Faurecia uses polyurethane foaming process simulation to develop top class automotive instrument panels

For middle/high range cars, instrument panels are mostly composed of a sandwich structure: substrate/foam/skin. The substrate and the skin are installed in a specific tool and the foam material is injected into the interval. Besides, this process allows to treat complex geometries. The result in term of touch, softness and aspect is a high level of perceived quality.

Performing simulation of polyurethane foam expansion

At the start of the project, Faurecia engineers defined the requirements to model an instrument panel with Computer-Aided Engineering (CAE). To do so, ESI and Faurecia engineers used ProCAST, ESI’s leading Finite Element solution for casting process simulation, and its dedicated environment Visual-CAST.

Polyurethane foaming process involves complex and coupled chemical reactions following the mixing of two or more liquids (polyol, isocyanate...). ProCAST is able to represent the flow of the liquid in the first seconds before the reaction starts, as well as the expansion process due to these chemical reactions.

Developing a predictive process simulation tool and applying it to the vehicle project allowed Faurecia engineers to identify critical areas earlier in the development process. With ProCAST, they performed realistic simulation of the foaming process taking into account the material expansion and change in viscosity due to foam polymerization.

THE CHALLENGE

Faurecia, fifth automotive equipment supplier in the world, strives to provide always better quality products to its customers. Faurecia wants to add foaming simulation to its simulation capability in order to reduce its development process time and cost for middle/high range cars.

THE BENEFITS

- Validate earlier the foaming process feasibility during bidding and pre-design phases
- Assess the manufacturability risks (e.g. incomplete part) before the tools are built
- Optimize the mold design and identify the optimum injection point and vent location
- Avoid time and cost consuming trial and error approach

"We use ProCAST and its dedicated environment Visual-CAST to simulate the foaming process for instrument panels intended to middle/high range cars. It brings a real competitive advantage: we can guarantee our OEM customers a better product in shorter time while fulfilling their requirements."

Jean-Jacques Pesce, CAE Innovation Manager, Interior Systems, Faurecia
Faurecia engineers also determined the influence of the local thicknesses and deflectors on foam expansion. Once they identified critical areas, they were able to modify accordingly the geometry of the instrument mold, validate it and specify injection parameters before building tools for actual production. Faurecia saved mold manufacturing time and costs. Optimizing process design with simulation provides direct benefits in terms of material consumption, quality and scrap rate.

For instance, foamed parts exhibiting air traps of more than 8 mm in diameter do not meet car makers’ requirements.

Thus, thanks to this process, engineers were able to anticipate potential parts rejection by car makers. Offering alternative solutions to avoid or reduce the effect, before tools are built and production is started, allowed Faurecia to save on cost and time during the development process.

Creating a competitive advantage

Faurecia validated the polyurethane foaming process simulation with ProCAST and is now the first Tier One automotive supplier worldwide to master this complex foaming process in simulation. ProCAST software is now used within car projects at an industrial level by Faurecia.

Before any production starts, the foaming process is validated first in simulation.

“The trend for the next 4 years is more and more the validation of the foaming process 100% with simulation. Physical prototypes, specifically special molds created for physical testing, will no longer be needed.”

Gilles Timoner, Process CAE Expert, Interior Systems, Faurecia

As a next step, Faurecia wants to include more physical effects in their material models in order to evaluate the global part performance. Software development is also needed to expand process simulation capabilities. ESI will work closely with Faurecia to move forward and achieve the implementation and validation of these new application targets.

“Using simulation is very useful because it gives a general overview of the foaming process: the filling of the mold, the distribution of the foam and its expansion. It allows us to make decisions earlier in the development process for a better shape before launching the tools and starting production.”

Eric Michau, Global CAE Manager, Interior Systems, Faurecia

To find out more about ESI’s Finite Point Method and ProCAST, please visit: www.esi-group.com

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**ABOUT FAURECIA**

Faurecia is one of the world’s leading (#5 worldwide) automotive equipment suppliers with four key Business Groups: Automotive Seating, Emissions Control Technologies, Interior Systems and Automotive Exteriors. In 2009, the Group posted sales of 9.3 billion euros. It employs 62,000 people in 32 countries at 200 sites and 33 R&D centers. Faurecia is listed on the NYSE Euronext Paris stock exchange. For more information visit: www.faurecia.com

**ABOUT ESI GROUP**

ESI is a pioneer and world-leading provider in virtual prototyping that takes into account the physics of materials. ESI has developed an extensive suite of coherent, industry-oriented applications to realistically simulate a product’s behavior during testing, to fine-tune manufacturing processes in accordance with desired product performance, and to evaluate the environment’s impact on performance. ESI’s solutions fit into a single collaborative and open environment for End-to-End Virtual Prototyping, thus eliminating the need for physical prototypes during product development. The company employs over 750 high-level specialists worldwide covering more than 30 countries. ESI Group is listed in compartment C of NYSE Euronext Paris. For further information, visit www.esi-group.com.