Field tribometer as a suitable method for assessing the adhesion coefficient in both real and laboratory conditions

M. Valena[1]*, M. Omasta[1], R. Galas[1], I. Křupka[1], M. Hartl[1]

[1]Brno university of technology, Faculty of mechanical engineering. Institute of machine and industrial design, Technická 2896/2, 616 69 Brno, Czech Republic

Keywords: field tribometer, adhesion curve, wheel-rail contact, adhesion coefficient.

One of the most important parameters, which are measured on the rail, is the coefficient of adhesion (CoA). A higher value of CoA leads to higher rolling resistance and higher fuel consumption. Lower values cause safety issues in the form of an extension of the braking distance. Measuring locomotives or tribometers pushed by a vehicle are used for accurate measurement of CoA. These measurements are expensive and time-consuming; therefore, field tribometers are used. This work describes a portable field tribometer fixed to the rail to measure CoA. The main parts of the device are frame with two magnetic bases and the measuring module, which consists of the measuring wheel, the brake, the torque sensor, and the encoder. The CoA is obtained by changing a traction force, which is realized by breaking the measuring wheel. During measurement, the braking torque and positions of the module and measuring wheel are recorded. The positions are further processed to obtain slip. Based on these data, the adhesion curve can be obtained in the measured section. The portable field tribometer can work in three different modes. The first is constant – the braking torque does not change during the measurement pass. The second is the ramp, which gradually changes the braking torque. The last mode called pulse alternates two values of the braking torque. Several measurements in real and laboratory conditions were performed to verify the device.

*Corresponding author: Martin.Valena@vut.cz