Design and manufacture of composite seat structures

Context

Vehicle emissions account for almost 12% of global CO₂ emissions. Targets for reducing greenhouse gas emissions have been set at an EU level and manufacturers and motorists will be penalised if they do not meet these targets. The weight gain required to achieve this result is around 250 kg per vehicle. Weight reduction is considered to be one of the main means of reducing CO₂ emissions by cars.

A multi-material approach, with the introduction of composite materials is a promising solution. However, to date mass production technologies for these materials have not yet been validated. Moreover, weight reduction research on the body of the car traditionally focuses on the structure of the vehicle (outer frame). Yet the interior of the vehicle accounts for some 20% of the total weight of a vehicle.

Objectives

The DEMOS project aims to design a lighter front seat frame through the use of a multi-material structure made from metals and thermoplastic composites with continuous and short fibres. Given that a set of car seats with a conventional steel frame currently weighs between 65 and 80 kg (approximately 5-7% of the weight of a vehicle), the target weight gain is 30%.

Multi-material technology, combining thermoplastic composites and metal, has been approved by Faurecia for a seat back; the next step is industrialising this technology for mass automotive production.

Implementation

The main steps in the DEMOS project are the following:

- The design of a multi-material seat frame, 30% lighter than a conventional steel frame;
- The development and validation of assembly technologies adapted to multi-material seat frames;
- Industrial pre-validation of casting technologies for the primary parts made from thermoplastic composites and assembly technologies;
- Life cycle analysis of multi-material seat frames and addressing seat recycling issues.
Expected results

**Innovation**
- Weight reduction in car seats through multi-material design;
- Development of new casting and assembly processes for mass produced vehicles.

**Economic and social**
- Development of an ecosystem between partners based on the Mov’eo, EMC2 and ID4CAR activity centres;
- Strengthening of the position of the Tech Center in Brières-les-Scellés in designing multi-material seats worldwide.

**Environment**
- Contribution to manufacturers’ goal to limit CO₂ emissions to 90g / km by 2020;
- Reduction in CO₂ emissions by around 2g / km.

Application and markets

The products that will be developed industrially and marketed on completion of the DEMOS project are seat frames with mechanical adjustments (multi-material seat adjuster and multi-material seat back).

If successful, the DEMOS project will enable Faurecia to maintain or improve its positioning in relation to some of its competitors, in particular its German competitors who already have a head start in the field of composite materials.

Moreover, for each partner, the results will be replicable and transferable:
- With some adaptation work, Faurecia will be able to use these results for rear seats, dashboard cross panels and also external body parts;
- The casting technologies developed with CETIM and CORIOLIS can be applied to the production of other parts;
- The multi-material assembly technologies, developed with CETIM and LISI may also be applied to the production of other parts and be used in other applications in different sectors.

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Seat structure