I-DEAS® MPI/Cool

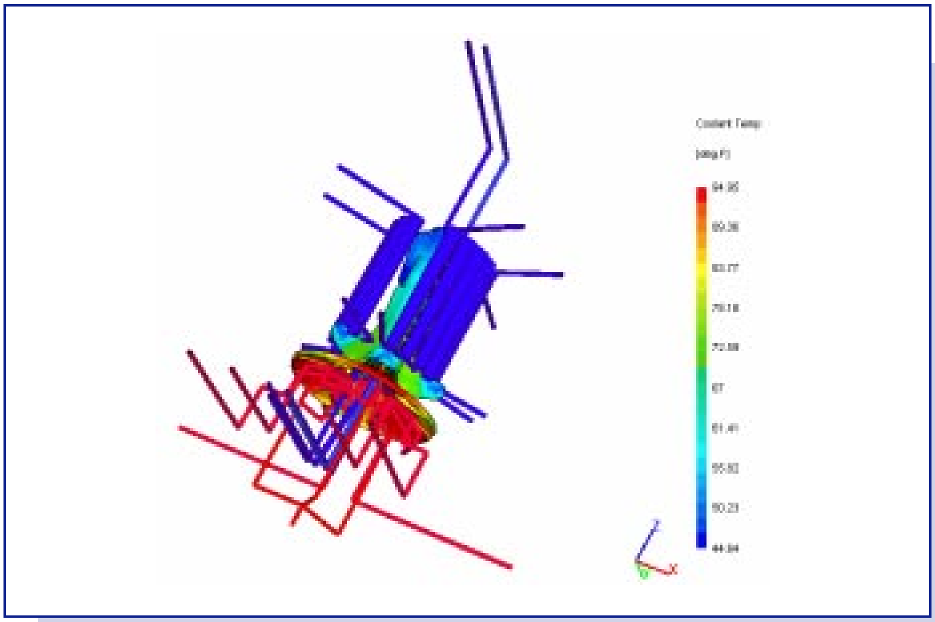
boundary element mold cooling analysis

Mold cooling analysis helps the user optimize the mold and cooling circuit design to achieve uniform mold cooling within a minimum cycle time.

Leading manufacturers and plastics processors around the world rely on I-DEAS® MPI/Cool to reduce their part cycle time and lower production costs, without compromising part quality.

Using I-DEAS MPI/Cool to trial alternatives, users can rapidly evaluate several mold designs. No longer is it necessary to rely on rules of thumb gained over years of experience to establish cooling circuit location and size, coolant types, mold and insert geometry, flow rates, and inlet temperatures.

By achieving uniform mold cooling, I-DEAS MPI/Cool reduces the warpage of a molded product and improves surface finish to give a consistently acceptable product, without high reject rates or expensive post molding operations.



Cooling circuit layout with circuit temperatures.

I-DEAS MPI/Cool Analyses

I-DEAS MPI/Cool is part of the Moldflow Plastics Insight, a suite of integrated analysis tools that work together to optimize the total process of producing a plastic part. I-DEAS MPI/Cool provides cooling (heat transfer) and network (circuit flow) analysis. It links with I-DEAS MPI/Flow to provide effects of cooling on flow, and to MPI/Warp to provide effects of mold temperature on warpage.

Network analysis provides information on flow rate requirements for coolant fluids enabling the appropriate pumping system to be used for the job. Cooling network geometries can be refined and flow rates estimated before running a full 3D thermal analysis.

3D Heat Transfer Analysis uses the boundary element method to determine the rate of heat transfer and distribution of temperature throughout a plastic part and within a mold. The rate of heat transfer is the principle factor that determines cycle time. Non-uniform temperature distributions can give rise to part warpage and its associated problems and expense.

Types of Analyses Available

An automatic analysis is used when there is freedom to set cooling time. In this case, the calculations estimate the minimum cooling time required to achieve a target average mold temperature and percentage freeze level in the plastic part. Automatic analysis is particularly useful during the early stages of part and mold design when looking to optimize cycle time. It can also be used to estimate cooling time for an existing operation, yielding the benefits of reduced cycle time and greater productivity.

A manual analysis is used to examine temperature distributions for given cavity, mold, and processing conditions. It can be used to examine new mold designs or modifications to existing mold designs, or to troubleshoot an existing molding problem. It is also used when a design is being taken through to MPI/Warp. In this case, plastics processing conditions and cycle time parameters are generally fixed by the plastics molding operation requirements.

The effect of standard mold features such as inserts, parting planes, and interfaces is taken into account in Moldflow's heat transfer analysis. Inserts are often made with different materials to ensure better heat extraction. Choices of material types and insert shape, size, and location can be simply evaluated to provide the optimum tool design.

All interfaces present some resistance to heat transfer as parting planes can influence the effectiveness of heat transfer within the mold. Representative interface conductances are supplied and can be assigned. External mold surfaces can be explicitly modeled and the distribution of temperature on the external surfaces obtained to indicate hot spots that may cause mechanical or wear problems during production.

Graphical Results

For the cavity:

•Cavity surface temperature distribution.
•Distribution of temperature difference across opposite walls of the cavity.
•Distribution of average plastic temperature at ejection time.
•Distribution of maximum plastic temperature at ejection time.
•Distribution of relative position of the peak temperature at ejection time.
•Distribution of frozen layer thickness (top side and difference).
•Through thickness temperature profile for each cavity element.

For the mold:

•Surface temperature distribution on top and bottom sides of inserts and parting planes.
•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.
•Flow rate in each cooling circuit.
•Reynolds number in each cooling circuit.

Prerequisites

Core Simulation

For More Information

For more information, contact your local SDRC representative or call 1-800-848-7372.