

Foreword

Although to the untrained eye it might seem as though the main characteristics of railway track have not changed since the early days of the railways in fact there have been huge advances in the technology and the performance of modern railway infrastructure. This improvement is driven by the demand for greater and greater performance resulting in higher axle loads and higher speeds and also the requirement for increased reliability and reduced maintenance which today's infrastructure managers must deliver.

These improvements would not be possible without the huge research efforts which are being made by teams in industry and universities around the world and some of the best of this research is represented by the work presented in this special issue. The papers include work by Ishida who explains how rolling contact fatigue on rails is being handled in Japan and by Liu and colleagues who use 3D finite element modelling to assess the potential for new types of ballastless track to reduce construction cost. Zong and colleagues in Australia demonstrate a new wheel-rail contact modelling method which helps to predict impact forces at the rail joints and benchmarks this with field data and Wexler analyses how the steel behaves at the microscopic level and how impact forces affect the rail material and its performance. Novel railway sleeper construction using fibre composites and prestressed concrete is described in papers by Van Erp et al and by Taherinezhad et al and Kaewunruen et al. The paper by Aikawa presents a new way to see through the stress wave in ballast aggregates subjected to dynamic and impact loadings by integrating advanced sensors with 3D FEM/DEM in order to improve understanding of the track deterioration process. The effect of bridge transitions and its effect on train ride quality is analysed by Sun and colleagues who show in their paper how simulations of train-track-bridge interaction using a high performance computer can provide a better insight into the root causes of impact loading at bridge ends.

The work presented here is already leading to practical improvements in the operation of railways and I am sure that further developments building on this work by the teams represented here and others will deliver even greater safety, performance and reliability levels in the future.

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