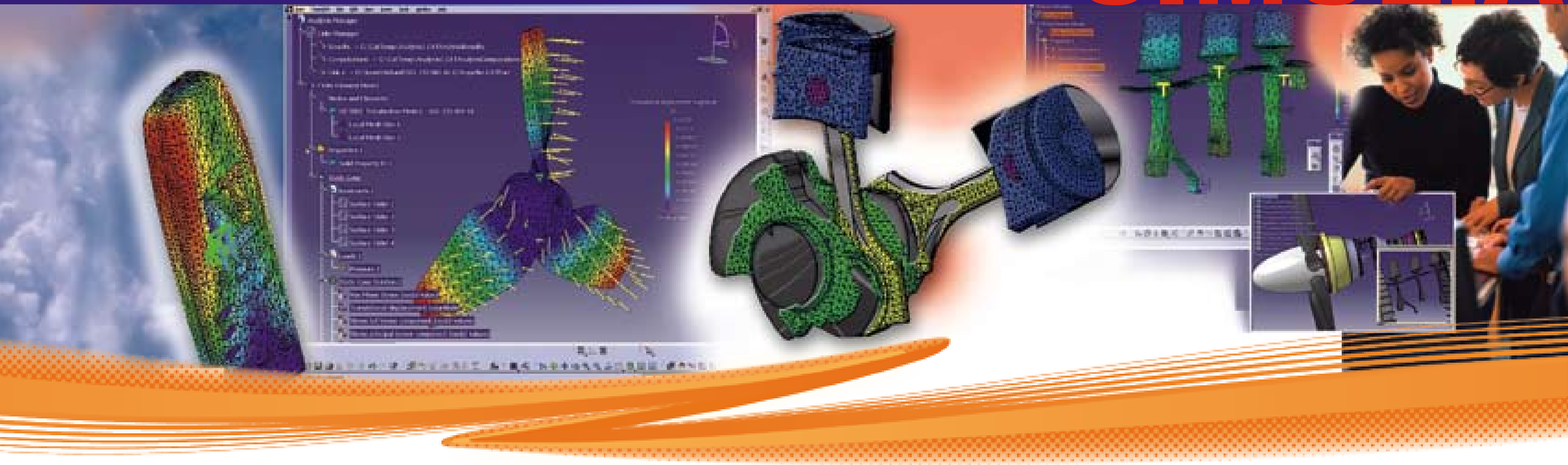


SIMULIA – Thermal Analysis (ATH)

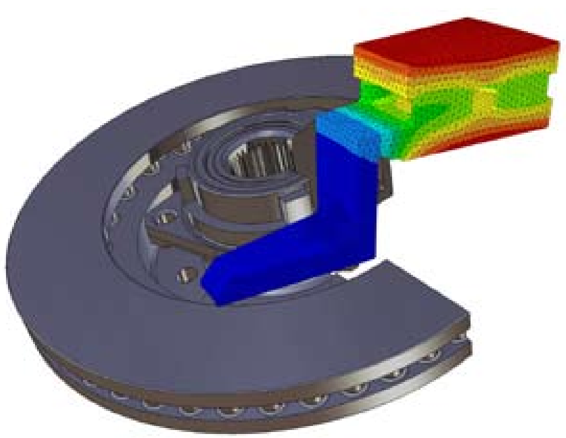
Extends the capabilities of Generative Part Structural Analysis (GPS) to thermal analysis

Overview

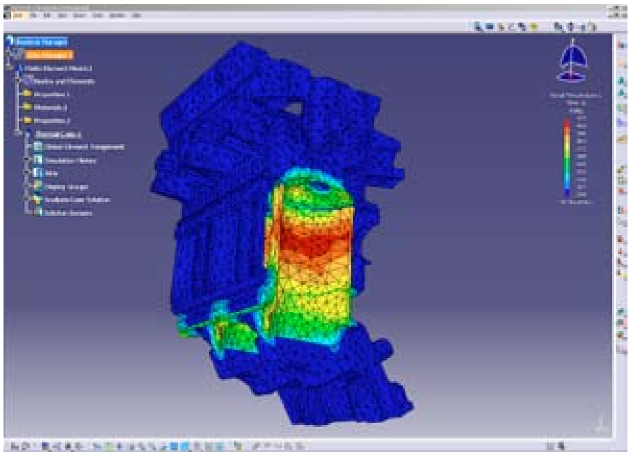
Thermal Analysis (ATH) extends the capability of GPS, allowing designers to understand the thermal behavior of their designs. The steady-state or transient temperature distribution can be calculated in response to the direct heating of a surface, the flow of a fluid past a surface, or the specified temperature of the surface. The thermal material properties can be temperature-dependent. When analyzing assemblies, the conductivity across the interface between contacting parts can be specified.

Product Highlights

- Calculates the temperature distribution in a part or assembly.
- Determines the steady-state or transient thermal response.
- Material properties can be temperature-dependent.
- Allows the conduction of heat between parts in an assembly.



Understanding the temperature variations within a disk brake during braking is necessary to ensure adequate heat venting. Thermal analysis allows the temperature of the brake to be determined during the braking process.



Temperature distribution for an engine heat transfer analysis

Features and Benefits

In addition to the functionalities and benefits provided by Generative Part Structural Analysis (GPS), Thermal Analysis (ATH) offers:

Thermal analysis

ATH allows the temperature distribution in a part or an assembly to be determined, allowing designers to understand the thermal behavior of their designs. The calculated temperature distribution can be used to perform a thermal stress analysis in Nonlinear Structural Analysis (ANL) to study the effect of thermal-induced stresses and potential fatigue problems that they may cause. The steady-state capability allows the long-term temperature distribution to be determined. ATH also has the ability to analyze the transient thermal response, such as the effect of a thermal shock or a start-up event.

Thermal loading

A heat flux can be applied to a point, surface, or volume, modeling the effect of direct heating. A film condition can also be applied to surfaces, modeling the effect of a fluid such as air or water next to the surface. The bulk temperature of the fluid and the heat transfer coefficient between the fluid and the structure must be defined. The temperature of parts of the model can also be specified directly.

Thermal materials

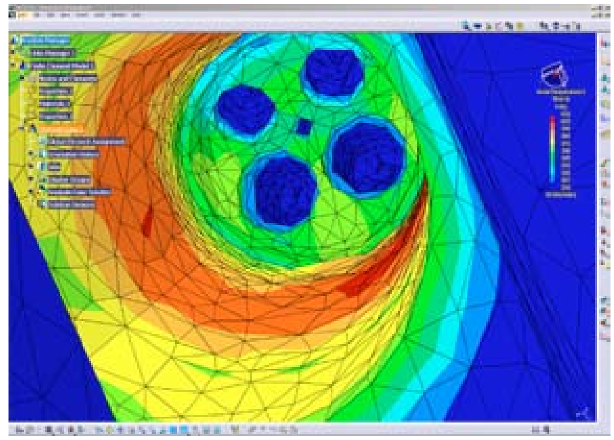
For a steady-state analysis, the conductivity of the material must be defined; for a transient analysis the density and specific heat is also required. The conductivity and specific heat can be specified to be temperature dependent, which is common for many materials. This makes the solution nonlinear and ATH will automatically perform a nonlinear analysis.

Thermal analysis of assemblies

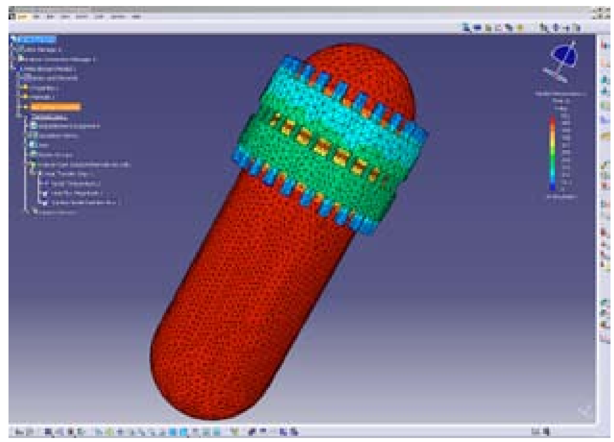
A thermal analysis of an assembly can be performed. ATH will automatically locate surfaces on adjacent parts and create thermal contact between them. The thermal conductivity across these contacting surfaces can be defined so that the surfaces conduct heat appropriately, depending on the size of the gap and the temperature at each surface.

Results interpretation

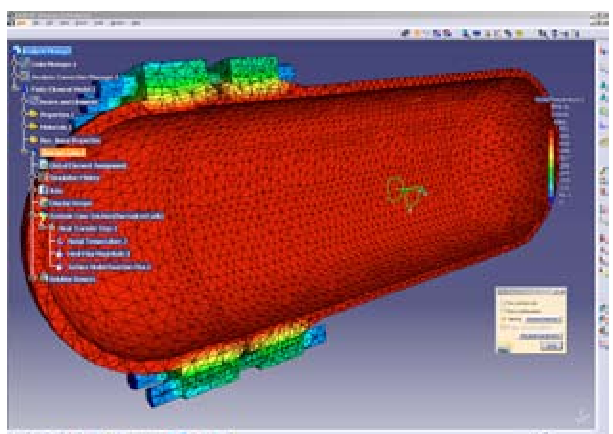
Contours of the temperature distribution in the part or assembly can be plotted. For a transient analysis, the temperature distribution can be plotted at various times during the transient and then animated. X-Y data can be exported to Excel allowing the time variation of the temperature at points in the model to be plotted.



Close-up view of the temperatures in the cylinder of an engine



Heat transfer analysis of a pressure vessel



Temperatures in the half section of the pressure vessel

SIMULIA World Headquarters
166 Valley Street
Providence, RI 02909 USA
+1 401 276 4400
E-mail: simulia.info@3ds.com

DASSAULT SYSTEMES