

DEMOULTRAGRIP - OPPORTUNITY TO DEVELOP NEW PRODUCTS FOR THE FOOTWEAR INDUSTRY

DANIEL PETCU, LAURENTIA ALEXANDRESCU

INCDTP - Division Leather and Footwear Research Institute, 93 Ion Minulescu St., sector 3, Bucharest, icpi@icpi.ro

The structure of production units in the Romanian footwear manufacturing industry demonstrates the existence of a production system based on SMEs, 97.1% of companies having less than 250 employees. The design criteria for models currently used by anti-slip footwear sole manufacturers are empirical, often based on intuition and previous experience. The technical problem is the lack of design tools that can be used in the design of shoe models, mainly the footwear's soles, in terms of making a prototype faster and at lower costs, while being more effective in creating an adequate response to the friction between footwear and walking surface during use. With DEMOULTRAGRIP project, the involved shoe manufacturing SMEs will gain a competitive advantage based on the use of new design tools for creating products with high resistance to sliding, speeding the design-prototyping operation, reducing prototyping and production cost, improving the anti-slip properties of products and reducing time-to-market.

Keywords: soles, rapid prototyping, friction coefficient

INTRODUCTION

According to the White Paper of Romanian Leather, Footwear and Leather Goods Industry, in 2010 in Romania there were a total of 1173 companies producing footwear (NACE code 1520) (INCDTP-ICPI, 2010). Depending on the companies' class size, the following structure was registered:

- SMEs:
 - 52.8% having between 0-9 employees,
 - 11.9% having between 10-19 employees,
 - 16.1% having between 20-49 employees,
 - 16.3% having between 50-249 employees,
- Large companies:
 - - 2.6% having more than 250 employees.

This situation, valid before the start of the financial crisis, shows a production structure based on SMEs. Productive units must face particular challenges such as competition from Asian market products, the evolution of CAD-CAM technology for footwear design, the decrease of the "lohn" production system and a need to conquer a place on the European footwear market. In this context, the move towards implementing CAD-CAM technologies for rapid prototyping should represent a key strategic option for SMEs in the footwear industry.

Currently, footwear sole manufacturers are designing the anti-slip pattern using empirical design criteria, often based on intuition and previous experience. The technical problem is the lack of design tools that can be used in the design of shoe models, in terms of making a prototype much faster and at a lower cost, while being more effective in creating an adequate response to the friction between footwear and walking surface during use. To answer this challenge, UltraGrip project (FP7 - SMEs - 2010 - 1.262413) developed a set of guidelines and a specific software solution that can be used as design tools for soles and flooring to optimize performance in relation to the slip phenomenon. Two of the main results of the UltraGrip are a software solution (mathematical model) to predict the behavior of slip and a set of guidelines with recommendations for improving the slip resistance of products.

UltraGrip consortium must conduct demonstration activities to ensure that UltraGrip instruments are ready and appropriate for exploitation and marketing. Consequently, DEMOULTRAGRIP project objective is to reduce the gap between pre-competitive tools developed in the UltraGrip project and a new version of these tools than can be marketed.

In line with this objective new business tools will be marketed. With DEMOULTRAGRIP project, the involved footwear manufacturing SMEs will gain a competitive advantage based on the use of new design tools for creating products with high anti-slip resistance, speeding the design-prototyping operations, prototyping and production cost reduction, improving the anti-slip properties of products and reducing time-to-market. All these issues will potentially increase both market share and the skills of designers and technicians.

INCDTP-ICPI ROLE IN THE PROJECT

Package structure of DEMOULTRAGRIP project activities is shown in Figure 1.

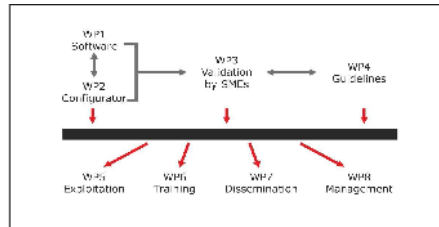


Figure 1. Structure of the DEMOULTRAGRIP project work packages

INCDTP-ICPI has ongoing activities for each of the eight work packages, as follows:

WP 1: Coefficient of Friction, CoF, Predicting-CAD Software

Objective: making the connection between the software solution for predicting friction coefficient from UltraGrip project and a new software solution for designing and predicting the behavior of footwear sole friction, which will be put on the market. INCDTP will manufacture different samples of rubber soles, TR, and thermoplastic polyurethane soles, TPU, and send them for testing to INESCOP which will update the predictive mathematical model of the coefficient of friction.

WP 2: Design Configurators of Soles

Objective: To achieve a configurator for soles that will qualitatively estimate the changes of the CoF due to the change of the sole's material or design. INCDTP will use the beta version of the soles configurator for test design and will send a feedback to the developers. Along with KOPITARNA, INCDTP will validate the online version.

WP 3: Computer DEMOULTRAGRIP Tools Assessment

Objective: To assess the commercial version of the software solution developed in WP1 and of the configurator developed in WP2 by using them in the design of prototype soles with high CoF (UltraGrip line models) obtained from different materials and with different destinations. INCDTP will design and produce a line of thermoplastic

rubber soles TR - UltraGrip TR line - with anti-slip properties for leisure footwear (shoes with anti-slip medium specification level).

WP 4: Guidelines for Commercial Applications

Objective: closing the gap between the recommendations obtained in UltraGrip project and commercial versions for final users. INCDTP will participate in the development of new guidelines along with other members of the consortium.

WP 5: Exploitation

Objective: develop first Market Study and Business Plan and preparation of the Operating Agreement between the consortium partners for marketing-exploitation of the DEMOULTRAGRIP products. INCDTP activity will be oriented to the TR-UltraGrip line.

WP 6: Training of Commercial Software Tools

Objective: training the end users to use the developed commercial software solutions. INCDTP: participation in training and the involvement of Romanian SMEs.

WP 7: Dissemination

Objective: to demonstrate the added value of the project results. INCDTP: participation in specialized footwear fairs.

WP 8: Project Management

Objective: To ensure overall project management. INCDTP: participation in working meetings of the consortium, contributions to reports and deliverables and its own financial management.

OPPORTUNITIES TO DEVELOP NEW PRODUCTS FOR THE FOOTWEAR INDUSTRY

The Market research conducted in the frame of the DEMOULTRAGRIP project has revealed both advantages and competitive disadvantages of micro-production department of ICPI if compared with the main actors in the specialized market (Figure 2). Introducing new materials for footwear sole design represents a constant concern of the Rubber Research Department of INCDTP-ICPI (Alexandrescu *et al.*, 2014).

| Market segments | % on total market sales | Set of values | % on total company's sales | Main competitor in each segment | | INCDTP | | Your company vs. main competitor | |
|-----------------|-------------------------|--|----------------------------|---------------------------------|----------------------------|--|--|----------------------------------|--|
| | | | | Strengths | Weaknesses | Strengths | Weaknesses | Competitive advantages | Competitive disadvantages |
| men | 8% | 1 st price 2 nd quality | 80% | bigger production capacity | poor quality the equipment | -quality -new materials -new equipment | -reduced production capacity weak marketing | -new materials | -reduced production capacity |
| women | 2% | 1 st price 2 nd quality | 20% | much more up-to-date models | poor quality the equipment | -quality -new materials -new equipment | -old moulds models -weak marketing | -new materials flexibility | -old models -small number of models |
| Total | 10% | - | 100% | - | - | - | - | - | - |

Figure 2. Analysis of the INCDTP-ICPI competitiveness compared to its main competitors in the local market

DEMOULTRAGRIP - Opportunity to Develop New Products for the Footwear Industry

In this context, related to the specific objective of the project - namely to develop thermoplastic rubber soles TR-UltraGrip line with high anti-slip properties, based on existing models but using new recipes designed in accordance with this objective - it is necessary to define a new future direction (Figure 3).

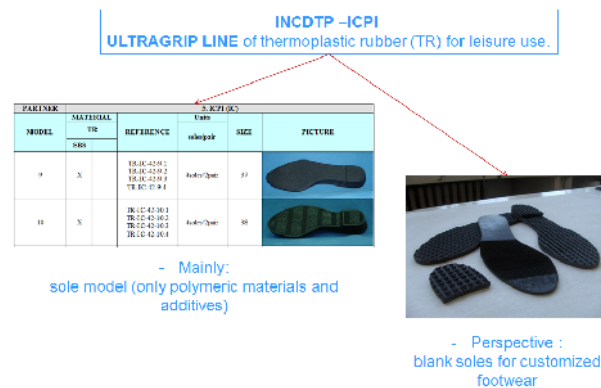


Figure 3. Main objective and development perspectives through participation in the DEMOULTRAGRIP project

The perspective, according to the structure of the production system based on SMEs, but also to the position relative to the main competitors in the market, is the development of a flexible design system of the "blank" plate type soles allowing rapid production of small orders in flexible conditions and in accordance with the specific needs of shoe manufacturing companies. It aims to create a technology for obtaining these plates by injection or by vulcanizing press molding, so the anti-slip design can be quickly changed depending on the beneficiary's request.

CONCLUSIONS

Participation in research projects together with recognized research institutes at European level and with private companies interested in the application of the results in production represents an opportunity to develop new products for the footwear industry.

The development of high added value products using CAD-CAM technology for rapid prototyping is, in the context of product competition from Asian countries, an essential option for the development of SME type footwear manufacturing companies.

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