

tire technology INTERNATIONAL

special edition

A new system developed by Altracon for high-speed friction testing delivers unprecedented indoor test results at low costs



Dream machines?

HSLFT

High speed linear friction tester

High-speed linear friction testing

A new system for high-speed friction testing delivers unprecedented indoor test results at low costs

by Ralf Berres, Altracon SA

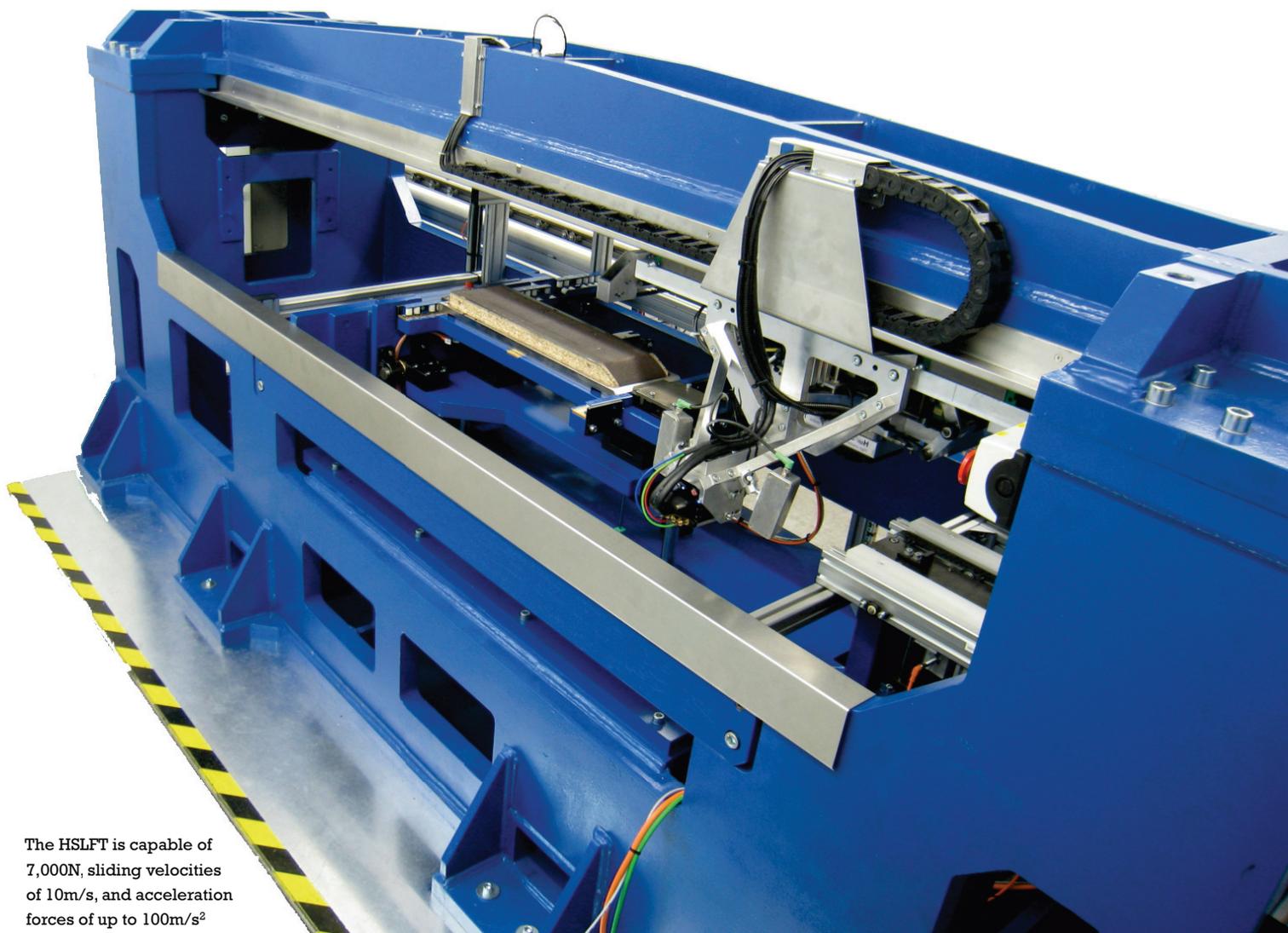
High Speed Linear Friction Testing (HSLFT) offers a unique possibility to determine friction coefficients of rubber samples on different surfaces and under various operating conditions to predict compound and pattern influence on the grip and traction performance.

This system is designed to generate all relevant test data, such as z, x, y force and moment. A novelty in the area of compound testing is the deployment of a linear induction motor. This motor

delivers a peak performance of 7,000N and enables sliding velocities up to 10m/s, generating accelerations up to 100m/s². In addition, vertical forces up to 3,500N can be applied to cover the full operating range of passenger car and truck tires. The multicomponent force plate, high-speed sampling amplifier, and the Altracon-developed load unit (built into the HSLFT system) deliver the highest quality measurements. By neutralizing the influence of acceleration on the data, the system shows the real results of friction.

Winter 365 days a year

Winter testing in the northern or southern hemisphere is always a risk because of the weather conditions, not to mention the time, money and human resources tire companies usually invest into these trips. Test cycles are limited to a rather short period of time. But setting up a test environment and relying on the support of mother nature means dealing with the negative impact of unpredictable changes in environmental conditions. Improving data accuracy through exact



The HSLFT is capable of 7,000N, sliding velocities of 10m/s, and acceleration forces of up to 100m/s²

From top: High performance and reproducibility are key facets of the HSLFT indoor test system

Several factors can be shown and compared graphically using a simple check box setup

A wide variety of test surfaces and conditions can be simulated, without venturing outdoors

The friction coefficient of different samples can be easily compared using the software

reproducibility, and at the same time reducing testing costs, were the goals that Altracon SA had in mind when it introduced the HSLFT system in 2008.

Any road type and condition

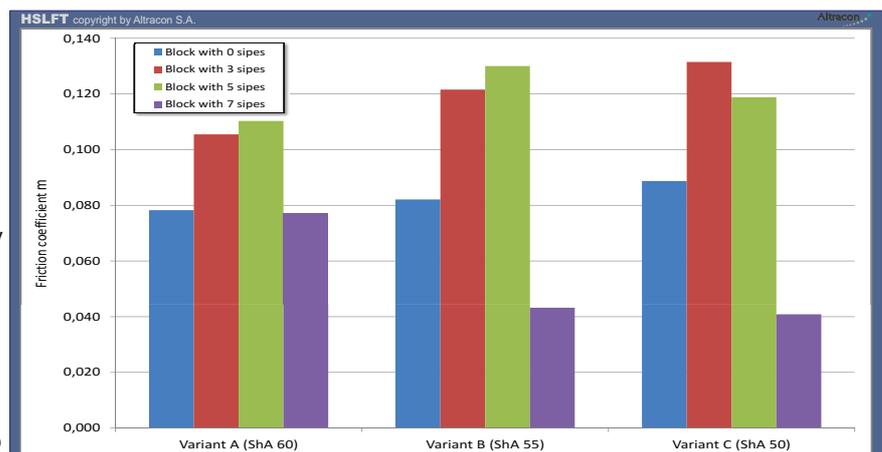
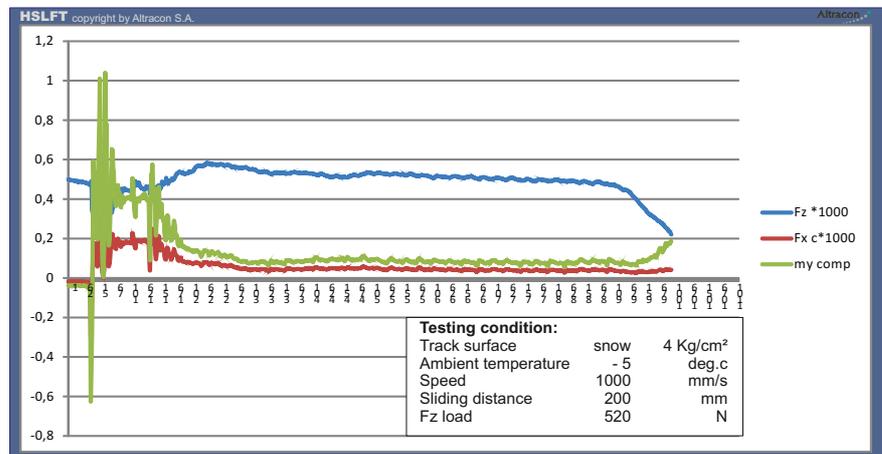
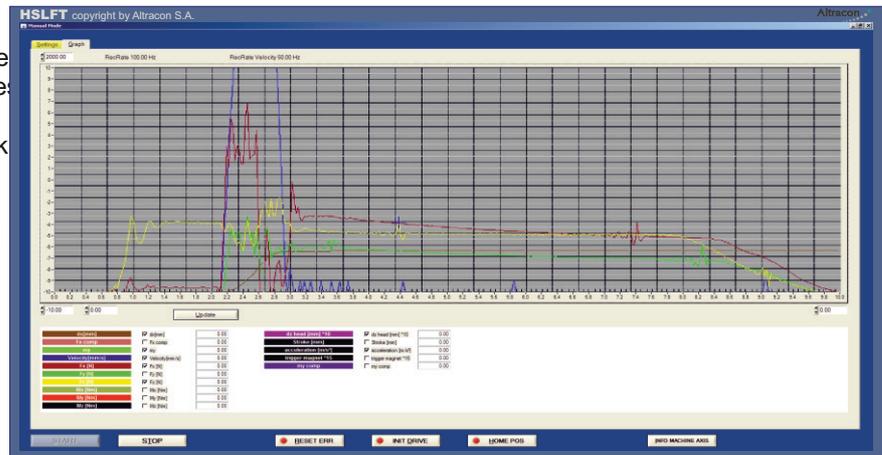
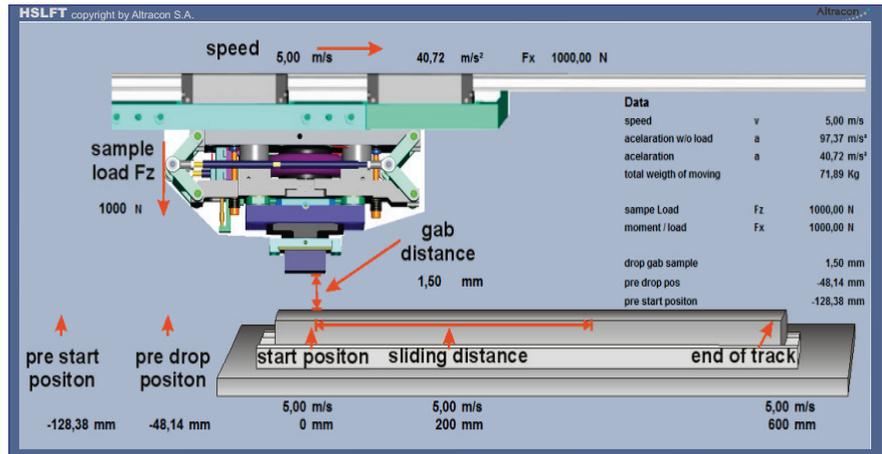
Testing surfaces like asphalt and concrete are used, as well as snow and ice surface with comparable characteristics to the outdoors. Even the simulation of wet track and aquaplaning conditions is possible. To test on snow and ice surfaces, or to simulate different temperature zones with high or low humidity, the entire system needs to be installed in a controllable climate chamber enabling a temperature range from -15°C (5°F) to +40°C (104°F). To get constant and repeatable results, the track condition and consistency is an important factor. The developers of the HSLFT put a lot of effort into the solution of this problem and came up with a technology to produce an ice or snow track during the test cycle and insert it automatically in the system.

Upgradable for future needs

Additional equipment, such as an integrated high-speed camera for evaluation of slip and block bending, a thermograph to measure stress, or a high-resolution surface scanner for a topographic characterization of applied surfaces, can be integrated within the system. Modules for conditioning, cleaning or scanning of the tracks for wear or samples are also available. The stiff construction of the unit and various multimounting ports enable changes and upgrades to be made to the testing environment at any time.

Cost and efficiency of testing

The pilot system, currently installed at a large tire manufacturer in Germany, is operated in manual mode and is primarily used for the purpose of test method development on road friction. The testing capacity in manual mode (one shift) is up to 150 tests per day. In future, a fully automated linear friction tester will be able to simulate different surfaces and samples from a database. With this setup



Supplier FOCuS

From top: The machine head can be adjusted for different measurements and tests

Oscillator stiffness and wear tests can be done using laser surface scans in both 1D and 3D

An extensive settings menu means that tests can be customized to users' particular needs

The HSLFT in situ, with multicomponent force plate, a sampling amplifier, and a load unit

the performance will increase to more than 400 tests a day. The average cost of a single test, based on the calculation of amortization within eight years, is about €60, only 5% of the cost calculated for an outdoor test.

Feedback just in time

Looking at the quality and efficiency of compound testing, the most important factor is the constant testing environment

User opinion

Dr-Ing. Hagen Schönfeld, head of test method development & material test technology, Continental Germany, said of the new measuring system: "This is the first time we've had ice and snow data indoors under defined conditions. By implementing this technology we are able to test pattern structure before we develop the tire mold, and compound structure before we produce test tires for outdoor testing. This keeps risk and cost at a very low level."

and the timeframe of data feedback after testing. From the beginning of the development of a mixture to the testing result it will take a maximum of three to five days, but you will miss the adventure of a six-month road trip in the north.

The development and construction of mold devices to run road tests is very expensive and takes a couple of months. A testing mold, used for a HSLFT block sample, cost less than €400 and can be developed and produced within a few weeks. This means the measurements of block pattern tests can be directly transferred to the design of a new tire tread structure.

A key solution for developers

The new HSLFT testing technology is a huge step forward in the process of tire development. It reduces risk by increasing the number of test cycles, delivers faster time to market by reducing the number of road tests, and lowers development costs by creating an indoor all-season test environment.

