Engine Backfire in an Air Intake Manifold

PARTNER: JSOL Corporation

- Committed to delivering comprehensive CAE solutions and strategic consulting focusing on digital engineering
- Largest LS-DYNA reseller in Japan
- Well known for adopting and using cutting edge technologies

CHALLENGE

- To comply to the environmental needs of automotive industry and deliver greener technology by weight saving
- To support the process of design of under-the-hood plastic parts reinforced with glass fibers

HOW TO MODEL THE CRITICAL INFLUENCE OF FIBER ORIENTATIONS FOR UNDER-THE-HOOD PLASTIC PARTS?

MATERIALS
Reinforced plastics

PERFORMANCES
Impact

DIGIMAT
Digimat-MF, Digimat-CAE, Digimat-MAP, Digimat-MX

CAE TECHNOLOGY
LS-DYNA, Moldex3D

INDUSTRY
Automotive

APPLICATION
Air intake manifold

“Fiber reinforced plastic becomes major material for intake manifold because of lightweight and heat resisting properties. Detecting the correct high stress concentration area is important to predict fatigue properties of manifold. DIGIMAT helps us to predict correct stress distribution by taking into account the fiber orientation coming from injection molding.”

Noriyo Ichinose, Sales engineer, JSOL Corporation, Japan

DIGIMAT SOLUTION

- Calibration of an elasto-plastic DIGIMAT material
- Simulation of the load case with Digimat-CAE/LS-DYNA interface based on fiber orientations coming from injection molding
- Comparison of maximum principle stresses of the composite material with an isotropic calculation

RESULTS

- For the high pressure peak ($t_1 = 8\,\text{ms}$) and the low pressure region ($t_1 = 12\,\text{ms}$) significant differences in the stress distribution are observed compared to the simulation using isotropic material
- The fiber reinforced part shows lower stresses than the isotropic case pointing out an over-designed part
- Potentially further weight can be saved on the part by introducing DIGIMAT in the design cycle
The Nonlinear Multi-scale Material & Structure Modeling Platform

DIGIMAT material modeling platform means developing innovative, optimized and cost-effective products. As a unique nonlinear multi-scale material and structure modeling platform, DIGIMAT offers:

- **Digimat-MF**: the Mean-Field homogenization software used to predict the nonlinear constitutive behavior of multi-phase material
- **Digimat-FE**: the Finite Element modeling of realistic Representative Volume Elements (RVE) of material microstructures
- **Digimat-MX**: the Material eXchange platform to reverse engineer, store, retrieve and securely exchange DIGIMAT material models between material experts and end users
- **Digimat-CAE**: the module that gathers interfaces to all major injection molding and structural FEA software codes
- **Digimat-MAP**: the shell and 3D mapping software to transfer fiber orientation, residual stresses, temperatures and weld lines from injection molding simulation onto a structural FEA
- **Micross**: a user-friendly tool for the design of honeycomb core composite sandwich panels based on FE analyses to compute bending and shear scenarios

The Material Modeling Company

e-Xstream engineering is a provider of simulation software & engineering services, 100% focused on advanced material modeling. Headquartered in Louvain-la-Neuve (Belgium) since 2003, today the company presence is worldwide through its branches in Luxembourg, Michigan (USA) and a large network of channel partners in Europe and Asia.

e-Xstream engineering develops and commercializes DIGIMAT – the nonlinear multi-scale material and structure modeling platform that fastens the development of optimal composite materials and parts.

DIGIMAT customers are material experts and structural engineers who accurately predict the behavior of multi-phase composite materials and structures. DIGIMAT is used by all major material suppliers and users across all industries (Automotive, Aerospace, Electric & Electronic, Leisure, Defense ...).

With this important customer base worldwide, e-Xstream combines deep expertise in material modeling and numerical simulations with the business understanding of the large variety of materials used across all industries.

www.e-Xstream.com

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