

New Research Projects: An Open Invitation to Participate

One of the principal areas of activity of PFI since its foundation has been the promotion of innovation in SMEs operating in the footwear and leather goods industries. Our research work keeps us in constant touch with industry and with other research institutes from a wide range of science and technology – ranging from microsystems engineering via electronics to sport science and medicine. We are currently embarking on five research projects related to the footwear industry. Interested companies now have an opportunity to become a member of a project advisory committee. Details are presented in the following article.

Occupational Footwear: Fresh and Clean

The wearing of occupational clothing and especially safety shoes is obligatory in many fields of work. Whereas workwear is generally laundered professionally by external service providers, this is essentially unheard of in the case of footwear. Absorption of perspiration, intense contact with all kinds of floor coverings and dirt, pronounced mechanical and often thermal stresses mean that such footwear rapidly soils and ages. PFI and wfk – Cleaning Technology Institute e.V. plan to develop an appropriate cleaning procedure in a research project entitled «Hygienisation and deodourisation of occupational footwear with plasma-activated steam».



3D Printing on Shoes

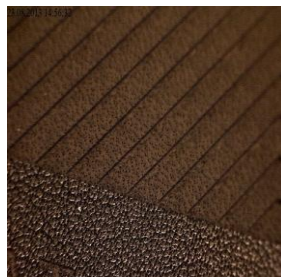
How about shoe fans themselves decorating the surface of their latest pair of sneakers by means of 3D printing? In the research project «Three-dimensional inkjet printing on shoes» PFI plans to develop a technique for optical individualisation of finished shoes and shoe components with the aid of an inkjet printer. Even sophisticated pictures and effects should be applicable to any part of a shoe.



An earlier PFI project («Study of the suitability of inkjet technology for application of individual effects and markings to shoes » – N09540/02 GAG) dating from 2005 could demonstrate the fundamental suitability of the technology in the case of planar materials. However, various steps such as surface pre-treatment and fixing of print by application of additional layers are also necessary. Owing to huge advances in inks, inkjet print heads, and in the areas of 3D and additive manufacturing, a new three-dimensional printing project is to be launched.

EPARLAS – Choice of Operating Parameters for Lasers Intended for Processing of Organic Substrates Exemplified for Leather Roughing in Footwear Manufacturing

The PFI research project «Studies on wear-free and non-reactive processing of footwear upper materials by means of short laser pulses» (Research Project No. 1061 of the Rhineland Palatinate Innovation Foundation (Stiftung Innovation Rheinland-Pfalz / SIRP) from 01.01.2013 to 31.12.2014, project partners Photonics Centre Kaiserslautern (PZKL) and International Shoe Competence Centre (ISC)) demonstrated that modern laser technology can accomplish and optimise the task of roughing.

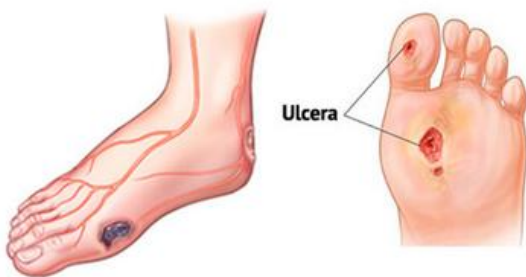


Leather surfaces ideally structured for adhesive bonding by laser treatment

Satisfactory results are obtained only if appropriate parameters are selected for the laser and the process. A subsequent project will focus on development of a self-adjusting laser system for leather processing in order to enable a much wider circle of users (e.g. the footwear and leather industry) to benefit from laser-based processing of materials with all its advantages. Operation of the laser system is also to be simplified.

Improved Prevention of Diabetic Foot

PFI is planning a joint project with the Orthopaedics Department of Fontys University of Applied Sciences at Venlo in the Netherlands. The goal is to develop an innovative approach for measuring not



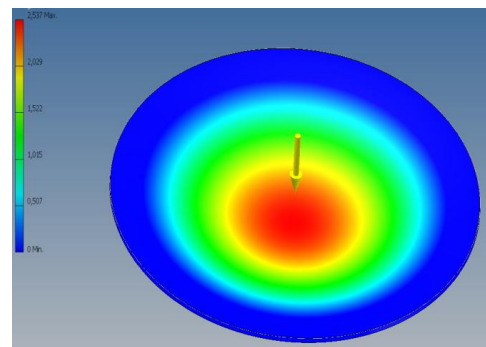
only the pressure but also the shear forces which come into play during the interaction between foot and shoe. Such a sensor system could help to prevent diabetic foot syndrome in diabetes patients.

The research project aims to initiate pre-competitive development of a suitable shear and pressure sensor system for integration into a shoe as well as development of appropriate manufacturing techniques for shoe production. A measuring system of this kind could put diabetics in a position to compensate for their impaired sensitivity to pain caused by pressure and shear forces, save many diabetes patients from long stays in hospital, and possibly even eliminate the need for some amputations. To avoid unnecessary restrictions in the everyday lives of the wearers, such a system should be of small overall size while offering high spatial resolution.

Use of Numerical Simulation in the Footwear Industry: Model Development for Mechanical Testing Procedures

Many industrial sectors utilise computer simulation to determine the mechanical load-bearing capacity of products or components. It would also be advantageous for the footwear industry to introduce the desired properties into a shoe already in the design phase and to be able to recognise and eliminate weak points. This would do away in large part with onerous prototyping tasks as well as the test phase, which would greatly accelerate product development and also cut costs.

The goal of the PFI research project «Use of numerical simulation in the footwear industry: Model development for mechanical testing procedures» is the development, testing, and validation of finite-element simulation models for realistic simulation of important tests on shoes. To this end, various tests such as the sturdiness of nailed heels, strength of seams, or penetration resistance tests for safety shoes are to be selected and set up on the basis of CAD models, and simulations then performed. For the sake of comparison, the actual tests will be carried out in the PFI laboratories, thus providing a scientific basis for assessment of the quality of simulation.



Preliminary experiment: Simulation of penetration resistance

If you wish to become a member of the project advisory committee of one of the research projects outlined here or if you have any questions concerning any of the projects, do not hesitate to contact:

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