

# **Stephenson Conference Research for Railways 2015**

London, United Kingdom  
21 - 23 April 2015

ISBN: 978-1-5108-5583-0

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2015) by the author(s) and/or their employer(s)  
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact Institution of Mechanical Engineers (IMechE)  
at the address below.

Institution of Mechanical Engineers (IMechE)  
One Birdcage Walk  
London, SW1H 9JJ  
United Kingdom

[library@imeche.org](mailto:library@imeche.org)  
[www.imeche.org](http://www.imeche.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# CONTENTS

---

C1408/063	From research to rulemaking in the Federal Railroad Administration <i>J Tunna, US Department of Transportation, USA</i>	1
C1408/089	Video measurement techniques for understanding wheel-induced lateral forces and track component deflections <i>P Waterfall, Imetrum Ltd and University of Bristol; B Temple, C Hardwick, LB Foster Rail Technologies; J Sharam, A Plumb, Imetrum Ltd, UK</i>	11
C1408/058	A 2D DEM analysis of railway ballast vibration under cyclic loads <i>X Zhang, C Zhao, W Zhai, Southwest Jiaotong University, China</i>	31
C1408/038	Railway bridge maintenance modelling <i>B Le, J Andrews, University of Nottingham, UK</i>	41
C1408/008	Multi-domain simulation of hybrid diesel-driven railway vehicles and comparison of electrical energy storage systems <i>S Schmid, Voith Turbo GmbH &amp; Co. KG, Germany; K Ebrahimi, University of Bradford, UK; W Commerell, UAS Ulm, Germany</i>	57
C1408/103	Prediction of wheel-rail contact forces based on a heavy haul locomotive dynamic inverse modelling <i>Y Q Sun, M Spiryagin, C Cole, Central Queensland University, Australia</i>	71
C1408/069	Plasticity in wheel-rail contact and its implications on vehicle-track interaction <i>K Six, A Meierhofer, G Trummer, C Marte, G Müller, B Luber, M Rosenberger, VIRTUAL VEHICLE Research Center; P Dietmaier, Graz University of Technology, Austria</i>	83
C1408/110	Development of a Tram-Train wheel profile for dual-operation running <i>D Crosbee, P D Allen, University of Huddersfield; R Carroll, Sheffield Supertram, UK</i>	95
C1408/062	An experimental study of dynamic performance of slab track using a full scale test rig <i>M Wang, X Yuan, C Cai, S Zhu, Southwest Jiaotong University, P.R. China</i>	111

C1408/090	The influence of support conditions on short- and long-term track behaviour <i>I Grossoni, Y Bezin, University of Huddersfield, UK</i>	121
C1408/030	Scoping prediction of railway ground-borne vibration in the presence of variable soils <i>D P Connolly, P K Woodward, O Laghrouche, B Suryanto, G Medero, Heriot-Watt University, UK; G Kouroussis, University of Mons, Belgium; M C Forde, University of Edinburgh, UK</i>	133
C1408/053	Study on radiation contribution of wheel/rail system noise <i>Q Yin, C Cai, S Zhu, Z Chen, Southwest Jiaotong University, China</i>	143
C1408/006	Modelling of Train Induced Vibration <i>E Ntotsios, S G Koroma, D J Thompson, University of Southampton; W I Hamad, H E M Hunt, J P Talbot, University of Cambridge, UK; M F M Hussein, Qatar University, Qatar</i>	153
C1408/033	Determining system-wide energy use in an established metro network <i>J P Powell, A González-Gil, R Palacín, P Batty, Newcastle University, UK</i>	163
C1408/032	Viable flywheel system for rail <i>J C Wheals, W To, J Dalby, M Vigar, J Hodgson, J Buchanan, Ricardo UK Ltd; A Robertson, J Macpherson, J Taylor, Artemis Intelligent Power Ltd; W Lanoe, M Heaton, Bombardier Transportation, UK</i>	171
C1408/117	Metro traction and power system energy optimisation <i>N Zhao, Z Tian, S Hillmansen, C Roberts, The University of Birmingham, UK; M Yuan, J Li, Guangzhou Metro Corporation; H Shi, K Li, Guangzhou Metro Design &amp; Research Institute Co., Ltd, P.R. China</i>	191
C1408/043	Modelling critical velocities on soft soils using finite element methods <i>S Mezher, P K Woodward, O Laghrouche, G Kouroussis, G Medero, D P Connolly, Heriot-Watt University, UK</i>	199
C1408/059	Bayesian reconstruction of three dimensional railway track geometry: improvements and developments in the system toward practical use <i>A Yoshimura, Tokyo University of Technology, Japan</i>	209
C1408/112	Design, construction and operation of a REPOINT laboratory demonstrator <i>S D Bemment, R Dixon, R Goodall, C P Ward, N Wright, Loughborough University, UK</i>	221

C1408/040	Identification of bridge bearing damage based on Radial Basis Function Neural Network <i>Z Chen, Q Yin, D Zhang, Southwest Jiaotong University, China</i>	233
C1408/074	Dynamic simulations in support of installation of light rail tracks on the Homer H. Hadley Memorial floating bridge <i>C Ketchum, R Joy, Transportation Technology Center, Inc.; T Cooper, Parsons Brinckerhoff, Inc., USA; A Foan, Andy Foan Ltd, UK; H Sederat, SC Solutions; J Sleavin, Sound Transit, USA</i>	245
C1408/107	Estimating the damage and marginal cost of different vehicle types on rail infrastructure: combining economic and engineering approaches <i>A S J Smith, P Wheat, University of Leeds; A Kaushal, S Iwnicki, University of Huddersfield, UK; K Odolinski, Swedish National Road and Transport Research Institute, Sweden</i>	265
C1408/106	Studying variations of skyhook method for comfort improvement <i>A Qazizadeh, S Stichel, KTH Royal Institute of Technology; R Persson, Bombardier Transportation, Sweden</i>	275
C1408/075	Material considerations on the formation of Vertical Split Rim wheel failures <i>D H Stone, ESI; S L Dedmon, Standard Steel, LLC, USA</i>	287
C1408/001	Design of the running gear for the SUSTRAIL freight vehicle <i>S D Iwnicki, University of Huddersfield, UK; A Orlova, Petersburg State Transport University, Russia; P-A Jonsson, KTH Royal Institute of Technology, Sweden; M Fartan, REMARUL Engineering, Romania</i>	299
C1408/052	Effect of disabled cement asphalt mortar layer on dynamic behavior of slab track <i>J Han, L Ling, X B Xiao, Z F Wen, X S Jin, Southwest Jiaotong University; G T Zhao, Southwest Jiaotong University and China Railway Corporation, China</i>	307
C1408/049	The effects of railway traffic on trackbed stability and deformation due to clay fill performance <i>G R Taylor, R Tan, A S O'Brien, Mott MacDonald Limited; J S Lane, Rail Safety and Standards Board; E Evans, Network Rail, UK</i>	323
C1408/108	Formalised finite element analysis and design of cast manganese crossings for switch and crossing layouts <i>H Persson, Heriot-Watt University and Progress Rail Services UK Limited; J M Ritchie, Y Chen, Heriot-Watt University; M Westoby, Progress Rail Services UK Limited, UK</i>	335

C1408/109	A frequency-domain finite element approach for modelling railway induced vibration in soils <i>N Hamdan, O Laghrouche, P K Woodward, D Connolly, Heriot-Watt University, UK</i>	347
C1408/012	Application of dynamic vibration double-absorbers in low-frequency vibration control of floating slab tracks under train-track interaction <i>S Zhu, C Cai, L Zhang, Southwest Jiaotong University; J Yang, H Yan, China Railway Eryuan Engineering Group Co. Ltd, P.R. China</i>	361
C1408/114	Investigation of ground vibration from circular tunnels using a 2.5D FE/BE model of tunnel and ground <i>Q Jin, D J Thompson, University of Southampton, UK</i>	375
C1408/039	Addressing nodal constraints on railway capacity <i>J Armstrong, University of Southampton and Arup; J Preston, C Potts, T Bektas, University of Southampton; D Paraskevopoulos, University of Bath, UK</i>	387
C1408/014	Investigation into the effect of moisture on rail adhesion <i>J Fisk, T Armitage, Arup; R Lewis, D Fletcher, M Evans, A Arnall, The University of Sheffield, UK</i>	395
C1408/009	Development of a methodology for co-simulation of tilting trains in SIMPACK-SIMULINK <i>N Kuka, ALSTOM Transport; C Ariaudo, R Verardi, ALSTOM Ferroviaria S.p.A., Italy</i>	409
C1408/016	Apparently independently rotating wheelset – a possible solution for all needs? <i>A Bracciali, University of Florence and AB Consulting sas, Italy</i>	427
C1408/037	Hunting stability and improvement measures for high speed vehicles <i>J Zeng, L Wei, M Chi, J Wang, Southwest Jiaotong University, China</i>	441
C1408/071	Failure analysis of railroad concrete crossties in center binding conditions using finite element method <i>H Yu, B P Marquis, D Y Jeong, Volpe National Transportation Systems Center, USA</i>	453
C1408/102	Insulated rail joint enhancement: testing and analysis <i>A E Beagles, P Beaty, D I Fletcher, R Lewis, The University of Sheffield; B P Temple, LB Foster Rail Technologies (UK) Ltd, UK</i>	463

C1408/017	Real-time on-board condition monitoring of train axle bearings <i>I Corni, University of Southampton and Perpetuum Ltd; N Symonds, R J K Wood, University of Southampton; A Wasenczuk, D Vincent, Perpetuum Ltd, UK</i>	477
C1408/086	Low-power embedded system approach for axlebox bearing condition monitoring <i>M Entezami, L Saade, E Stewart, C Roberts, P Weston, The University of Birmingham; R Lewis, TWI Ltd, UK</i>	491
C1408/113	Modern innovations on the application of the rotating ultrasonic probe to in-service inspection of freight solid axles: experiments and MAPOD approach <i>M Carboni, Politecnico di Milano; S Cantini, Lucchini RS SpA, Italy</i>	503
C1408/104	Robust multi-train trajectory optimisation for real world conditions using a 'noisy' genetic algorithm <i>J Goodwin, D I Fletcher, R F Harrison, University of Sheffield, UK</i>	515
C1408/011	SafeCap: the train advisory system for real-time traffic management <i>A Iliasov, A Romanovsky, Newcastle University, UK</i>	529
C1408/101	Evaluation of bogie rotational resistance <i>T Tanaka, K Iida, M Suzuki, T Iida, N Watanabe, T Miyamoto, Railway Technical Research Institute, Japan</i>	539
C1408/057	Investigation of the application of adjustable air suspension under traction control for heavy haul locomotives <i>M Spiryagin, P Wolfs, C Cole, Y Q Sun, Central Queensland University, Australia; V Spiryagin, Rostov Electric Locomotive Repair Plant, Russia; I Persson, AB DEsolver, Sweden</i>	549
C1408/024	Wireless mesh sensors are transforming asset monitoring in rail <i>S Maddison, B Smith, Senceive Ltd, UK</i>	559
C1408/105	Deploying a low energy power model within data loggers and sensors for the remote monitoring of assets <i>R J Preece, Arrowvale Electronics and University of Birmingham; T M Hanif, R J Amos, Arrowvale Electronics; E J C Stewart, University of Birmingham, UK</i>	573

C1408/047	Application of FRA new vehicle-track system qualification requirements <i>B P Marquis, Volpe National Transportation Systems Center; A Tajaddini, Federal Railroad Administration, USA; H-P Kotz, Siemens – Infrastructure and Cities, Austria; W Breuer, Siemens – Infrastructure and Cities, Germany; M Trosino, National Railroad Passenger Corporation, USA</i>	581
C1408/076	The development and application of a lean future state design methodology to the railway possession and isolation authorisation process <i>S Stiles, University of Nottingham and SHE Solutions Ltd; W Garner, Coventry University, UK</i>	595
C1408/092	The variability of generalised cost weighting parameters <i>S Pani, F Schmid, University of Birmingham; N G Harris, Railway Consultancy Ltd, UK</i>	609
C1408/099	Influence of varying input parameters on model validation results <i>G Götz, Technische Universität Berlin, Germany; O Polach, Bombardier Transportation (Switzerland) AG, Switzerland</i>	623
C1408/004	A comparison of full scale and model scale measurements of train aerodynamic characteristics <i>C Baker, A Quinn, H Hemida, M Sterling, M Gallagher, J Morden, University of Birmingham, UK</i>	637
C1408/088	Preliminary results of monitoring audio frequency track circuits <i>L Saade, P Weston, C Roberts, University of Birmingham, UK</i>	649
C1408/046	A 10 Gbit/s Ethernet infrastructure for future-proofed railway communications <i>G Koczian, S Walker, University of Essex; G Howell, B Simpkin, LPA Connection Systems, UK</i>	659
C1408/067	Revising US passenger railcar occupant volume integrity requirements <i>J Gordon, U.S. Department of Transportation, USA</i>	665
C1408/045	Evaluating options for a fault tolerant railway system <i>C Fecarotti, J Andrews, R Remenyte-Prescott, The University of Nottingham, UK</i>	679
C1408/098	The paper that eliminates paper <i>M Davies, Interfleet, UK</i>	691
C1408/025	Theoretical and experimental analyses of the HXN3 locomotive cab vibration isolation system <i>C-S Li, S-H Luo, W-H Ma, Southwest Jiaotong University; T-W Qu, Dalian Locomotive and Rolling Stock Co., Ltd, P.R. China</i>	701



C1408/029	Vibration isolation design of under chassis equipments for high-speed EMU trains <i>D Gong, J Zhou, W Sun, Tongji University, China</i>	717
C1408/018	Flexible carbody vertical vibration characteristic of high-speed train <i>H Cao, Southwest Jiaotong University and Southwest University of Science &amp; Technology; W Zhang, B Miao, Southwest Jiaotong University, P.R. China</i>	731
C1408/068	ICE-S – Vehicle reaction measurement and track geometry measurement on the same measuring train: Results of the comparison of the two different track inspection methods <i>T Kolbe, R Kratochwille, Deutsche Bahn AG, DB Systemtechnik GmbH, Germany</i>	743
C1408/087	Detection of vertical track faults using an instrumented in-service vehicle: Considering efficient real-time fault detection <i>G J Yeo, P F Weston, C Roberts, University of Birmingham, UK</i>	755
C1408/119	Determination of vertical alignment of track using accelerometer readings <i>E J OBrien, University College Dublin; C Bowe, Iarnród Éireann Irish Rail; P Quirke, University College Dublin and Iarnród Éireann Irish Rail, Ireland</i>	765
C1408/073	Crashworthiness research on diesel multiple unit fuel tanks <i>K M Jacobsen, M E Carolan, US Department of Transportation, USA</i>	777
C1408/072	Locomotive crashworthiness research <i>D C Tyrell, P Llana, U.S. Department of Transportation, USA</i>	791
C1408/084	Radial expansion of metal tubes: static testing and simulation correlation <i>C Moreno, R Beaumont, D J Hughes, R Dashwood, University of Warwick; T Williams, OLEO International, UK</i>	805
C1408/093	Lean principles and sustainable operation of high-speed railways <i>D Hasegawa, G Nicholson, C Roberts, F Schmid, The University of Birmingham, UK; V Novak, Virginia Polytechnic Institute and State University, USA</i>	815
C1408/021	Consideration of the trade-offs between operational energy consumption and emissions and embedded energy consumption and emissions in rail infrastructure <i>J A Pritchard, University of Southampton, UK</i>	825

## **CASE STUDIES**

C1408/120	How accident investigation can drive research <i>W Rasaiah, Rail Accident Investigation Branch, UK</i>	837
C1408/121	ON-TIME: Improving customer satisfaction through increased capacity and decreased delays <i>M Dasigi, Network Rail, UK</i>	841

## **AUTHOR INDEX**