

International Journal of Railway Technology

Editor:
J. Pombo

**Volume 5 - Issue 1
2016**

Special Issue:
**Railways 2016: The Third International Conference
on Railway Technology:
Research, Development and Maintenance**



The International Journal of Railway Technology (IJRT) is an international journal dedicated to research, development and application in the scope of railway systems. The aim of the Journal is to provide an international platform for researchers and experts to promote, disseminate and discuss the recent developments and advances in the field of railway technology. Furthermore, this publication aims to encourage interaction and collaboration between universities, research centers, railway operators and industry in order to identify problems, propose solutions and indicate directions for future research. The Journal publishes original papers that cover, but are not limited to, the following topics:

- **Rolling Stock:** Design, manufacture and maintenance; Modelling and simulation; High speed trains, light railways and freight capacity; Performance and optimisation; Aerodynamics and crosswind; Noise, vibration and comfort; Safety, security and reliability; Ergonomics and interior design.
- **Infrastructure:** Bridges, tunnels and transition zones; Track design, construction and maintenance; Interaction of vehicles with the infrastructure and the environment; Foundations; Track monitoring; Trackbeds: sleepers and ties; Geotechnical aspects: earthworks, embankments, stabilisation; Technologies for track defects detection.
- **Energy and Environment:** Re-use of kinetic energy; Energy sources and smart grids; Hybrid traction and power trains; Sustainable rail transport.
- **Signalling and Communication:** ERTMS - European Rail Traffic Management System; ITS - Information and Technology Systems.
- **Operations** Traffic management; Interoperability; Intermodal solutions.
- **Strategies and Economics:** Standards and regulations; Capacity and cost; Track access charges; Future trends in railway engineering.

© Saxe-Coburg Publications, Stirlingshire, Scotland

published 2016 by

Saxe-Coburg Publications

Dun Eaglais, Station Brae, Kippen

Stirlingshire, FK8 3DY, United Kingdom

Saxe-Coburg Publications is an imprint of Civil-Comp Ltd

ISSN 2049-5358

Volume 5 - Issue 1, 2016

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Publisher's production and editorial team: Steven Miller, Jane Tabor, Rosemary Brodie

Cover design: Erzsébet Györi

Printed in Great Britain by Bell & Bain Ltd, Glasgow

Contents

<i>Editorial</i>	<i>iii</i>
Train Aerodynamics: Past, Present and Future <i>C. Baker</i>	1-22
Railway Wheelsets: History, Research and Developments <i>A. Bracciali</i>	23-52
Contact Performance of an Axle Bearing Assembly under Impact and Vibration Conditions of the Wheel-Flat and Rail-Gap of a Railway Passenger Train <i>S.Y. Pei, H.S. Wang, H. Xi, H.Y. Wang, W. Chang, H. Wei, Y. Gao K.S. Chen, S.N. Xu, H. Xu and F.C. Wang</i>	53-81
Discrete Element Method Simulation as a Key Tool Towards Performance Design of Ballasted Tracks <i>C. Voivret, V.-H. Nhu and R. Peralès</i>	83-98

Editorial

The International Journal of Railway Technology (IJRT) provides an international platform for researchers and experts to promote, disseminate and discuss the recent developments and advances in the field of railway technology. Furthermore, this publication aims to encourage the interaction and collaboration between universities, research centers, railway operators and industry in order to identify problems, propose solutions and indicate directions of future research. Railways 2016: The Third International Conference on Railway Technology: Research, Development and Maintenance to be held in Cagliari, Sardinia, Italy, 5-8 April 2016 will provide a venue for those from academia and industry concerned with the development of railways to discuss and debate these and many other issues.

Three special issues of the IJRT (Volume 5(1), 5(2) and 5(3)) are to be devoted to the publication of the invited lectures to be presented at Railways 2016. These lectures provide: (1) A state-of-the-art review of a particular research area, or; (2) Summarise a body of previously unpublished significant research or knowledge. I am particularly grateful to the Invited Lecturers for the contribution of their papers to both the journal and the conference. Other contributed papers to be presented at the Railways 2016 Conference will be published in: "Proceedings of the Third International Conference on Railway Technology: Research, Development and Maintenance" edited by J. Pombo and published by Civil-Comp Press.

I would like to thank the members of the Editorial Board of the Railways 2016 Conference: Dr V. Abate, Brazil; Prof. J.E. Abdalla Filho, Brazil; Dr M. Aizpun, Chile; Prof. A. Alonso, Spain; Prof. J.A.C. Ambrsio, Portugal; Dr L.V. Andersen, Denmark; Prof. J.M.C.S. Andr, Portugal; Dr L. Baeza, Spain; Prof. C. Baker, UK; Dr M. Baldeiras, Portugal; Prof. Dr M. Banerjee, India; Prof. S. Barmada, Italy; Prof. Z. Bazaras, Lithuania; Prof. Dr-Ing M. Beitelschmidt, Germany; Dr Y. Bezin, UK; Dr N. Bojovic, Serbia; Prof. C. Boller, UK; Prof. A. Bracciali, Italy; Prof. M.A. Bradford, Australia; Prof. S. Bruni, Italy; Dr R. Calada, Portugal; Dr C. Carganico, Italy; Prof. R. Carrazedo, Brazil; Dr R.L. Chen, China; Prof. K.H. Cho, Korea; Dr Y.H. Cho, Korea; Dr I.J. Coleman, UK; Dr A. Cornish, UK; Prof. A.G. Correia, Portugal; Dr S. Costa D'Aguiar, France; Dr B. Counter, UK; Dr C. Cruceanu, Romania; Prof. B. De Schutter, Netherlands; Prof. G. Degrande, Belgium; Prof. R. Delgado, Portugal; Dr Z. Dimitrovov, Portugal; Prof D. Duhamel, France; Dr D.J. Edwards, UK; Prof. G. Efraimsson, Sweden; Prof. J.L. Escalona Franco, Spain; Prof A. Facchinetti, Italy; Dr D.I. Fletcher, UK; Prof. E. Fortunato, Portugal; Prof. L. Fryba, Czech Republic; Dr P. Galvn, Spain; Prof. Dr Ing. J. Gerlici, Slovakia; Dr J.M. Goicolea, Spain; Prof. A.

Gugliotta, Italy; Dr M. Hartnett, Ireland; Dr H. Hemida, UK; Dr L. Hornicek, Czech Republic; Dr S.S. Hsu, UK; Prof. B. Indraratna, Australia; Dr M. Ishida, Japan; Prof. X. Jin, China; Prof. C. Johnson, UK; Prof. Y.H. Jung, Korea; Prof. S. Kaewunruen, UK; Dr R. Karoumi, Sweden; Prof. E. Kassa, Norway; Dr P. Koziol, Poland; Prof. S. Krajnovic, Sweden; Dr N. Kuka, Italy; Prof. A. Levchenkov, Latvia; Prof R. Lewis, UK; Dr D. Li, USA; Dr Z. Li, Netherlands; Prof. Y. Lim, Korea; Prof. S. Loose, Germany; Prof R. Lunden, Sweden; Prof. M.R. Macrio, Portugal; Prof. J. Magiera, Poland; Prof. C. Majorana, Italy; Prof. G. Malavasi, Italy; Dr M. Malvezzi, Italy; Dr I. Manka, Poland; Dr M. Marinov, UK; Dr E. Markiewicz, France; Dr V. Markine, Netherlands; Dr M.D. Martnez-Rodrigo, Spain; Dr S. Martins Moretto, Portugal; Prof. M. Matos Neves, Portugal; Prof. A. Matsumoto, Japan; Dr T. Mazilu, Romania; Dr E. Meli, Italy; Dr M. Milenkovic, Serbia; Dr Y. Momoya, Japan; Prof. A. Mpanda, France; Prof. H. Nakamura, Japan; Prof. C. Nash, UK; Dr M. Novales, Spain; Dr A. Nunez, Netherlands; Prof. A. Nurmikolu, Finland; Prof. C. O'Neill, UK; Prof. U. Olofsson, Sweden; Dr Z. Orban, Hungary; Mr T.W. Palfreyman, UK; Dr H. Pan, China; Prof. A. Parida, Sweden; Prof. M.S. Pereira, Portugal; Prof. Dr O. Polach, Switzerland; Prof. Dr-Ing. C. Proppe, Germany; Dr L. Pugi, Italy; Dr Z. Qian, Netherlands; Prof. Y. Qiu, China; Prof. G. Raghuram, India; Assoc. Prof. A. Ramalho, Portugal; Prof. S. Ricci, Italy; Dr A. Rindi, Italy; Dr C. Roberts, UK; Prof. J. Ros, Spain; Dr A. Rovira, Spain; Dr R. Saudo Ortega, Spain; Dr G. Saussine, France; Dr L. Schmitt, France; Prof. A.A. Shabana, USA; Dr R.C. Sharma, India; Prof. X. Sheng, China; Prof. M. Sitarz, Poland; Dr K. Six, Austria; Prof. R.A. Smith, UK; Dr M.J.M.M. Steenbergen, Netherlands; Prof. S. Stichel, Sweden; Dr B. Suarez, Spain; Prof. Y. Suda, Japan; Assoc. Prof. H. Sugiyama, USA; Mr A. Tabbal, France; Prof. P.F. Teixeira, Portugal; Prof. Y. Terumichi, Japan; Prof. B.H.V. Topping, UK; Esp. R. Troian, Brazil; Prof. H. True, Denmark; Dr M. Tucci, Italy; Dr E. Tutumluer, USA; Prof. C. Vale, Portugal; Prof. L.M. Vianna, Brazil; Dr C. Voivret, France; Dr E.A.H. Vollebregt, Netherlands; Prof. C. Wagner, Germany; Prof. F. Wang, China; Dr B. Wilson, USA; Dr J.K.W. Winter, Germany; Prof. P.K. Woodward, UK; Prof. T.X. Wu, China; Prof. B. Wynne, UK; Prof. G. Yang, China; Prof. Y.B. Yang, Taiwan; Dr D. Younesian, Iran; Dr J.A. Zakeri, Iran; and Dr W.H. Zhang, China.

Finally, I would particularly like to thank Professor Barry Topping, for his support and experience, Steven Miller, for his organisational skills, and Mario Nagy, for his administrative support.



Professor J. Pombo
 Heriot-Watt University, Edinburgh, U.K.
 LAETA, IDMEC, IST - University of Lisbon
 & ISEL - Lisbon Polytechnic Institute, Portugal