# A novel methodology for assessment of the tribological performance of top-of-rail products

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Top-of-rail (TOR) products have been developed to reduce squeal and corrugation problems in rail transportation. Although these benefits have been confirmed by several studies, a significant dependency between the adhesion level and applied amount of TOR products has been revealed. The studies showed that even slight over-application can lead to slippage problems and extension of braking distance. On the other hand, a small amount of TOR products does not provide the required benefits. For this reason, it is crucial to evaluate an optimal amount for each TOR product considered for use in real operation. Field tests are the most suitable approach for evaluating an optimal amount, however, these types of tests are expensive and time-consuming. Therefore, field tests are reasonable as a final step in the development of TOR products. In other cases, laboratory tests may be an appropriate approach to assess the performance of TOR products. These laboratory tests could be suitable especially as comparative tests of various TOR products. Furthermore, laboratory tests allow the study of other effects (e.g. contaminants, air humidity, temperature etc.) affecting the performance of TOR products.

The goal of this study was to develop a suitable methodology for the assessment of the tribological performance of top-of-rail products, specifically the evaluation of the adhesion coefficient and the product retentivity. This methodology could be potentially used as a standard in the future. For this purpose, the methodology was developed using a commercial tribometer. The Mini-Traction-Machine was chosen as the most suitable device because it is one of the most widespread commercial devices which allows to achieve typical rolling-sliding conditions that occur in the wheel/rail contact. There were two main requirements for the methodology: (1) to achieve a good repeatability of experiments with TOR products, and (2) to use contact pair (the disc and the ball) repeatedly. The developed methodology includes and describes six consecutive steps: (1) wear-in, (2) contact pair cleaning, (3) surface scanning, (4) run-in, (5) application of TOR product, (6) and the adhesion test. The methodology also includes recommendations when samples should be replaced.

**Keywords:** Adhesion coefficient, Friction management, Rolling-sliding contact, Top-of-rail lubrication, Wheel-rail tribology.

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