



**HSLFT testing machine
for highly efficient tyre
development**

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Altracon S.A.

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HSLFT testing machine for highly efficient tyre development

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Today's vehicle development is faced with tremendous challenges. The environmentally friendly car is highly efficient, low-noise, comfortable, just to mention a few major development targets. Tyres, as everybody knows, are the link to the road. Besides the general concept of the car it is self-explaining, that the first priority should be to tune their performance, which contributes significantly. Multiple standards are defined to proof the tyre performance and it is both a big challenge and effort to tune all the tyre parameters including the metrological description of their influence. It is time to improve the efficiency of the tyre development process to keep development cost and effort on a payable level.

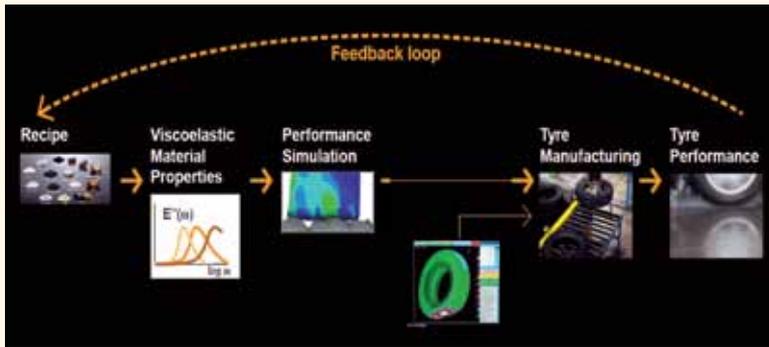
Efficient tyre development starts with an efficient material development process:

Today's pathway from a compound recipe to tyre performance is long and expensive. After a new recipe has been created the compound is mixed and vulcanized. In a next step the viscoelastic properties are measured in the laboratory. The results are then used to simulate the performance of the compound and estimate the later tyre performance based on a tyre- and tread-design which is not yet defined. A long iteration phase starts, which finally ends by manufacturing prototype tyres which must be tested in- and outdoors. Now the performance feedback-loop to the compound development specialist

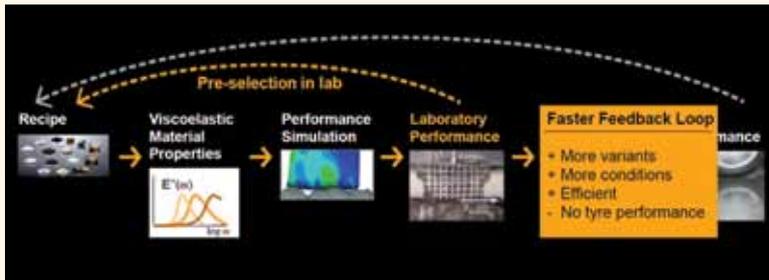
may be closed – however, the performance is always combined with other tyre parameters. This process must be repeated until material-, tread- and tyre design are finalized.

Based on the fact that driving performance is significantly depending on grip of the tyre, the improvement of the material development process starts by implementing an intermediate step into the process, which allows to measure the materials grip depending on multiple frame-conditions. Grip is measured by the measurement of friction in a defined direction, which must be done on multiple surfaces to get meaningful results. A High Speed Linear Friction Tester (HSLFT) allows to do so.

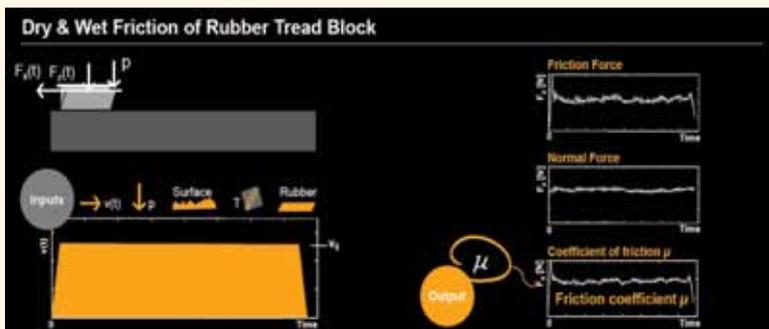
The HSLFT is equipped with sample carriers and track cassettes, both with quick-change mechanism to exchange rubber samples and tracks to realize all combinations of friction. The cassettes may be equipped with both, artificial track surfaces i.e. made from Safety-Walk® or Teflon, as well as real road surfaces like concrete or asphalt, which may be even cut out of test tracks. The measurement is in general simple and according to the friction theory defined by C.A. de Coulomb in the year 1780, but it is essential, that the environmental parameters and testing parameters are exactly controlled to assure best repeatability and to build up a reliable database. The parameter control is the difficulty with such measurement and Altracon's HSLFT is perfectly designed to



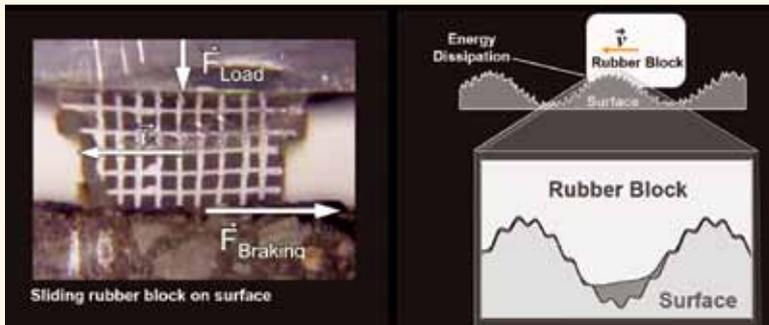
Picture 1: Pathway from Compound Recipe to Tyre Performance



Picture 2: Efficient Laboratory Performance Testing with HSLFT with improved Feedback loop



Picture 3: Friction Testing with HSLFT



Picture 4: Sliding rubber block on rough asphalt surface



Picture 5: High Speed Linear Friction Tester (HSLFT) made by Altracon

manage this, including testing at dry- or wet- as well as snow- and ice-conditions.

The friction measurement is done on a track which only has 500mm length, but this is enough to precisely measure stick- and slip-friction and the transmission in between. The rubber sample may be moved by a specially developed magnetic linear drive with speeds of up to 8 m/s and 100 m/s² acceleration, sufficient to cover the motion of a tread block under real driving conditions even at 300 km/h. The sample is loaded by a fast hydraulic system, which allows to control the load to simulate the load-path of a tread block during its motion through the footprint of a rolling tyre or to apply any other load path. The maximum load of 5000N is sufficient to simulate realistic load conditions of the sample.

A high speed camera system, that is applied to the machine allows tread block design analyses in combination with the friction measurement and completes the performance measurement with display and often explanation of the corresponding tread block functionality.

This system provides all necessary data to fully describe the performance of rubber material under all realistic conditions based on laboratory measurements. The correlation with real measurements on the road is impressively high. The improvement compared to today's pathway of compound development is the significant abbreviation of the feedback-loop to the material development specialist. The feedback-loop which required a period of months and an appreciable investment in the past including manufacturing and testing of prototype tyres can be shortened with this system to just one week plus the savings for manufacturing and testing of prototype tyres. The short feedback-loop allows to increase the number of tests for more variants or more conditions. A fully automated HSLFT offers a capacity of around 20.000 tests per week.

Another advantage of such system is the selected measurement of the material performance without influences of other tyre design parameters. Tread block design parameters may be also selectively added step by step, which the conventional way doesn't allow.

The High Speed Linear Friction Tester (HSLFT) is the tool to improve the efficiency of the tyre development process to keep development cost and effort on a payable level. Reliable material performance data measured in the lab will shorten the feedback-loop to the development specialists and will allow to respond to the multiple development and testing demands which face the tyre industries by powerful material pre-selection. This is truly state of the art material development and testing. ▲

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The solution provider for tire homologation testing technology

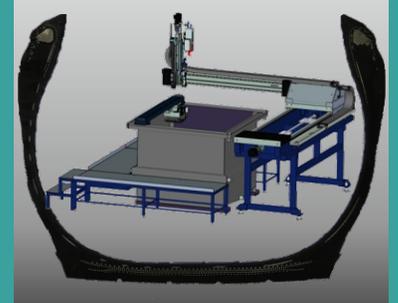
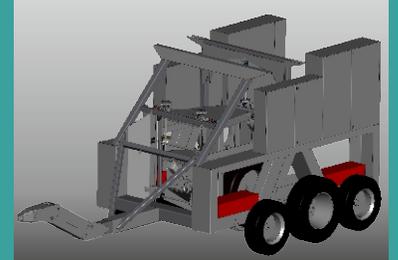
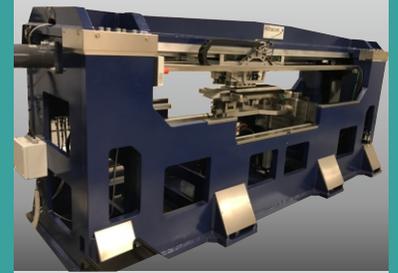
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