

Development of a Laboratory-Based Protocol for the Pre-Selection of Heavy-Haul Railway Lubricating Greases



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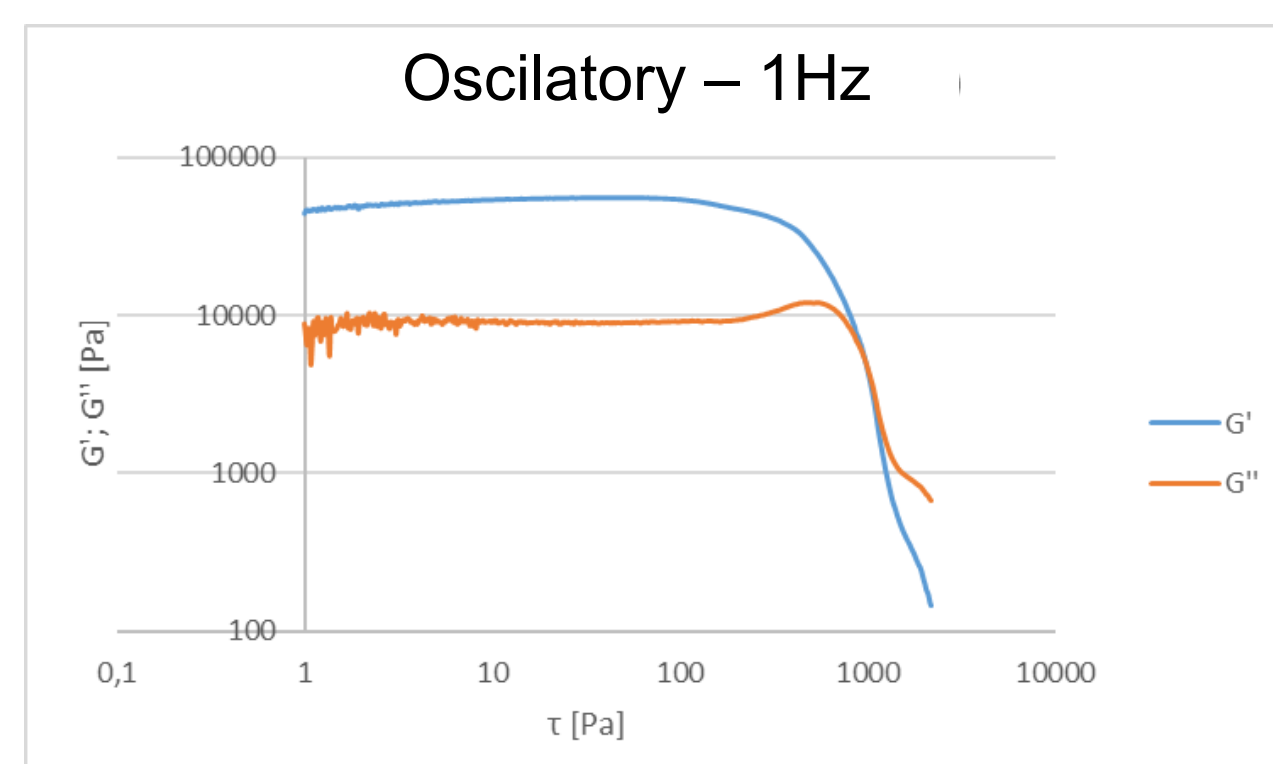
Introduction

The performance evaluation of lubricating greases for railway applications can be conducted through laboratory tests, scale models, and field tests. However, scale tests are often limited due to the lack of access to appropriate machinery, and field tests are laborious, with numerous uncontrollable variables. These limitations highlight the need for a robust pre-selection protocol of greases prior to large-scale or in-situ testing. This study proposes a systematic protocol for evaluating grease performance tailored to railway applications through simplified laboratory tests, encompassing tribological and rheological characterizations. The primary objective is to assess key performance attributes of greases, including lubricity, retentivity and pumpability

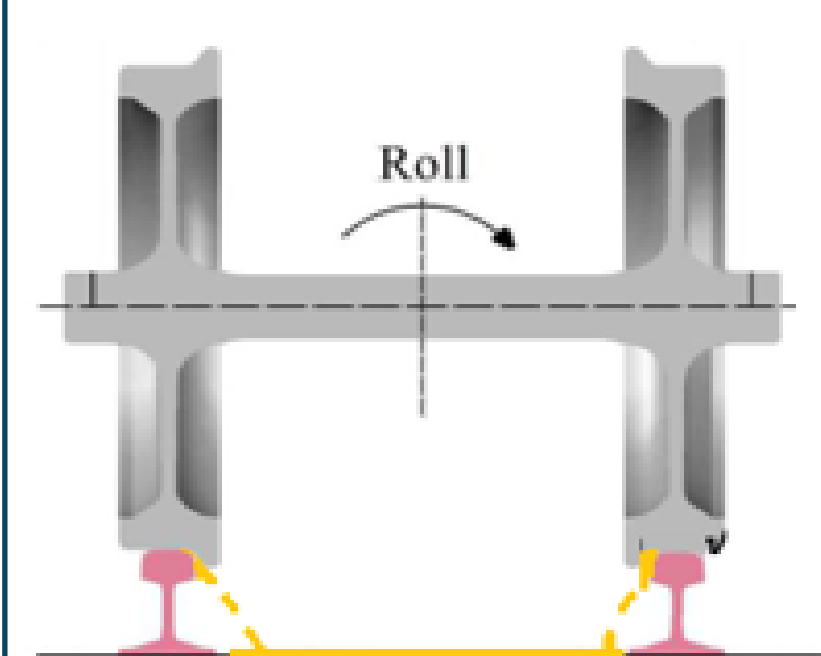
Pumpability



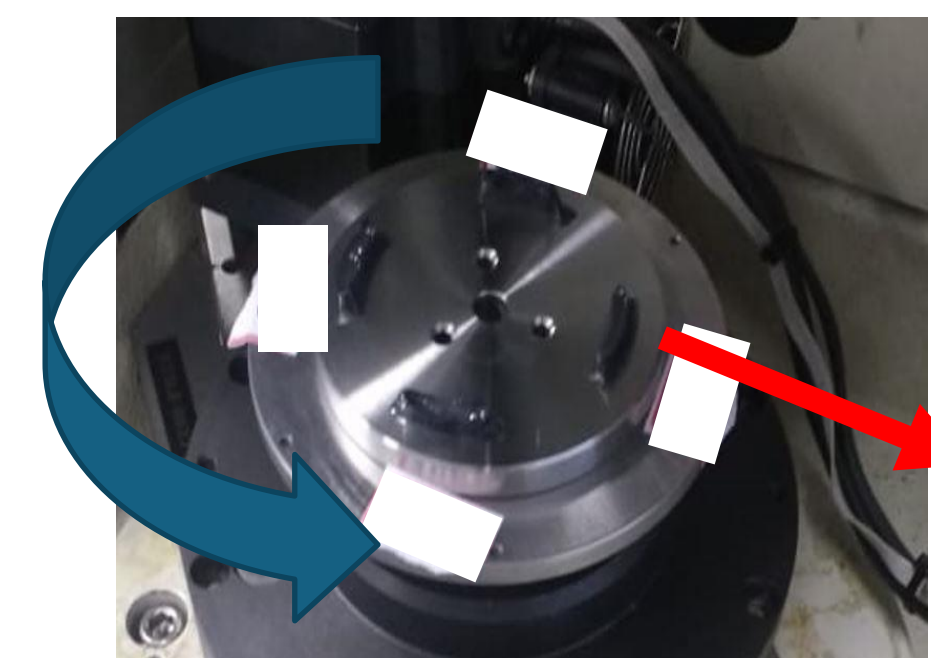
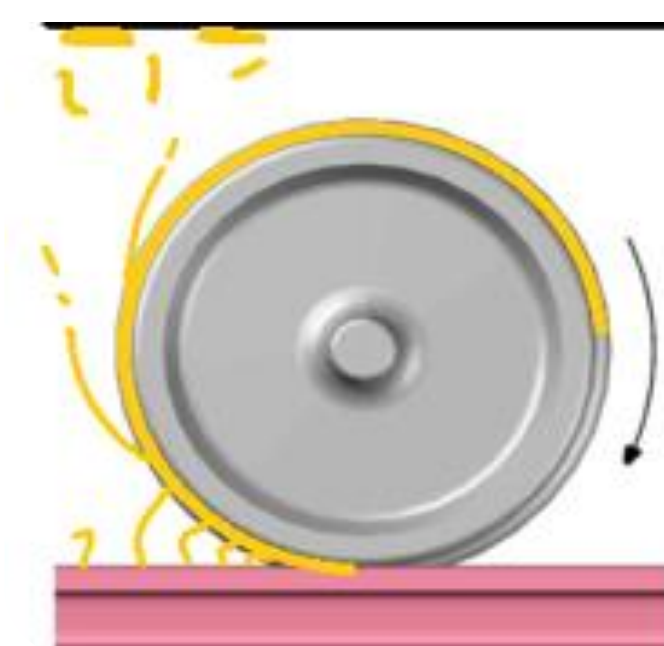
i) Flow curve analysis and oscillatory rheometry to evaluate pumpability and flow behavior



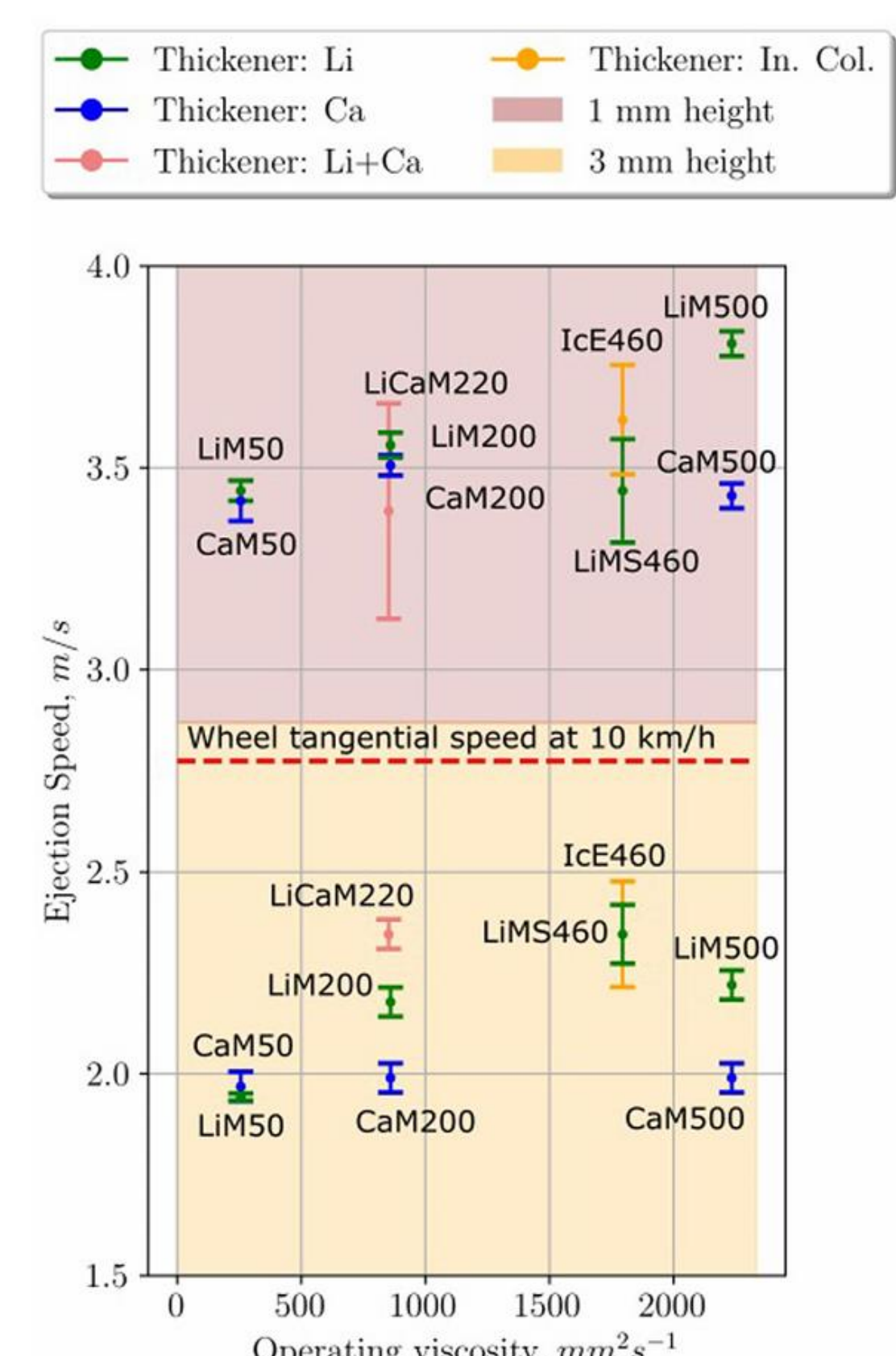
Grease Ejection – Splash and Centrifugal



ii) Tackiness tests to assess the grease's adhesive properties to the wheel flange

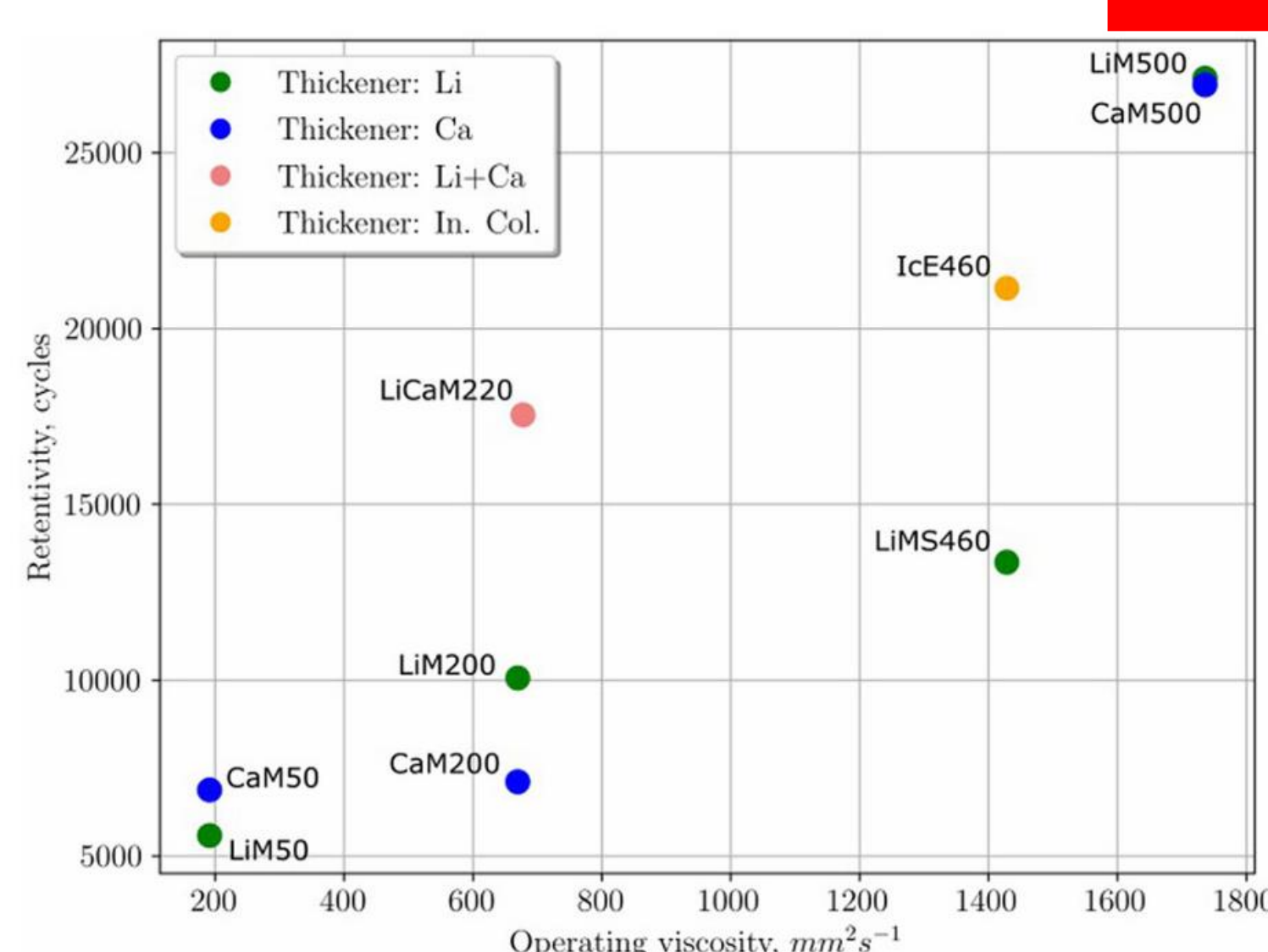
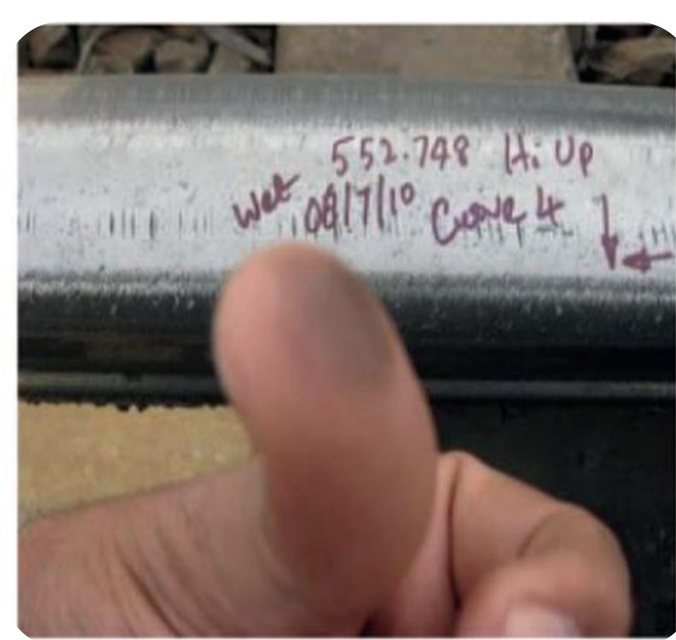


iii) Critical velocity tests to determine grease retention under dynamic conditions

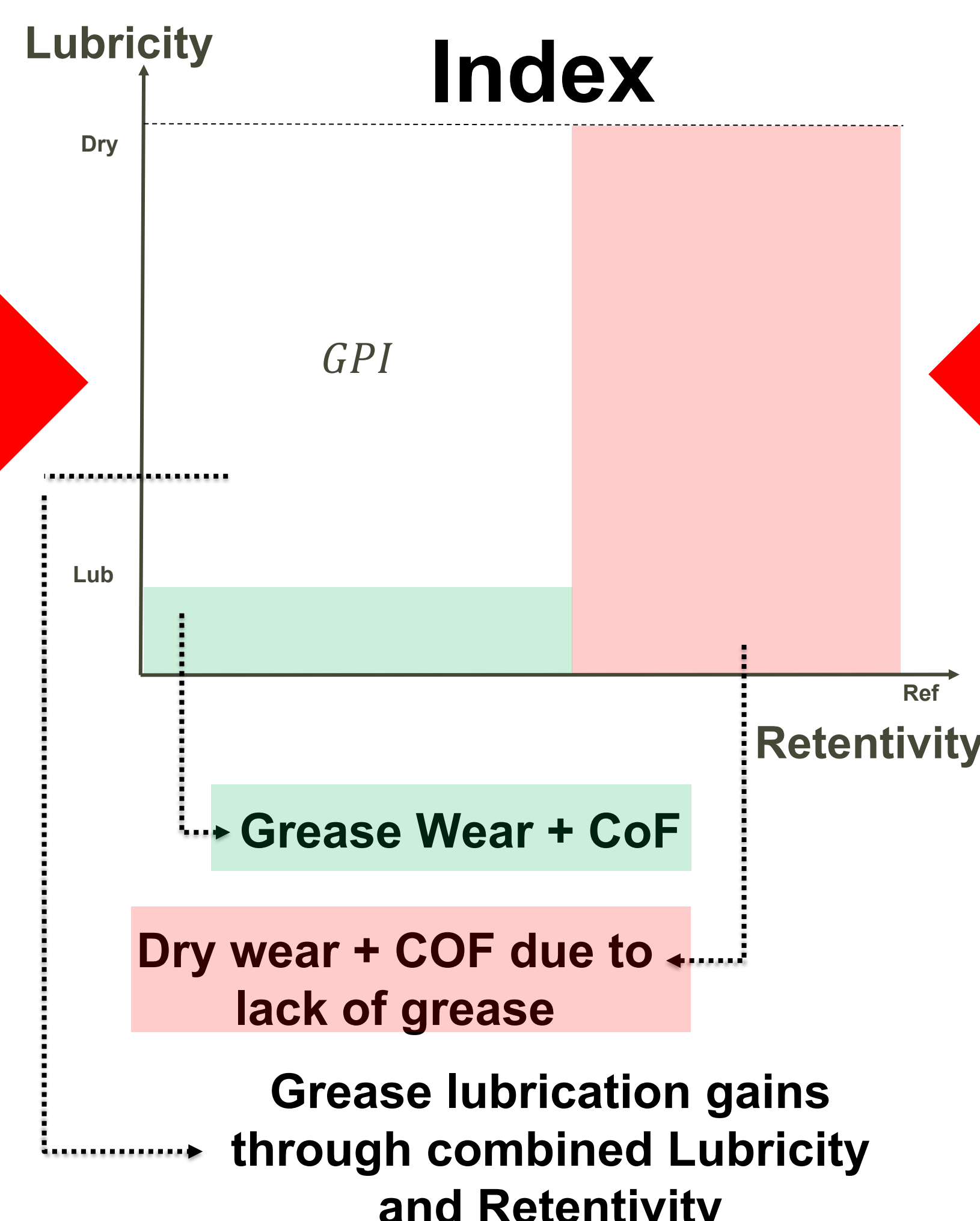


Retentivity

iv) Starved lubricated tests for evaluating grease performance in retentivity

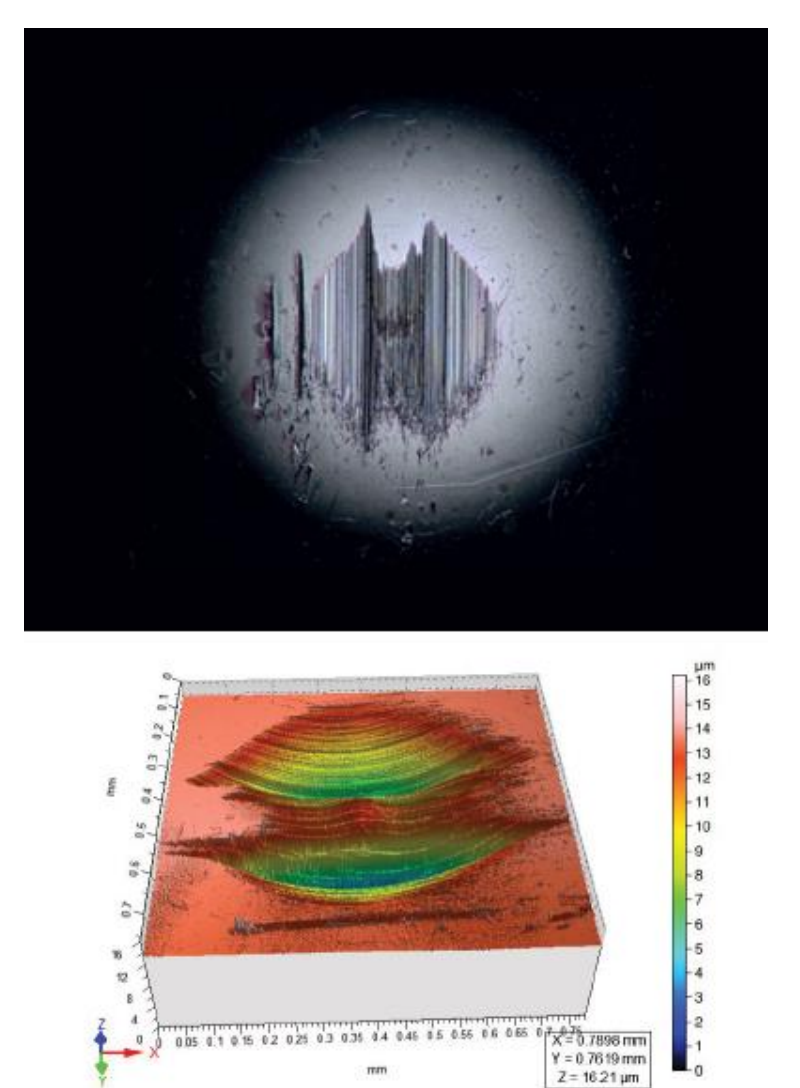
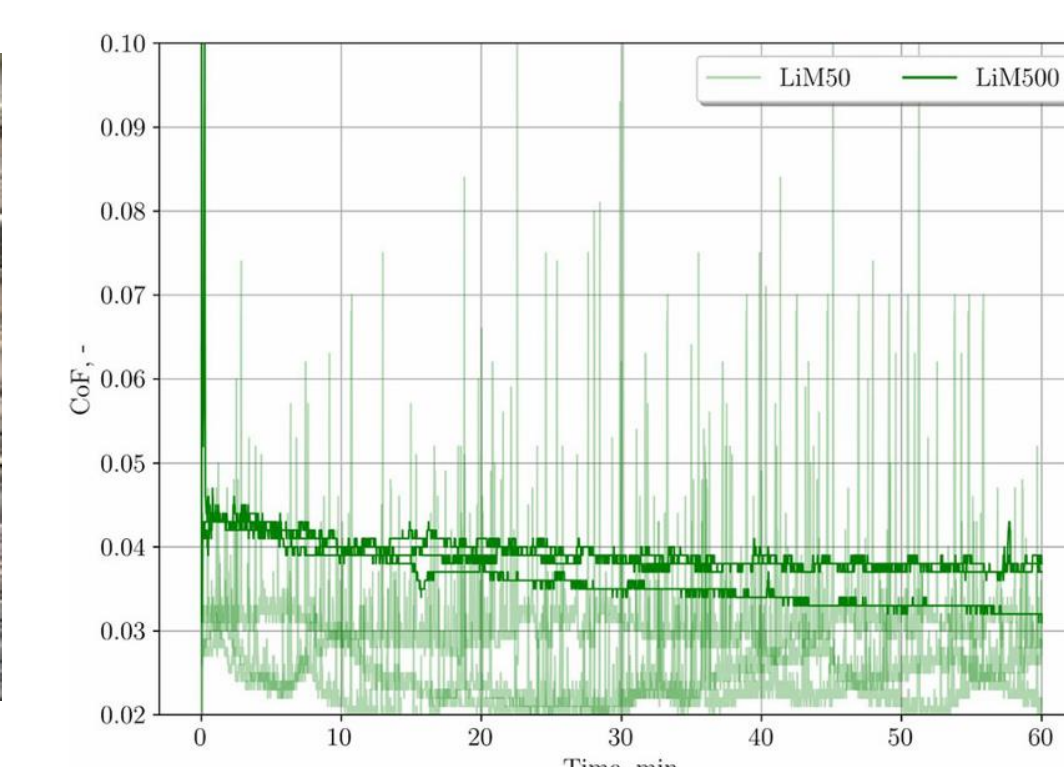
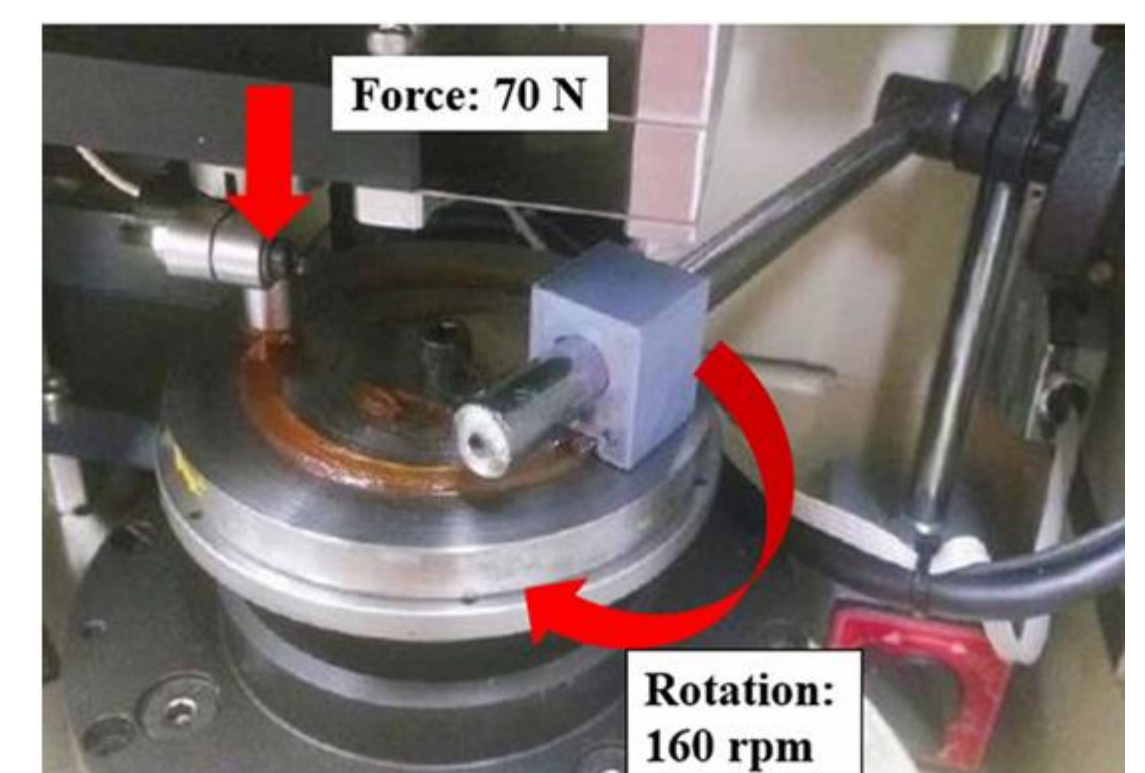
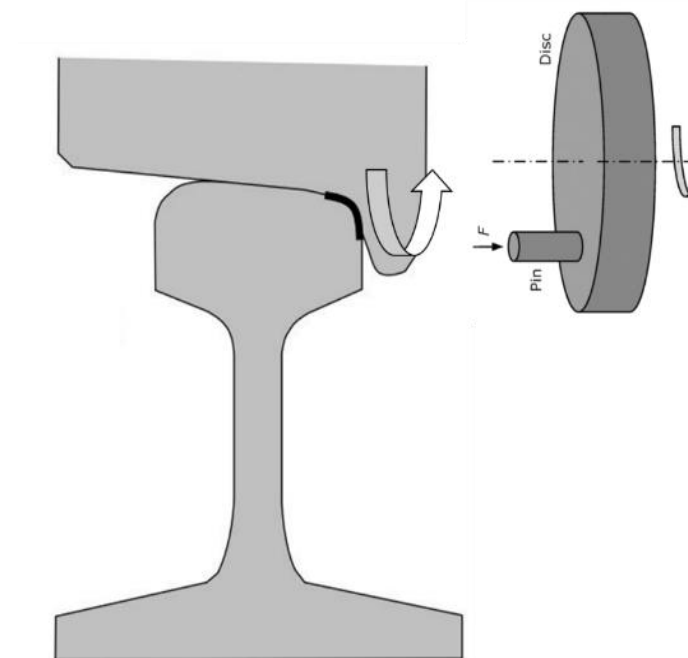


GPI - Grease Performance Index



Lubricity

v) Fully - flooded pure sliding lubrication tests for assessing coefficient of friction and wear



Conclusions

The results from these tests are synthesized into a comprehensive grease performance index, which facilitates the selection of greases with high potential for success in field trials. This protocol was developed based on literature review and field validations, with the objectives of:

- optimizing time and resources by reducing the number of greases subjected to field and scale testing, and
- standardizing the laboratory selection methodology, addressing the current lack of direct correlation between laboratory test results and field performance in railway applications.

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