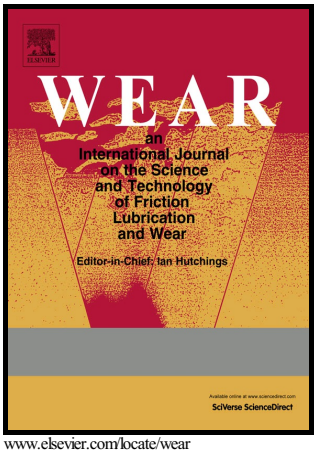

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PII: S0043-1648(17)31610-1
DOI: https://doi.org/10.1016/j.wear.2017.12.013
Reference: WEA102320

To appear in: *Wear*

Received date: 3 November 2017
Revised date: 17 December 2017
Accepted date: 17 December 2017

Cite this article as: Malal Kane and Vikki Edmondson, Modelling the bitumen scour effect: enhancement of a dynamic friction model to predict the skid resistance of rubber upon asphalt pavement surfaces subjected to wear by traffic polishing, *Wear,* https://doi.org/10.1016/j.wear.2017.12.013

Modelling the bitumen scour effect: enhancement of a dynamic friction model to predict the skid resistance of rubber upon asphalt pavement surfaces subjected to wear by traffic polishing

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Abstract

This paper explores the prediction of whole-life cycle skid resistance for asphalt. When asphalt surfaces are newly laid, the microtexture of the aggregates is masked by a film of bitumen binder that tends to lower skid resistance during the early life of a pavement, typically the first two year dependent on traffic volume. However, as it is subjected to traffic polishing, the skid resistance of a newly laid pavement starts increasing as a consequence of the scouring of the bitumen binder film, which gradually reveals the microtexture. Once fully exposed, the microtexture is progressively polished by the traffic tending to cause a decrease in skid resistance and leading to pavements becoming more slippery again in the long term.

To take into account the early life masking of the microtexture of an asphalt surface, a coefficient or "weight factor" is introduced to a Dynamic Friction Model (DFM) previously developed to predict the skid resistance of rubber moving upon a rough surface. To validate the modified model, mosaic and asphalt samples are prepared utilizing different aggregates and submitted to controlled laboratory polishing, to simulate both the wear of surface texture and scour of the bitumen film under traffic. The specimens' surface textures are recorded at different stages of polishing, and contact friction measurements taken using a Wehner-Schulze machine. These experimentally obtained values are compared with the fiction coefficients calculated with the modified model. The results illustrate comparable friction coefficients (More than 85% of the model simulations produced results with accurate at ±2% of the experimental measures), and accordingly demonstrate the robustness of the enhanced model to account for the initial presence of the bitumen binder film, in the evaluation of skid resistance for asphalt pavement surfaces.

Keywords

Dynamic Friction Model, Skid Resistance, Polishing, Bitumen, Texture, Friction After Polishing.