

APPLICATION SHEET

Elastomers – DMA EPLEXOR®

Predictive Testing – According to a Study of LANXESS AG, Leverkusen, Germany: Available for Tensile and Compression Samples

The development of new tires with optimized rolling resistance is a main objective of the tire industry. One standard method for the determination of the rolling resistance is the drum test which directly analyzes the tire. The test result will indicate the uniformly energy loss within the tire. The drum test will establish a tire ranking corresponding to the rolling resistance. The lower the rolling resistance, the better the ranking.

This testing method requires the production of a prototype and is therefore very time-consuming and above all cost-intensive.

The method of dynamic-mechanical analysis (DMA) now provides a new useful tool in order to reduce the amount of drum tests by the application of a predictive test procedure (Literature: C. Wrana, U. Eisele and S. Kelbch, Leverkusen/ Germany; Measurement and Molecular Modeling of Rolling Resistance in Tire Treads; KGK Kautschuk Gummi Kunststoffe 53, volume No. 3-4/2000).

The test procedure is able to simulate the energy loss determined with the drum test with a specially designed pulse repetition sample test mode, using the dynamic testing equipment EPLEXOR® (see figure 1). This test can be carried out using only the compound. At this early state, the manufacturing of a prototype is not necessary.

The pulse sequence shown in the figure below simulates the rolling tire. As a test result, $\tan\delta$ will be obtained which relates directly to the total amount of energy loss during the rolling process of the tire. A partial substitution of drum tests by the application of dynamic tests by using the pulse load technology seems only to be successful if a satisfied correlation between the $\tan\delta$ measurement and the tire ranking in % can be observed. The easiest way to find a correlation between $\tan\delta$ and the tire ranking is the application of a linear function.

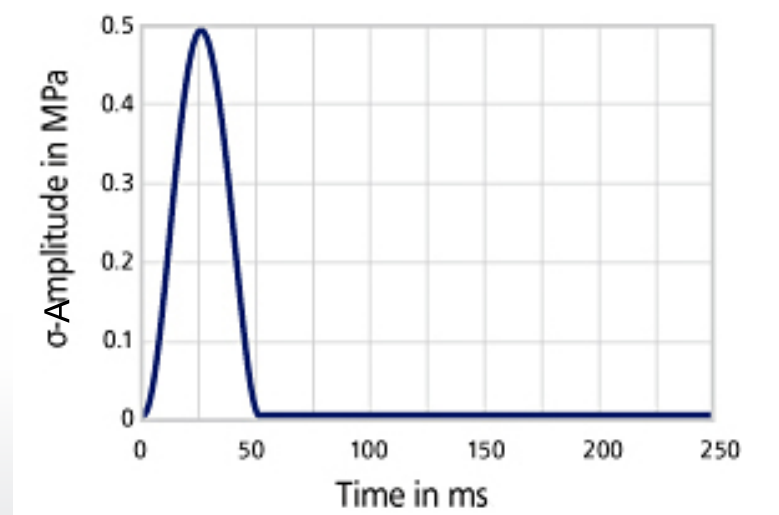


Fig. 1. Pulse load in tensile mode

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The dynamic test procedure was carried out on 14 different tread compounds. Figure 2 exhibits an excellent correlation with tire ranking provided by the drum tester (ranking in %) and the $\tan\delta$ measurement obtained with the EPLEXOR® system. The correlation coefficient is better

than $R^2 > 0.92$. The prediction of the rolling resistance using the method of pulse load application is a useful and quick procedure which can be used in addition to conventional drum tests.

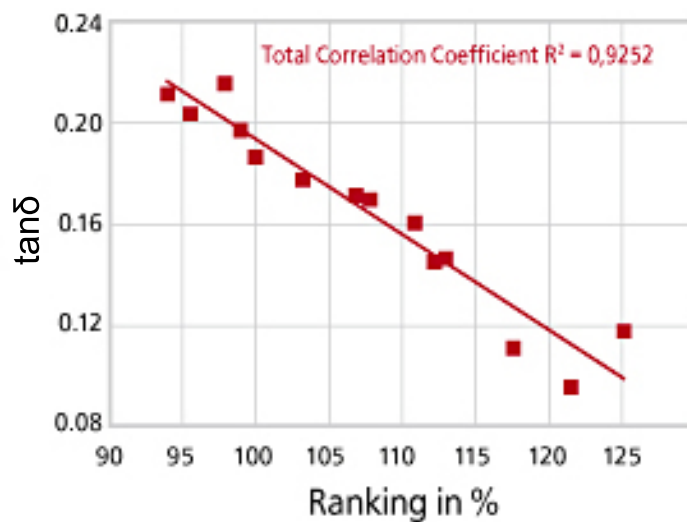


Fig. 2. Correlation of $\tan\delta$ (Pulse-DMA) und ranking of the rolling resistance