

PFI Project Description

Simulation of Standard Tests

Testing out of mechanical product tests by numerical simulation – e.g. for certification purposes – as early as in the footwear development phase is currently common practice in only few, mainly large companies. The main advantage, alongside considerable cost savings, is a significant shortening of the time-to-market. How can simulation systems be made available to SMEs and also be further refined?

Status quo: Footwear for technical applications is largely developed on the basis of previous experience and trial and error. Standard tests usually have to be repeated several times. That costs time and money because sample shoes have to be produced and subjected to testing. If design changes are necessary, the next round of testing follows until the design can ultimately be approved.

Since the real-life performance of the finished shoe cannot be precisely evaluated during the design phase, many companies apply a “safety factor” during the design of safety-relevant components: However, this burdens the shoe with more material and hence more weight than would actually be needed to pass the conformity test. The more precisely the performance of a shoe under load can be predicted, the better shoes and components can be produced to meet the demands placed on them.

Simulation of the physical behaviour of shoes and components offers appropriate solutions. Until now, however, only major footwear manufacturers make use of simulation methods in the design phase.

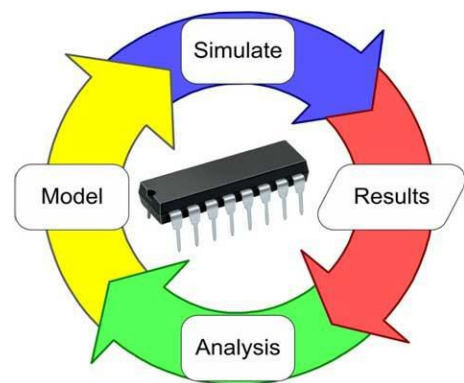
Aim of the project:

- Reduction of costs and time-to-market thanks to new simplified simulation tools
- Improved understanding of (mechanical) processes during testing
- On the basis of simulated reference tests, which are performed under real life conditions at PFI, the simulation models can be refined and verified.

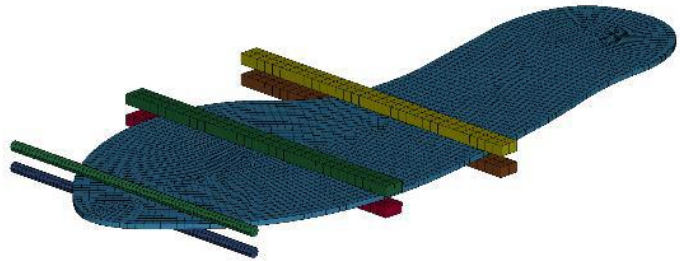
Approach adopted:

Simulation on the basis of the Finite-Element Method (FEM).

Tests simulated in the course of the project:



- Energy absorption of the heel area (DIN EN 20344)
- Penetration resistance (DIN EN 20344)
- Seam strength (DIN EN 13572 or PFI standard method)
- Flexural strength of penetration-resistant inserts (DIN EN 12568 [5])



The tests to be simulated are designed in such a way that various kinds of loads can be represented in simulations. The results of simulation are compared with the results of conventional testing and the simulation methods successively refined.

In addition, formulation of a simple material database is also envisaged.

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