ANSA & Moldex3D WHITE PAPER

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Overview of ANSA & Moldex3D Coupling

Moldex3D, a suite of professional CAE tools that enable accurate and efficient plastic part verification and mold optimization, now extends its mesh compatibility to ANSA's delicate 2D/3D mesh technology.

The deployment of Moldex3D and ANSA enables designers to set up the attributes needed for injection molding analysis powered by Moldex3D. Users can easily complete all the necessary setups for mesh in the dedicated pre-processing deck of ANSA and get ready for accurate plastic molding analysis with Moldex3D. The *.mfe or *.msh file can be directly exported from ANSA to Moldex3D Project, and users can benefit from the simulation results from the perspectives of design and manufacturing.

ANSA, an advanced multidisciplinary CAE pre-processing tool, provides all the necessary functions for full model build-up, from CAD data to ready-to-run solver input file, in a single integrated environment. ANSA has become one of the best products for CAE professionals because of its wide range of features and tools that meet various demands.

The interactions between ANSA and Moldex3D will continue to move forward with collaborative efforts from both sides; with more delicate meshing tools developed by ANSA and more simulation modules supported by Moldex3D. We believe that this platform will become mainstream in the near future.

How ANSA & Moldex3D Users benefit from the coupling

	Features in ANSA	Benefits for mutual users
1	Numerous mesh handling functions	Better quality meshes lead to more accurate simulation results
2	Batch Meshing Manager	An automatic mesh generation tool that reduces manual processing time for mesh generation
3	Dedicated solver deck	Simulation-driven design; shorter learning curve for existing ANSA users who are interested in Moldex3D Injection Molding analysis

1. Powerful meshing tools developed by ANSA which enable users to build high quality meshes which lead to more accurate simulation results.
    - High performance and quality volume/shell meshing algorithms.
    - State-of-the-art boundary layer elements development.

2. An automatic mesh building process provided by ANSA Batch Meshing Manager will have a positive impact on Moldex3D users with complicated models. It drastically reduces the human error factor and minimizes meshing time for model completion, thereby achieving a high quality mesh based on the demands of users.
    - It leads to controllable and effortless optimal results for both shell and volume meshing.
    - Following the versatile mesh area idealization, geometry can be meshed according to modeling requirements by cutting surface edges, volume meshing, and wrapping algorithms.

3. With the dedicated pre-processing deck in ANSA, existing ANSA users need no additional training of other platforms for injection molding pre-process setup which may be a key factor that interests new to the field users of injection molding analysis.

In general, designers may benefit from this simulation-driven design process provided by this cooperation leading to faster time-to –market, lower cost in the design phase and better quality of products. Quality improvement can be attributed to the fact that design changes cost less in the early stage. This ultimately has a greater impact on product manufacturability.

ANSA Specialties

ANSA's powerful functionality provides high efficiency solutions for the pre-processing of molding simulations. Its functionalities includes:

Topology and CAD functionality

- Integrated CAD tools for geometry creation, modification, cleanup, and de-featuring.

Surface meshing

- Automatic and robust mesh area simplification and de-featuring
- Generation of tria, quad or mixed mesh using several meshing algorithms
- Flexible hexahedral boxes for the automatic refinement of specific regions of the model
- Shell mesh clean-up tools (close openings, paste nodes, connect elements, intersect meshes, etc)
- Powerful and versatile tools for handling and combining CAD geometry and imported shell mesh.

Volume meshing

- Generation of penta and hexa boundary layers with variable parameters per property, advanced controls for squeezing, collapsing, or excluding, to overcome quality and proximity problems, generation of layers from both sides of zero-thickness walls and more
- A very robust smoothing algorithm ensures high quality layers generation all around complex model geometries
- Fast and robust Volume meshing for tetra, prism, pyramid, and hexa elements,
- Flexible hexahedral or cylindrical Size Boxes for tetra and hexa-Interior mesh with controlled mesh refinement and growth rate in space
- Unstructured hexa and penta meshing through map and sweep algorithms
- Pure hexa meshing based on multi-block decomposition of geometry with associated box topologies.
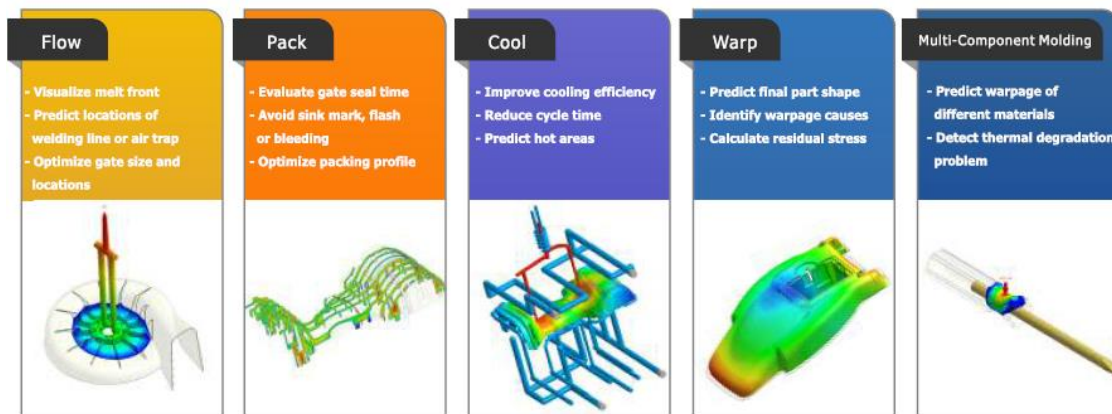
Batch meshing

- Complete automation of all the steps of CFD mesh generation based on pre-defined scenarios, for surface meshing wrapping layers generation and volume meshing.
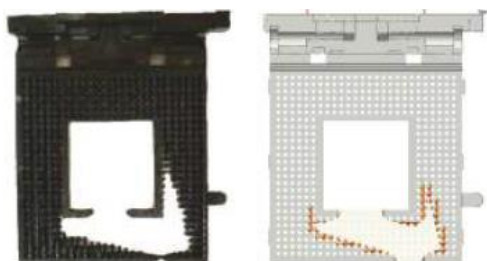
Mesh Quality control

- Quality check according to Moldex3D criteria
- Clear identification of poor-quality elements, colored by criteria type or value
- Contour plot of mesh colored according to mesh distortion or mesh quality
- Powerful reconstruction algorithm used for the improvement or modification of surface mesh and of the neighboring solid mesh.

Moldex3D Simulation Process

Moldex3D visualizes how the flow is injected into a cavity from one or multiple gates, affected by material properties and process conditions. These conditions include injection speed, mold temperature, etc. It also enables the simulation of insert molding, overmolding, and multi-shot sequential molding. More than 85% of common manufacturing problems can be predicted upfront, such as short shots, flow imbalance, air traps, or sink marks. Preventing these problems will highly improve part quality, structure and appearance. Based on the filling and packing results, you can evaluate the efficiency of cooling system design. A well-designed cooling system results in better plastic melt solidification and reduces cycle time. Moreover, Moldex3D provides accurate warpage prediction during each phase of the injection molding process.

Flow	Pack	Cool	Warp	Multi-Component Molding
- Visualize melt front - Predict locations of welding line or air trap - Optimize gate size and locations	- Evaluate gate seal time - Avoid sink mark, flash or bleeding - Optimize packing profile	- Improve cooling efficiency - Reduce cycle time - Predict hot areas	- Predict final part shape - Identify warpage causes - Calculate residual stress	- Predict warpage of different materials - Detect thermal degradation problem

Moldex3D solutions help users simulate and validate their part and mold designs before putting mold trials and fixes into practice. Major manufacturing defects can be predicted upfront; design revision and optimization can also be done more efficiently which enables designers to get instantaneous feedback on quality and manufacturability in the early design phase. Moldex3D not only provides better solutions in product development but also reduces the time and cost from inefficient mold trials and fixes.

Moldex3D provides accurate simulations of filling patterns for plastic parts even with complicated geometry.

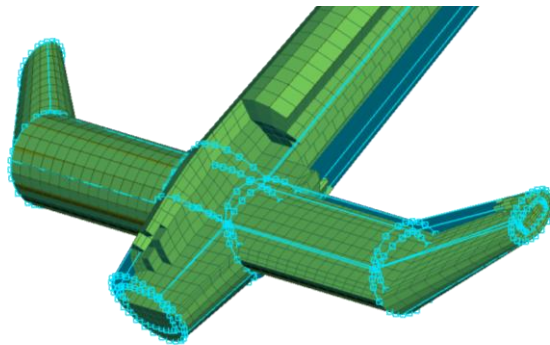## Special Features in ANSA for Moldex3D users

Dedicated Moldex3D pre-processing deck

A dedicated pre- processing deck to setup injection molding specific entities for Moldex3D:

- Definition of melt entrance, coolant channels entrance/exit
- Definition of runner/coolant channel attributes (section type and size)
- Wizard for automatic reaction of line elements for coolant channels and runners
- Definition of part/mold inserts
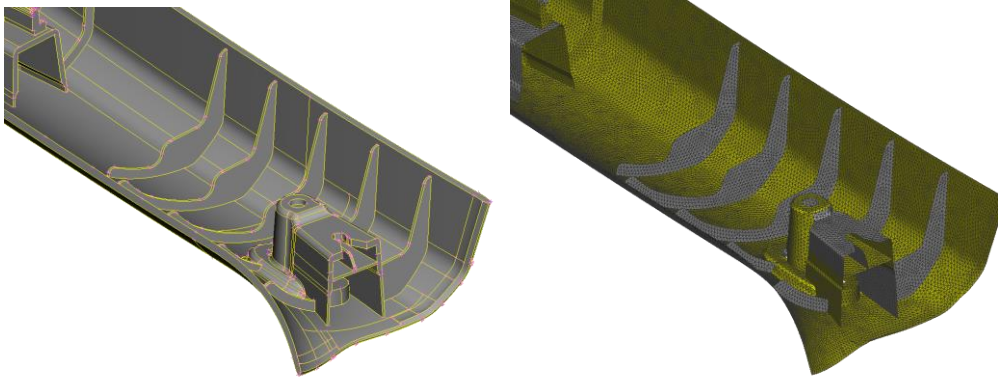- Predefined quality criteria for mesh check and correction

Hexablock tool

The tool enables the creation of hexa or prism meshes, especially for runners.

Middle surface extraction tool

The Middle Casting functionality can be used to automatically extract a middle skin from a solid requiring none or minimum manual local corrections.

Molding Layout starting option

A dedicated start-up option is provided so that mesh parameters and quality criteria are automatically set in compliance with Moldex3D requirements.
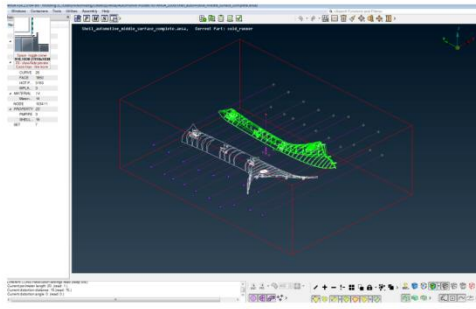
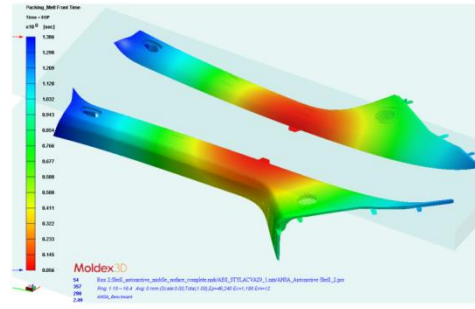## Sample Cases

Shell Case (A-Pillar Trim)

Shell Model Info:

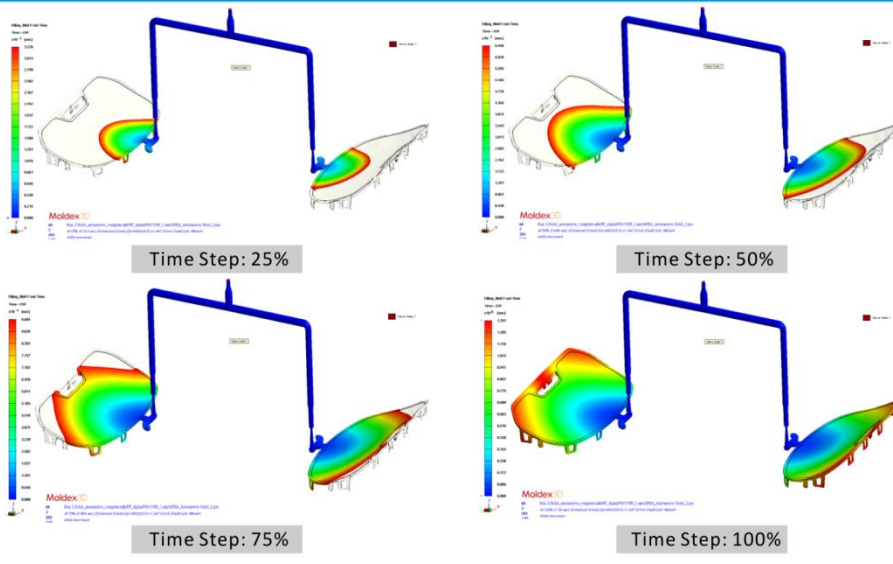Cavity Dimension: 527*806*270 (mm)

Element Number: 46240

Shell Mesh in ANSA

Analysis result in Moldex3D

Solid Case (Melt Front Time)

The Melt Front Time results show the position of melt front with respect to time during the filling stage. In general, optimized Melt Front Time results should show balanced flow contribution of each gate and all flow paths should reach the cavity wall at the same time.

Time Step: 25%

Time Step: 50%

Time Step: 75%

Time Step: 100%

Both the cases above were completed by Shell & Solid module in ANSA. For more details about the workflow, please refer to the tutorial provided by ANSA; both *.msh and *.mfe files are fully compatible with Moldex3D Project.

Support Platform

Supports only *.msh for versions prior to ANSA 14.0.0.

Fully supports both *.mfe and *.msh since ANSA 14.0.0

Conclusion & Contact Information

With the deployment of this state of the art pre-processing tool, ANSA and the world leading injection molding simulation software, Moldex3D, plastic part manufacturers can integrate simulation into the product development process, find defects in the early design stage and reduce the cost and time to market.

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