Moldex3D

Composite Molding

Release Composite Molding Potential

PLM EGYPT
Industrial solutions for
CAD/CAM/CAE/Tooling/CNC
Application

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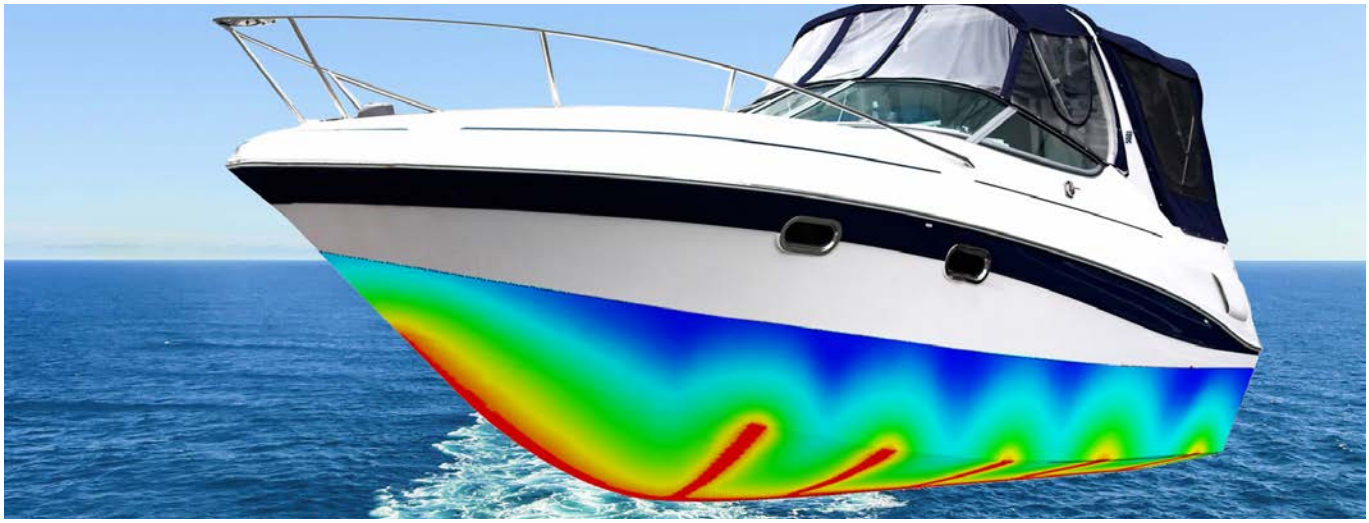
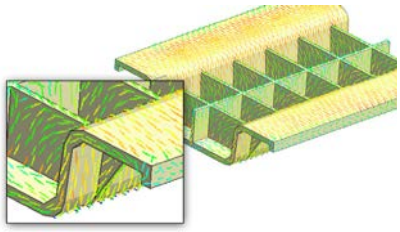


Moldex3D provides various realistic 3D simulation solutions for the composite molding process, such as short fiber injection molding, long fiber injection molding, SMC/BMC/GMT/D-LFT compression molding, various RTM (Vacuum RTM, High Pressure RTM, Wet RTM) and Hybrid molding, etc.

Fiber Orientation Prediction

- Visualize fiber orientation, length, and concentration inside fiber-reinforced plastics.
- Evaluate the filler effect to mechanical properties and final shrinkage
- Optimize process conditions to enhance the part strength.
- Support short, long, flat fiber and flake orientation simulation.

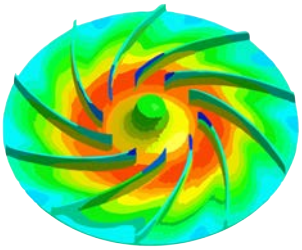


Resin Transfer Molding

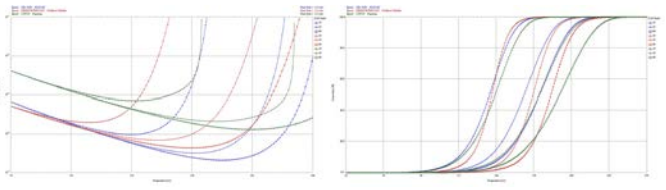
- Predict resin flow behavior through anisotropic porous media.
- Decide appropriate fabric materials, and optimize process conditions.
- Control resin infusion by pressure or flow rate.
- Capture cure reaction trend during molding through viscosity and kinetics models.

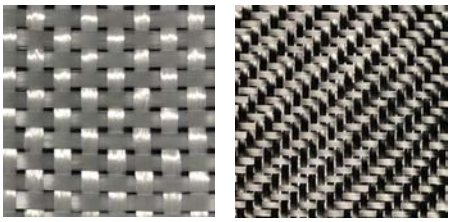
SMC/BMC/GMT/D-LFT Compression Molding

- Visualize dynamic melt flow advancement during compression molding process.
- Evaluate chopped fiber orientation prediction, compression force response and anisotropic warpage result for SMC/BMC/GMT/D-LFT compression molding.
- Predict potential molding defects, such as flashing.



Material Characterization



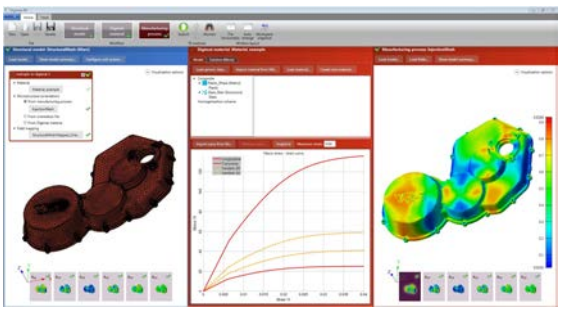


- Evaluate curing kinetics under temperature variations
- Evaluate viscoelastic properties, chemical shrinkage and thermal expansion effect.
- Evaluate the permeability and porosity of fabric layer.

FEA Interface/Micromechanics Interface

- Export fiber orientation, anisotropic mechanical property, stress and pressure simulation results to structural analysis software.
- Validate the structural performance of products and mold sustainability.

Moldex3D Digimat-RP



- Bridging manufacturing process and FEA analysis.
- Predict the mechanical behaviors of reinforced plastic with nonlinear material modeling technology.
- Define material properties and of failure criteria of reinforced plastic.
- Support automatic reverse engineering for material modeling based on experiment data.

Tablet Cover Warpage Improvement

Challenges

- Short shots
- Air traps
- Shrinkage caused by different wall thickness

Benefits

- Met the target of 1mm part thickness,
- Reducing 23% thickness
- Reducing 92% warpage
- Reducing 8.3% pressure loss
- Reducing 13% scrap
- Saved more than 6% of manufacturing costs with insert molding

Solutions

Utilizing the Moldex3D Advanced package to find the main factors of warpage and solved this issue by replacing the materials.

Case Study

The objective of this case is to improve the warpage. The warpage simulation result indicated the shrinkage effect impact was greater than the thermal effect (Fig. 1).
To fix this problem, PEGATRON tried to add different percentages of glass fiber content materials into the product and use Moldex3D to validate the warpage results. They found the filler could effectively reduce the warpage to meet the specification. The reason was that fiber would orientate along the filling direction (X-axis) to resist the shrinkage.
PEGATRON verified the analysis result with the experiment and found the flow patterns of simulation and experiment have the same trends. As for the flatness verification, the experiment results with different materials were all consistent with the simulation results (Fig. 2).

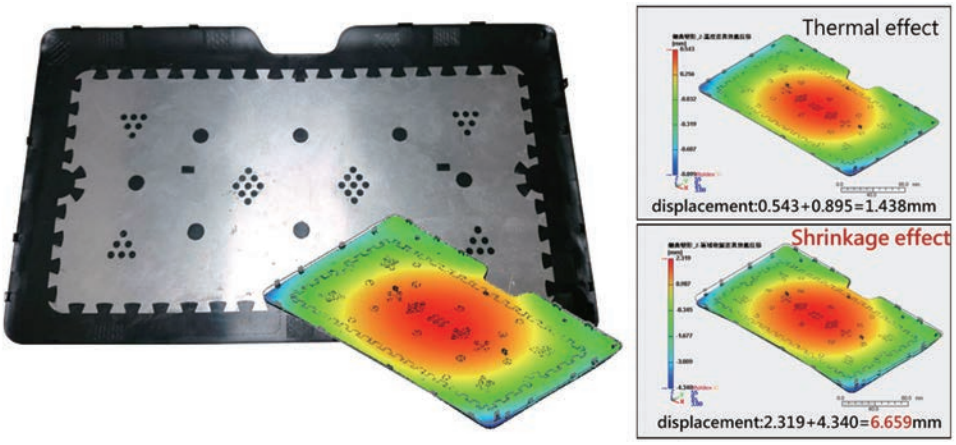


Fig. 1 The warpage results of the original material

Flatness Verification		
Material	Analysis result	Experiment
Sabic Lexan_HFD1830 (PC)	10.08mm	14mm
Sabic Thermocomp_D151 (PC+10%GF)	4.5mm	5mm
Sabic Thermocomp_D452 (PC+40%GF)	0.94mm	0.1mm

Fig. 2 The flatness verification with the experiment results

CAE Validation of the EASYPERM Measuring Process

Challenges

- Difficult to capture the filling behavior of anisotropic material
- Find the local pressure during RTM process

Benefits

- Visualize the flow front evolution
- Successfully predicted the arriving time and the local pressure increasing trend

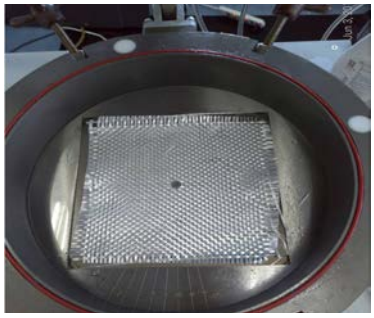
Solutions

Utilizing the Moldex3D filling analysis to predict flow front evolution and use the sensor nodes get the local pressure trend.

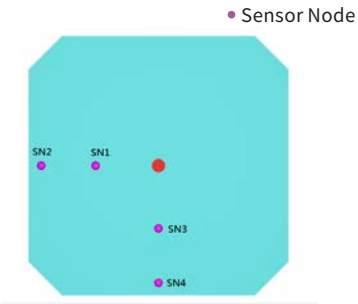
Case Study

The objective of this study is to get a comprehensive understanding of the permeability measuring process. The instrument EASYPERM is a device used to measure the fabric permeability properties which won the JEC Invention Award in 2015. The instrument measures pressure at different locations through a pressure sensor. This verification case focuses on two properties of the RTM process, the flow front arriving time and local pressure increasing trend in the filling process. The geometry and pressure sensor location is shown in Fig. 1 Fig. 2 shows the comparison of the flow front arriving time and local pressure increasing trend between the experimental and the simulation results. The dot lines are the experimental results, and the solid line is the simulation results. The local pressure increasing trend of simulation is in good agreement with the experiment. By using the simulation tools, we can observe the fluid flow within the mold. The comparison between simulation and experiment results shows the reliability of the simulation result.

Fig. 1 (a) Outward appearance of the mold



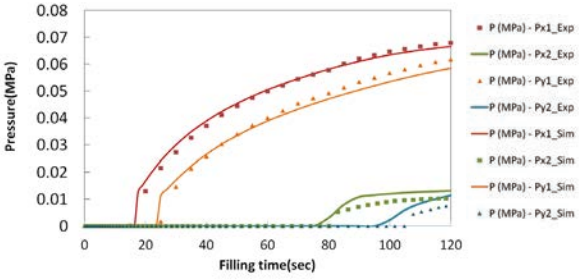
(b) Fabric preparation



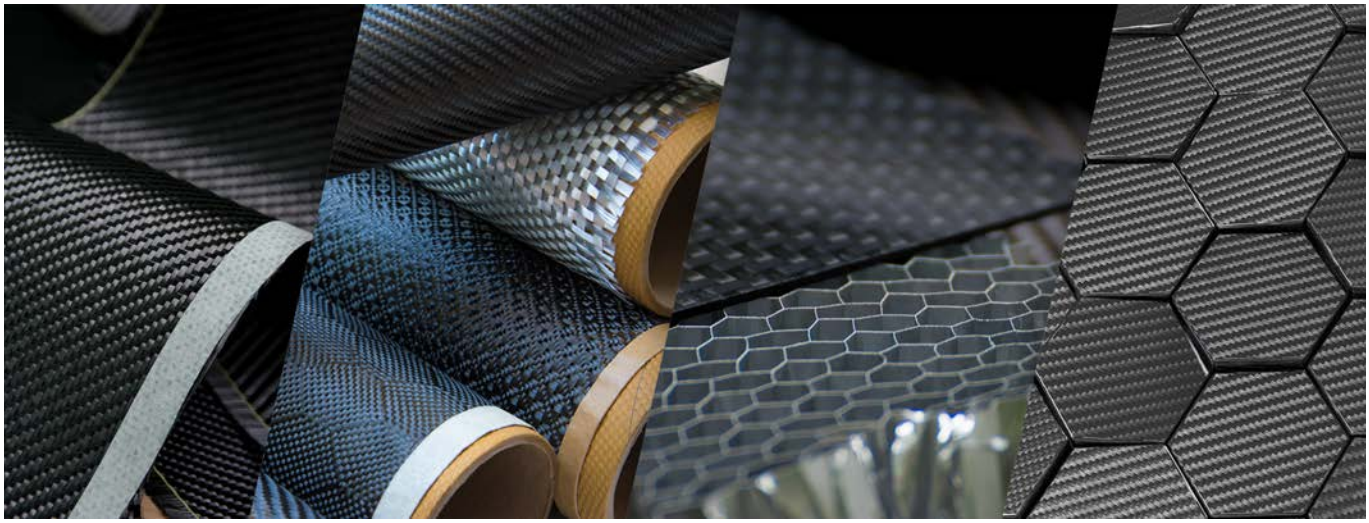
(c) Cavity geometry and pressure sensor location

	EASYPERM(sec)	Simulation(sec)
SN1 – X1	16	17.8
SN2 – X2	78	77.5
SN3 – Y1	24	23.9
SN4 – Y2	99	107.7

Fig. 2 (a) Flow front arriving time



(b) Local pressure vs filling time



ISO 17025 CERTIFIED LABORATORY

Moldex3D Material Center has the best-in-class equipment to help customers obtain reliable material data. We also offer data fitting, material file generation and more for precise simulation.

What We Provide?

- Thermoplastic / Thermoset / Fabric-RTM/ IC Packaging material measurement
- Customized Services of Test Items, Consulting, and Report
- Data Fitting & Material File Generation

List of Instruments

- DHR-3 (TA)
- MCR-502 (Anton Paar)
- Rheograph RG-25(Gottfert)
- MDR-A1 (U-CAN)
- DSC-8500 (Perkin Elmar)
- PVTC-A1 (U-CAN)
- FOAMAT 285 (Format)
- EASYPERM
- DMA-Q850 (TA)
- Instron 5966 (Instron)
- TMA-4000 (Perkin Elmar)
- PVT-6000 (GoTech)
- DSA 100 (KRŰSS)

Product Portfolio and Features

● Essential features contained | ○ Optional features

	Composite Standard	Composite Professional
Process		
Vacuum RTM	●	●
High Pressure RTM	●	●
Wet RTM	●	●
SMC/BMC/GMT/D-LFT Compression	●	●
Hybrid Molding (MCM)	●	●
Thermoplastic Injection Molding (IM)	●	●
Reaction Injection Molding (RIM)	●	●
Simulation Capabilities		
Parallel Processing (PP)	16	16
Cloud-Connect	○	○
Pre/Post Processing (Mesh)	●	●
CAD Geometry Model [1]	●	●
Material Database [2]	●	●
Filling	●	●
Charge Placement design	●	●
Gate and Venting Design	●	●
Surface Defect Prediction	●	●
Fiber Orientation [3]	●	●
FEA Interface [4]		●
Micromechanics Interface [5]		●
Packing and Curing		●
Cooling		●
Transient Mold Cooling or Heating		●
Conformal Cooling		●
3D Coolant CFD		●
Rapid Temperature Cycling		●
Induction Heating		●
Heating Elements		●
Warpage		●
Stress		●
Enhanced Fiber		●
Insert Molding		●
Multi-shot Sequential Molding		●
Solution Add-On		
Moldex3D Digimat-RP	○	○
Moldex3D CADdoctor	○	○
Moldiverse		
Material Hub Cloud (MHC) [6]	●	●
University - Moldex3D Software Training [7]	●	●

1. Import geometry from CATIA V5 and Rhino, as well as STEP, IGES, Parasolid and STL files.
2. Database: Thermoplastics materials, thermoset materials, molding materials, coolant materials, and mold materials.
3. Flat Fiber and Flow-Fiber Coupling function require additional license EnhancedFiber
4. Moldex3D discontinuous-fiber FEA Interface supports Abaqus, ANSYS, MSC Nastran, NX Nastran, LS-DYNA, MSC.Marc, and OptiStruct.
5. Moldex3D Micromechanics Interface supports Digimat and CONVERSE.
6. Material Hub Cloud (MHC) is a cloud database offering the most up-to-date material properties for users to find suitable materials and alternatives.
7. The best on-line practical guide and demo videos by Moldex3D software experts.

System Requirements

Platform	Windows	Windows 10, Windows11, Windows Server 2019
	Linux	CentOS 7 series, CentOS 8 series, RHEL 7 series, RHEL 8 series
Hardware	Minimum	
	CPU	AMD Ryzen ™ 7 series, Intel® Core ™ i7 series
	RAM	16 GB RAM
	HDD	20 GB free space (For Program Installation)
	Recommended	
	CPU	AMD EPYC ™ Milan / Milan-X series, Intel® XEON® Gold / Platinum / Bronze series
	RAM	16GB x 8 With ECC / 3200Mhz
	HDD	4 TB SSD (For Project Management)
	Graphic Card	NVIDIA Quadro series, AMD Radeon series
	Screen Resolution	1920 x 1080

Note
1. Linux platform is used for calculation resource only. Moldex3D Pre/Post-processor does not support Linux platform.
2. To increase calculation efficiency and stability, it is recommended to switch off Hyper-Threading under RC/DMP structure. For memory population rules, please refer to your CPU processor type for optimized performance.

Automotive

ANTOLIN, Autoliv, BEHR, BOSCH, Continental, DELPHI, Ford, HONDA, KOSTAL, MAHLE, MAGNA, molex, NISSAN, plastal, SEAT, TOYOTA, VOLVO, Visteon, ZF

Electronics

ASE, Amkor Technology, DENSO, FOXCONN, FESTO, FRESENIUS KABI, GARMIN, hynix, KONICA MINOLTA, LG, nunc, OLYMPUS, Panasonic, SONY, SUUNTO, Salcomp, SCHMALZ, SAMSUNG, TOMTOM, TEXAS INSTRUMENTS, WIDEX

Material / Consumer / Others

ARKEMA, CHIMEI, DECATHLON, Danfoss, DSM, FABER CASTELL, Freudenberg, GRUNDFOS, Husqvarna, MATSUI, Mold Masters, BASF The Chemical Company, Rockwell Automation, Synventive, SUMITOMO CHEMICAL Co., Ltd., SKF, SEIKI CORPORATION, Ticona, UMAREX, Unilever, VELUX, YUDO

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