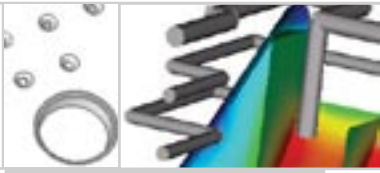
MPI/Cool



MPI/Cool provides tools for modeling mold cooling circuits, inserts, and bases around a part and analyzing the efficiency of the mold's cooling system.

MPI/Cool simulations allow users to optimize mold and cooling circuit design to achieve uniform part cooling, minimize cycle times, eliminate part warpage due to cooling factors, and decrease overall manufacturing costs.

Capabilities

MPI/Cool allows you to:

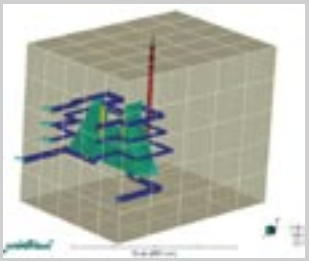
- Optimize part and mold designs to achieve uniform cooling with the minimum cycle time
- View the temperature difference between the core and cavity mold surfaces
- Minimize unbalanced cooling and residual stress to reduce or eliminate part warpage
- Predict temperature for all surfaces within the mold: part, runners, cooling channels, inserts
- Predict the required cooling time for the part and cold runner to determine overall cycle time

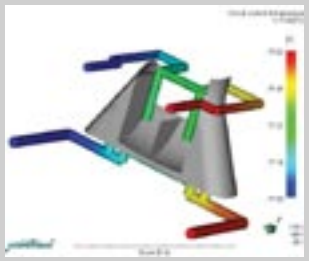
Supported Geometry Entities:

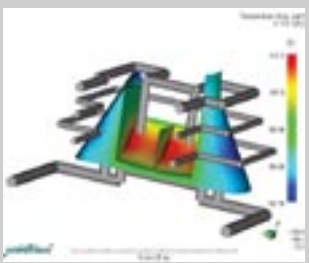
- Part model
- Cooling lines:
  - Circular or non-circular cross-sections
  - Baffles
  - Bubblers
  - Hoses
  - Mold inserts
  - Multiple mold materials
  - Hot and cold runners

Supported Analysis Integrations:

- MPI/Flow
- MPI/Fiber
- MPI/Gas (midplane models only)
- MPI/Co-injection (midplane models only)
- MPI/Injection Compression (midplane models only)







MPI/Cool Features

Features:

- Boundary-element method (BEM) for three-dimensional, transient (time-dependent) cooling simulations
- An analytical solution (through the thickness) is used for the part for solving the heat flux and temperature profiles in the polymer which is directly coupled to the BEM in the mold
- The heat flux in the polymer part is calculated by an analytical solution which is directly coupled to the BEM in the mold which is in turn coupled to the energy equation of the circuit network solver so as to accurately capture the mold/melt and the mold coolant interface dynamics
- Incorporates multiple mold materials used with mold inserts or in areas where highly conductive materials are placed to promote cooling
- Seamless asymmetric simulation captures the full effects of temperature variation through the thickness of the part from core to cavity mold surfaces
- "Aggregated mesh solver" option available for improved memory management and solution speed
- Groups of neighboring elements are aggregated to form large master elements, thus reducing the overall number of elements used in the solution
- Results are mapped back to the original mesh for interfacing to other solvers and post-processing

Automatic Analysis:

- Calculations yield the minimum cooling time required to achieve a target average temperature and percent frozen level

Manual Analysis:

- Used to examine temperature distributions for a given cavity, mold, and set of processing conditions
- Evaluate new mold designs
- Evaluate modifications to existing mold designs
- Interfaces with MPI/Warp through MPI/Flow

Results:

- For the cavity:
  - Cavity surface temperature distribution
  - Distribution of temperature differences across opposite surfaces of the cavity
  - Distribution of average plastic temperature at ejection time
  - Distribution of maximum plastic temperature at ejection time
  - Relative position of the peak temperature at ejection time
  - Distribution of frozen layer thickness
  - Temperature profile through thickness for each cavity element
- For the mold:
  - Surface temperature distribution on top and bottom sides of inserts and parting plane
  - Distribution of temperature difference across insert and parting plane surfaces
  - Temperature of mold external surfaces and surface of cooling circuits
  - Pressure drop along each cooling circuit
  - Variation in coolant temperature
  - Flow rate in each cooling circuit
  - Reynolds number in each cooling circuit

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