TRANSFER OF KNOWLEDGE FOR DASHBOARD AND HEAD-UP DISPLAY OPTIMIZATION THROUGH TESTING AND MODELLING OF ADVANCED MATERIALS

Goal of the project

The goal of the project is the determination of strain rate and temperature variation in mechanical properties of several advanced materials used in vehicle instrument clusters and Head-Up displays. With the gathered experimental data, non-linear material models are to be developed for the use in finite element analysis of various components during the product design stage.

Short description of the project

This project deals with the mechanical characterization and numerical simulations of advanced materials used in the automotive industry

Project implemented by:

This project is implemented by Universitatea Politehnica Timișoara with the support of Continental Automotive Romania.

Implementation period

01/10/2016 – 31/03/2018

Main activities

01. Determination of the mechanical and thermal properties of the investigated materials
- Static tests (determination of the influence of strain rate and temperature)
- Fatigue tests
- DMA tests

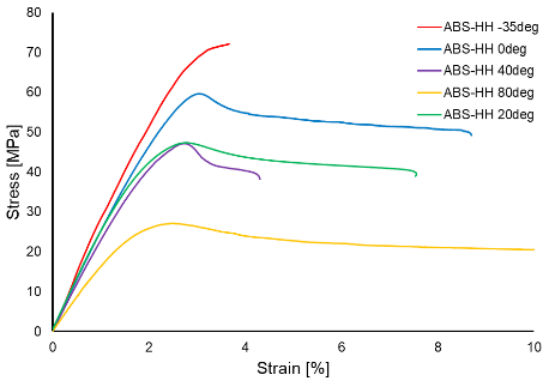
02. Development and evaluation of constitutive models used in simulations
- Development of constitutive models based on the gathered experimental data
- Evaluation of the developed material modes through experiment replication

03. Implementation of the constitutive models in product simulations
- Analysis of simulation results and comparison with experimental data
- Identification of optimal models from an accuracy and simulation time standpoint

04. Development of procedures for facilitating the introduction of new materials
- Establishment of a test benchmarks
- Proposal of easy-to-calibrate material models for simulating new materials

Results

In this project, the experimental procedures determined the mechanical properties of 5 materials. The strain rate influence on the tensile and flexural properties was investigated in the range of 2 – 200 mm/min test speed, showing a noticeable influence on the strength and stiffness of the materials. The materials were also tested in a temperature range of -35 ºC to 80 ºC, showing significant variation is strength, stiffness and also in behavior (Figure 1).



Other experimental procedures included DMA tests and the determination of the Poisson ratio.

The gathered experimental data was used to calibrate elastic-plastic material models for finite element analysis simulations. Temperature and strain-rate dependency was integrated in the models, the material evaluation showing good agreement with the experimental results.

Applicability and transferability of the results:

The aim of the Bridge Grant was to directly aid companies through the transfer of knowledge, all results being delivered to the project partner:

- The experimental results were supplied to Continental Automotive Romania, the data being used in the material selection process in product design.
- The proposed material models will be used by Continental Automotive Romania in numerical analyses of newly designed components.

Financed through/by

UEFISCDI

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