Analysis of the influence of the material output rate on the coefficient of friction

[1]Reich, Alexander*; [2]Kölker, Michael*; [2] Univ.-Prof. Dr.-Ing. Schindler, Christian
[1]Nowe GmbH A Wabtec Company; [2]Institute for Rail Vehicles and Transport Systems – RWTH Aachen

KEYWORDS – railway, sanding, output rate

In conventional railways as well as tramways, sanding equipment is used to improve the coefficient of friction between the wheel and the rail. Sanding is especially necessary in inclement or humid weather conditions, which have an adverse effect on the friction coefficient.
For conventional railways the following relations between amount of spreading material and translational speed are given [1]:

$$v < 140\ km/h \qquad R_{S30} = 400\ g + 100\ g$$
$$v \geq 140\ km/h \qquad R_{S30} = 650\ g + 150\ g \qquad \text{Eq. 1}$$

where RS30 represents the amount of material spread per t = 30 s. The EBA specifies a supplementary rule B 011 [2] that limits the material output rate as given by Eq. 1 by prescribing a minimum output rate of RS30 = 200 g. In case of tramways, no information is provided for the material output rate according to [3] §36 Section. 6 Nr. 2. Relevant information can only be found in [4], which stipulates that the amount of sand (to be spread) should be calibrated suitably to prevent any possible disruptions or failures, especially in the train protection system It can thus be inferred, that depending on the type of regulation being followed, different material output rates are prescribed and consequently, implemented.
The aim of this work is to assess the extent of the influence that the material output rate has on the friction coefficient. To this end, comparative tests were conducted on the single.wheel rolling test bench (German: Einzelradrollprüfstand or ERP) seen in Fig. 1.

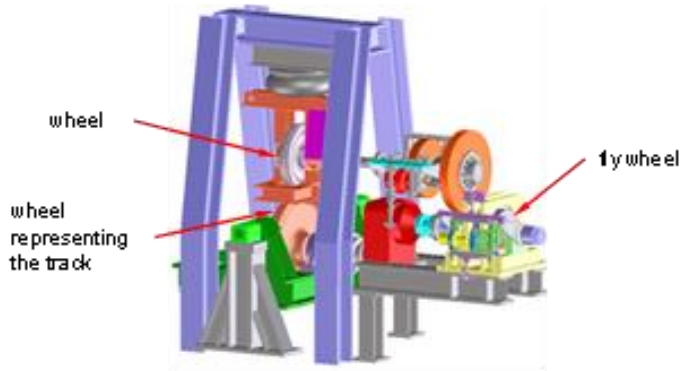

Figure 1: CAD-Model of the Single-wheel Rolling Testbench

The tests were so designed that only the parameters pertaining to the material output rate could be varied, with all other relevant parameters remaining constant.

[1] Technische Spezifikation für Interoperabilität, Teilsystem – Zugsteuerung, Zugsicherung und Signalgebung, 2006/860/EG
[2] Ergänzungsregelung Nr. B 011 zum „Sanden“, Rev. 1.0 ,10.02.2016
[3] Verordnung über den Bau und Betrieb der Straßenbahn (BOStrab) im Sinne des Personenbeförderungsgesetzes (PBefG), 12.12.2016
[4] Technische Regeln für die Bemessung und Prüfung der Bremsen von Fahrzeugen nach der BOStrab (TR Br), 2008, VDV