Pavement Wear by Studded Tires in Low-Speed Urban Traffic Environment

Harri M. HEIKKINEN
Satakunta University of Applied Sciences / Faculty of Logistics and Maritime Management, Rauma, Finland

***Abstract*—The scope of this research was to investigate the influence of vehicle speed on asphalt pavement studded tire wear at speeds below 60–80 km/h. To distinguish the pavement wear caused by studded tires from the other rutting mechanisms, other possible variables explaining pavement rutting in urban traffic environment were included. The research methods used were literature research, actual rut depth measurements with manually operating laser profilograph beam and a statistical analysis of the pavement rutting measurements conducted between 2004 and 2011 using pavement monitoring vehicle.**

The majority of wear caused by studs is directly proportional to the vehicle speed or. Since 1990´s, the aspect ratio of studded tires has decreased considerably in Finland and elsewhere. The lower the aspect ratio is, the shorter the tire footprint length is. In theory, this means that the stud contact to the pavement surface is not as abrasive at low speeds, as it has been previously discussed in the studies based on tests with higher aspect ratio tires.

Theoretically, without any dust from external factors such as chippings spread on roads or streets to prevent slippery icy conditions, pavement surface wear is directly proportional to the road dust emitted. All experiments in this research indicate that the road dust emissions at speeds below 60 km/h are comparable to the speed of vehicles equipped with studded tires, so it can be concluded that the pavement wear is dependent on the driving speed in a similar way.

Any significant statistical correlation between the driving speed and the measured rut depth increase was found neather in the pavement monitoring measurements nor in the actual rut depth measurements. However, there was a fair positive correlation between the driving speed and the area of ruts in terms of lost material obtained graphically from the measured individual pavement transverse profiles. The difference between rut depth and rutted area as dependent variables could be explained by positive correlation of the lane width to the speed limit.

This research challenges the previous research findings in Finland, which have suggested that the pavement wear is increasing when the driving speed decreases below 60-80 km/h. It looks like the contribution of deformation to the total rutting in urban-type traffic may have been underestimated, while the pavement wear caused by studded tires may have been overestimated.

AUTHORS

Harri M. Heikkinen was with the Department of Civil and Environmental Engineering of Aalto University School of Engineering, Espoo 02150 FIN. He is now with the Faculty of Logistics and Maritime Management, Satakunta University of Applied Sciences, Rauma, 26100 (e-mail: harri.heikkinen@samk.fi).

Published as submitted by the author.