

DIGIMAT™ to ANSYS®, Multi-Scale Modeling Composite Structures

The interface between DIGIMAT and ANSYS offers ANSYS users the capability to perform accurate nonlinear implicit FEA of composite structures where DIGIMAT-MF™ is used to model the nonlinear, anisotropic and rate-dependent behavior of the composite material.

DIGIMAT™ is a nonlinear multi-scale material and structure modeling platform that can be used to predict the behavior of multi-phase materials such as reinforced plastics, filled rubbers, hard metals, graphite,... and structures made out of these materials.

DIGIMAT-MF™ is the Mean-Field homogenization module of DIGIMAT which offers the capability to define the composite material behavior as a function of:

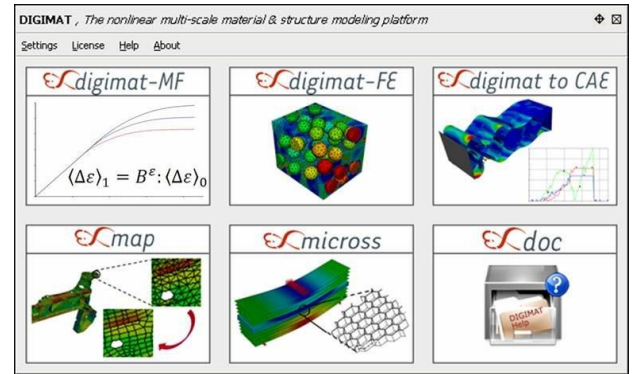
- 1) the material behavior of the matrix and inclusion phase(s);
- 2) the composite microstructure morphology.

DIGIMAT-FE™ is the Finite Element based tool for the nonlinear micromechanical modeling of realistic Representative Volume Element (RVE) of complex material microstructures.

DIGIMAT to CAE™ is the multi-scale structural modeling tool that groups the interfaces between injection molding software, DIGIMAT-MF™ and structural analysis software.

MAP™ is a 3D mapping software used to transfer the fiber orientations, residual stresses and temperatures from the injection molding mesh to the structural analysis mesh.

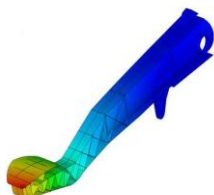
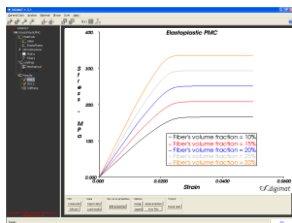
MICROSS™ is a user friendly tool for the design of composite sandwich structures with honeycomb core.



DIGIMAT to ANSYS is the strongly-coupled interface from DIGIMAT-MF to ANSYS via the USER DEFINED MATERIAL capability. DIGIMAT-MF™ is provided as a software library that is linked to ANSYS to offer a strong multi-scale coupling between the nonlinear micromechanical material modeling capabilities of DIGIMAT-MF and the nonlinear explicit FEA capabilities of ANSYS. In this configuration, DIGIMAT-MF acts as an advanced anisotropic, nonlinear and rate-dependent user defined material at each relevant integration point of the ANSYS FE mesh.

digimat-MF

digimat to ANSYS



Courtesy of Rhodia & Trelleborg



MAJOR BENEFITS

Accurate Micromechanical Material Modeling:

- Anisotropic*, corresponding to the local microstructure morphology
- Nonlinear*, elasto-plastic with continuous damage
- Rate-dependent*, visco-elastic or elasto-viscoplastic matrix.

Accurate Nonlinear Multi-Scale Structure Modeling:

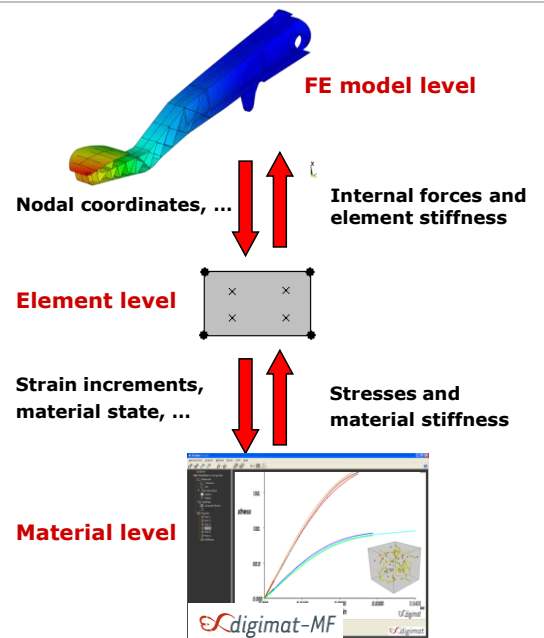
- Heterogeneous*, corresponding to the local microstructure morphology
- Optimal mesh refinement, element choice & solution strategy.*

Efficient & User-Friendly Solution Procedure:

- Streamlined* multi-scale modeling procedure
- Intuitive* graphical user interface.

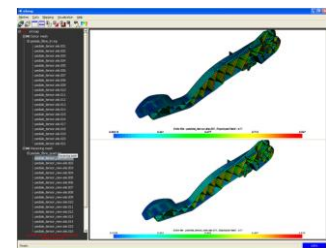
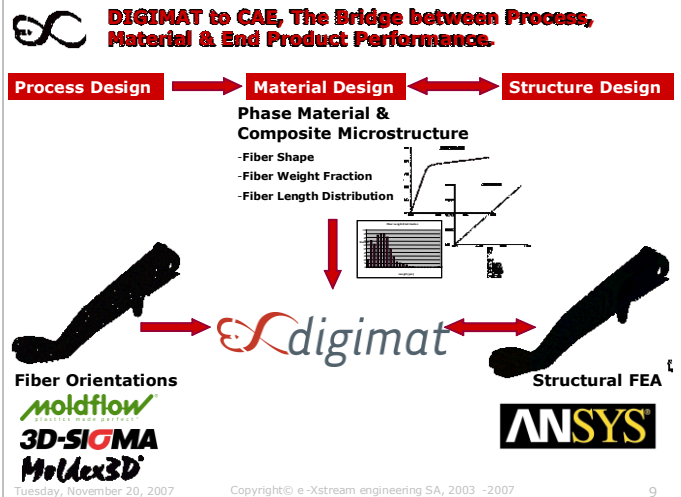
DIGIMAT™ to ANSYS® Interface

- ❑ DIGIMAT-MF is strongly coupled to ANSYS using the User Defined Material Capability.
- ❑ From ANSYS, the material is simply referenced by a MaterialName that corresponds to the MaterialName.mat file generated by DIGIMAT-MF, containing its micromechanical material definition.
- ❑ ANSYS and DIGIMAT-MF are linked together to build a unique executable. The finite element solution is handled by ANSYS where DIGIMAT-MF computes the nonlinear, anisotropic and rate-dependent material response at each integration point of the structure.
- ❑ The results of the DIGIMAT to ANSYS multi-scale analyses are available in the ANSYS output file at the composite level (macro scale) and in each phase (micro scale, e.g. in the matrix and fibers).



DIGIMAT™ to ANSYS® for Reinforced Plastic Parts

- ❑ DIGIMAT is interfaced to Moldflow®, Sigmasoft® and Moldex3D® injection molding software to enable an accurate and efficient ANSYS FEA of fiber-reinforced plastic parts where DIGIMAT-MF™ is used to model the nonlinear, anisotropic and rate-dependent behavior of the part, while taking into account the fiber orientation, residual stresses and temperatures predicted by the injection molding software at each point of the structure.
- ❑ DIGIMAT to ANSYS enables an accurate prediction of the failure of reinforced plastics parts subject to quasi-static load. This is possible thanks to DIGIMAT-MF's capability to model:
 1. rate-dependent (i.e. visco-elastic and elasto-viscoplastic) material response
 2. material anisotropy induced by the reinforcement (e.g. fibers) orientation
 3. local material heterogeneity induced by the underlying material microstructure (i.e. fiber length, fiber content).
- ❑ A comprehensive set of failure indicators are available in DIGIMAT-MF and can be applied to the composite (macro scale) and/or to the matrix and/or fiber phases (micro scale).



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For more information about DIGIMAT™ to ANSYS® and DIGIMAT™ material modeling platform, please contact info@e-Xstream.com or visit www.e-Xstream.com.

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