Application of geosynthetics and recycled rubber products for rail track stabilisation

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In recent decades, the rapid growth of population and urbanisation and the increasing demand for passenger and freight transportation have fostered the adoption of substantially faster and heavier trains, as well as the increase in the traffic volume. Hence, traditional rail infrastructures have become significantly overloaded, which has aggravated the degradation of the track components, leading to more frequent and costly maintenance. Modernising the railway infrastructure to meet the current and future rail transportation needs is therefore a challenge facing all developed societies.

The use of geosynthetics such as geogrids, geotextiles and geocells in new rail tracks and in track rehabilitation has gained wide acceptance worldwide owing to their technical and economic benefits. In particular, the application of geogrids in ballasted rail tracks reduces the rate of permanent ballast deformation and particle breakage under repetitive wheel loads (e.g. Brown et al. 2007; Chen et al. 2012; Ferreira and Indraratna 2017; Indraratna et al. 2018; Ngo et al. 2018). Furthermore, installing rubber energy-absorbing materials (such as ballast mats, under sleeper pads, rubber crumbs and tyre cells) manufactured from waste tyres in the track substructure not only assists in the attenuation of ballast damage induced by high cyclic and impact loadings, but it is also economically beneficial and environmentally sustainable (e.g. Nimbalkar et al. 2012; Navaratnarajah and Indraratna 2017; Indraratna et al. 2019).

In this talk, the effectiveness of geosynthetics and recycled rubber materials in mitigating the deterioration of ballasted rail tracks will be discussed, focusing primarily on research undertaken at the University of Wollongong (Australia), using state-of-the-art rail test facilities. The research outcomes will contribute to the development of innovative and more sustainable design solutions, considering the role of artificial inclusions in rail tracks for improved performance and reduced construction and maintenance costs.

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