigue
6. Developments in the Understanding of the Statistics of Rolling Contact Fatigue Testing and Advances in Modelling

From the published papers it is clear that there remains a need for full life testing in safety critical aero and railway applications. And the key to the reported success of the SNR high stress level flat washer rolling contact fatigue testing (FB2) is probably the detailed post test examinations. The value of Polymet testing for high alloyed corrosion resistant steels cannot be ignored, and structural testing and in particular with the application of a torsion load can be relevant. The domain of material response analysis clearly belongs to the specialist and the paper on vibration effect on the material response is a significant result. Modelling has its place and contributes to our understandings, but it cannot yet replace testing and material response evaluations.

The financial contribution of the following symposium sponsors is gratefully acknowledged:

AB SKF, Sweden  
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Latrobe Steel, USA  
Nedstaal, The Netherlands  
Sanyo Special Steel Co., Japan  
Tata Steel, Speciality Steels, UK  
Timken Company, USA

Bearing steels have done a sterling job in keeping the world turning but ceramic materials are being increasingly applied in so called hybrid rolling bearings. The hybrid bearings have numerous advantages over conventional full steel rolling bearings in specific applications, and future ASTM symposia will need to deal with “materials,” rather than just steels, for rolling bearings particularly for high load elevated temperature applications.

John M. Beswick  
Symposium Chairman  
SKF Group Technology Development  
Nieuwegein, The Netherlands



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