Proceedings of 2024 Joint Rail Conference

(JRC2024)

May 13-15, 2024 Columbia, South Carolina

Conference SponsorRail Transportation Division

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Two Park Avenue * New York, N.Y. 10016

© 2024, The American Society of Mechanical Engineers, 2 Park Avenue, New York, NY 10016, USA (www.asme.org)

All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

IINFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, tel: 978-750-8400, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions

ISBN: 978-0-7918-8777-6

TABLE OF CONTENTS

UAV-Based Railroad Line Detection	1
Keith Lewandowski, Nikolaos Vitzilaios	
Development of Rail Anchor Testing Through Literature Review of CWR Buckling Resistance Evaluation.	10
Juan Rodriguez, Siang Zhou, Constantine M. Tarawneh, Alberto Sanchez, Teresa Salazar- Flores, Mustapha Rahmaninezhad, Hameem Gorabi	
Enhancing Railway Safety Through Satellite-Based Monitoring for Rockfall Potential	18
Using SmartRock to Assess Railroad Ballast Vertical Acceleration in Large-Scale Triaxial Test Under Varied Loading Pulses	26
A Deep LSTM-Sliding Window Model for Real-Time Monitoring of Railroad Conditions Using Distributed Acoustic Sensing (DAS)	31
Investigating the Use of B-Spline Signature Responses to Detect Internal Rail Defects	39
Evaluating the Use of Surface Wave Ultrasonics for Near-Surface Rolling Contact Fatigue Depth Characterization	45
AI-Enabled Vibration Sensing System for Early Detection of Trains at Active Highway-Rail Grade Crossings Mohsen Amjadian, Md Masnun Rahman, Constantine Tarawneh, Valik Villarreal, Dylan Rocha	56
Counteracting Freeze-Thaw Deterioration Using Fiber Reinforced Concrete for Railroad Ties	64
A Hybrid Rail Surface Spot Irregularities (RSSI) Detection Algorithm Based on Onboard Measurements	70
EPS Geofoam In-Filled Ground Vibration Barriers for Environmental Sustainability of Ballasted High-Speed Railway Tracks: State of the Art	
Performance of a Mobile, Non-Contacting, Reference-Free Prototype System for RNT and Rail Stress Measurements	87
Feature Extraction From Vibration Signature Required From Railroad Bearing Onboard Condition Monitoring Sensor Modules	92
Kevin Quaye, Ping Xu, Dimah Dera, Heinrich Foltz, Constantine Tarawneh, Alberto Diaz	
Automatic Assessment of Rail Squat Defects by Sensor Fusion	97

Finite Element Analysis of Crack Growth in Steel Rails Subjected to Non-Uniform Residual	
Stresses: Shelling to Detail Fracture	102
Locomotive Crash Energy Management Train-To-Train Impact Test Results	112
Tunica Bana, Renara Siringjenov, Karina bacobsen	
Hydrogen Powered Rail Traction Technology Review - The Pathways to Reduce the Rail Environmental Footprint	123
Passenger Railcar Production in North America: Rationalization and Standardization	136
Stuart 1. Trout	
Research on Wheel Wear Coefficient Considering Wheel Profile and Operating Route Based on Multi-Rigid-Body Method	143
Ruiyang Song, Lixia Sun, Jimin Zhang	
Managing Hi-Railer Set-on and Set-Off in a Train Control System Using Axle Counters	149
Empirical Verification of a Heuristic Radio Propagation Model in a Non-Uniform Subway Tunnel Environment	158
Arash Aziminejad, Ashley Wu, Andrew Lee, Gabriel Epelbaum	150
Why CBTC at Metro?: A Technical Case Study	164
System Integration Testing in the Factory for Train Control and Signaling Systems	172
Challenges and Solutions of Track Circuits in Rail Transit Systems	182
Fault Detection of a Loose Bolt Connection for Implementation of the DC Series Motor in the Railway Industry by Wavelet	191
IEC 61850 and its Capabilities in Protection Systems	199
Streamlining System Assurance Program Objectives and Compliance With Both European and American Standards by Early Integration	208
Multiscale Computational Modeling of Subsurface Cracking in Railhead: Insights Into Fatigue Life Sina Saberi, Gavin Whetstone, David H. Allen	219
Effects of Lading Conditions on Puncture Resistance and Release Probability of HAZMAT Tank Cars	227
Steven W. Kirkpatrick	441
AI-Based Hazard Detection for Railway Crossings	228
Darren Espinoza, Gasser Ali, Constantine Tarawneh	236

Simulation-Based Framework to Evaluate the Accident Performance of Novel Railroad Tank Cars Paul Gharzouzi, Steven W. Kirkpatrick, Leandro Iannacone, Paolo Gardoni, Chen-Yu Lin, Todd Treichel, Chris P. L. Barkan	245
Powering Onboard Bearing Health Monitoring Sensors With Thermoelectric Generators Under Non-Uniform Temperatures	253
Danna Capitanachi, Gael de Leon, Carlos Rodriguez, Constantine Tarawneh, Heinrich Foltz	
Healthy and Defective Tapered Roller Bearing Temperature Metrics	259
Curtis Pena Experimental Investigation of Lateral Load Effects on Railway Tapered Roller Bearing Performance	264
Abel David Sanchez Trinidad, Constantine Tarawneh, Diego Aguila, Arturo Fuentes, Santanna Guiterrez, Curtis Pena, Daniel Reyna	200
Railroad Track and Wheel Defect Detection With Onboard Condition Monitoring System	271
Optimized Vibration-Based Health Metrics for Freight Rail Bearings	279
Spectral Clustering in Railway Crossing Accidents Analysis	286
Evaluating the Puncture Resistance of the DOT-113 Tank Car for Liquified Natural Gas Service	292
Kernel Ridge Regression in Predicting Railway Crossing Accidents	304
Rapid Rail Transit (Metro) System. Implementation and Expansion Technical and Operational Challenges Review - The D.C. Metrorail Case Study	310
Review of Passenger Railroad EMU and MU Rolling Stock in the US and Canada - Part I, New York State Region	322
Historical Implications of Wayside Detector Systems and Their Ability to Detect Hot Bearing Derailments	343
Constantine Tarawneh, Brent Wilson, Byron Porter	

Author Index