Stiffness of a Bracket in Reinforced PBT

CUSTOMER: SCHNEIDER ELECTRIC
• Global specialist in energy management offering integrated solutions for safe, efficient and reliable energy
• Continuously exploring new technologies, developing new products and serving new markets

CUSTOMER: DUPONT
• Provider of wide range of innovative products and services for markets including electronics, communications, safety and protection, ...
• DuPont uses DIGIMAT to support their customers in designing innovative composites

CHALLENGE
• Predict structural response of a glass fiber filled PBT polymer bracket
• Accurately design and optimize electrical components existing geometry

HOW TO TAKE INTO ACCOUNT THE INFLUENCE OF PROCESSING IN STIFFNESS PREDICTION?

DIGIMAT SOLUTION
• Reverse engineering of an elasto-plastic DIGIMAT material model
• Computation of the nonlinear stiffness based on fiber orientation prediction performed with Moldflow
• Comparison with experimental stiffness for two different composite materials developed by DuPont:
  o 20% glass fiber reinforced PBT polymer, (material 1)
  o 50% glass fiber reinforced PBT polymer, (material 2)
• Material damage behavior is not modeled

RESULTS
• Stiffness at break computed with standard elastoplastic materials leads to 85% error for part in material 1 and to 120% error for part in material 2.
• Stiffness at break computed with elastoplastic DIGIMAT materials leads to 5% error for part in material 1 and to 2.5% error for part in material 2.
• Process design can be trustfully optimized with DIGIMAT to improve part performances at better cost.

MATERIALS
Short fiber reinforced plastics

PERFORMANCES
Stiffness at break

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

CAE TECHNOLOGY
Ansys, Moldflow

INDUSTRY
Electrical goods

APPLICATION
Design of a GF reinforced bracket

“...From REACH legislation to unexpected fluctuations in raw material price levels, our products are more than ever challenged, in this context DIGIMAT offers the perfect combination of material modeling platform to optimize the performance of our reinforced thermoplastic components and DIGIMAT has demonstrated its ability to provide robust and accurate prediction of our materials behavior.”

M. Oubahmane
Innovation & Technology Specialist
Schneider Electric

Glass fiber reinforced bracket (50% GF).

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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 the 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.

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