

The Dynamics of Vertical Transportation Systems in Deep Underground and High-Rise Applications

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Abstract

High speed and high capacity lifting installations move heavy payloads and passengers to / from depths in excess of 3000 m and service buildings of nearly 1000 m tall. This lecture will describe how the principles and methods of applied mechanics are used to solve practical engineering problems in the modern vertical transportation (VT) technologies, from material handling problems in deep underground mines to lift engineering projects in high-rise applications. In these systems long slender continua (LSC) such as steel wire ropes and composite belts play pivotal roles as suspension means and weight-compensation members. The natural frequencies of VT systems employing LSC are slowly varying, rendering them non-stationary. The dynamic interactions involve exchanges of energy between various modes of vibration. An adverse situation arises when the system is excited near its natural frequency and one of the time varying frequencies of the system approaches the frequency of the excitation. In this context the lecture will demonstrate how the prediction of dynamic behaviour of vertical transportation systems is essential for developing vibration suppression and control strategies to minimize the effects of adverse dynamic responses so that the installation will operate without compromising the structural integrity and safety standards. The lecture will also highlight future research directions in this area of engineering.

About the speaker

Professor Stefan Kaczmarczyk received his Masters degree in Mechanical Engineering from the Silesian University of Science and Technology, and his PhD in Mechanical Engineering from the University of Natal (now the University of KwaZulu-Natal). He is Professor of Applied Mechanics at the University of Northampton, UK, a Chartered Engineer, and Fellow of the Institution of Mechanical Engineers. Prof Kaczmarczyk's expertise is in the area of dynamics and vibration with particular applications in the sustainable design of vertical transportation and material handling systems. He has been involved in collaborative research with a number of national and international partners and has an extensive national and international track record in consulting and research in Applied Dynamics and Vertical Transportation system engineering. He has published over 100 refereed journal and conference papers in these fields.

Venue and Time: Lecture Theatre, Unite Building (School of Engineering), Howard College Campus, UKZN, 22 August 2017, 12.15-13.00. For more information, please contact Ms Nombuso Dlamini School of Engineering Research Office Dlaminin7@ukzn.ac.za