TRIBOLOGICAL INVESTIGATIONS USING A LINEAR FRICTION TESTER (LFT)

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INTRODUCTION

Sliding friction is a very common and manifold phenomenon, which plays an important role in many technical applications. In field tests it is hard or expensive to achieve reproducible results for friction behavior. For this reason at the Institute for Mechanics of Materials and Structures a testing device, the so-called Linear Friction Tester (LFT) was developed [1], which has been used for a wide range of experimental friction investigations under easy and precisely controllable conditions. Helpful for the realization of these projects were numerical FEM-based simulations and theoretical reflections on the friction process. Several applications are presented on this poster. More results and a detailed description can be found in [2], an overview in [3].


RUBBER FRICTION TESTS

The main application area of the LFT is testing of tire materials. Because of the differences in the dimensions, it is not possible to compare results of street tests with LFT results directly. Nevertheless, by choosing matched test parameters and analysis methods, the comparison is possible to a certain degree.

In the Figure shown below, the influence of the sample geometry is addressed. For the LFT samples and for the tires used for street tests the same seven geometries have been used. The match between the two series is satisfying. Usually the standard deviation for such tests is between 1% and 3%. Compared to street tests, the LFT results are more accurate, and experiments by means of the LFT are of course much cheaper.

DESIGN TESTS FOR WIND TURBINES

For the construction of wind turbines materials for bearings are needed, which show an optimal performance (i.e. high friction coefficient \( \mu \)) for a wide range of conditions. For that purpose LFT tests were performed with samples of different materials and designs, simulating different construction conditions. Similar tests have been done with materials for conveyor bands of different materials and designs, simulating different construction conditions. The so-called Linear Friction Tester (LFT) was developed [1], which has been used for a wide range of experimental friction investigations under easy and precisely controllable conditions. Helpful for the realization of these projects were numerical FEM-based simulations and theoretical reflections on the friction process. Several applications are presented on this poster. More results and a detailed description can be found in [2], an overview in [3].


WEAR TESTS

In friction processes wear plays often an essential role. Quantification of wear is of high interest. The photo shows the abrasion of four samples of different tire materials under the same conditions, the diagram the weight loss. The total weight loss of the four samples varies between 0.75 and 2.9 g. This might be relevant, if material with good friction performance can feature a low lifespan, as in this example.

Acknowledgement

The support of our industrial partners, e.g. Continental AG, Hannover, is acknowledged.

weight loss of rubber samples on asphalt

100 150 200 250 300

Sample 1  Sample 2  Sample 3  Sample 4

50 150 250 500 1000

Pressure (N/mm²)

10 30 50 70

Sliding distance [mm]

50 100 150 200

Temperature [°C]

PROSPECTS & ACKNOWLEDGEMENT

As an instrument for friction tests the LFT is by now a well-established test facility. Several other applications have been realized for specific test series. Some further types of investigations using the LFT are:

1. Long-term tests to investigate the influence of the aging process on the friction behavior.
2. Acoustic tests regarding the noise caused especially of tire materials on road surfaces.
3. Investigation of the influence of temperature differences between the friction partners and/or water, which is coating the friction interface.

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