

CRTech TD Direct® is devoted to the defeaturing, meshing, and preparation of CAD models for thermal analysis. Bi-directional linking provides synchronization between TD Direct and Thermal Desktop.

CRTech TD Direct® is powerful software that fills the gap between design geometry and C&R Thermal Desktop®. TD Direct is built in SpaceClaim Corporation's SpaceClaim Engineer®, a CAD tool that focuses on preparing geometry for analysis, just as Thermal Desktop is built in AutoCAD. The starting point is the full design geometry in any format. The final product is the completed analysis in Thermal Desktop. The step in between is TD Direct, where the user has the ability to easily simplify, heal, and alter the geometry while working with an exceedingly capable mesher.

Starting with CAD Drawings

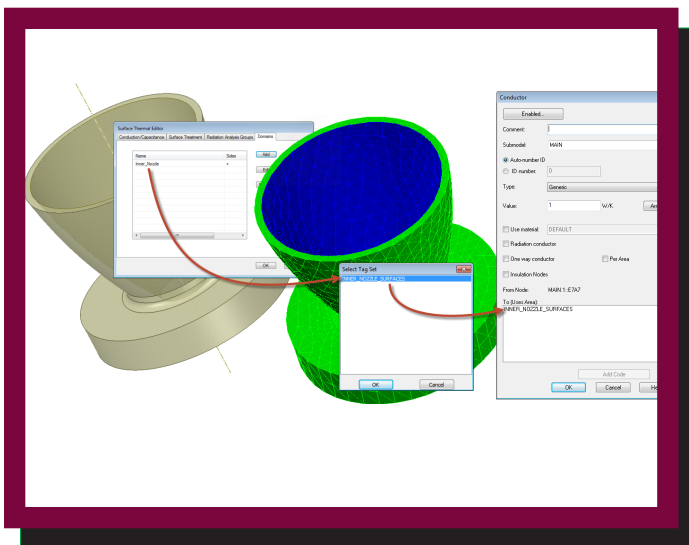
Thermal engineers are often given a CAD drawing of a part with the intent of creating a thermal model. This has a number of potential problems. First, companies don't often supply thermal engineers with licenses for their CAD software. Second, thermal engineers are often not familiar with the CAD software. As a result, the CAD drawing may be provided in what is considered "dumb geometry," often in the form of a STEP or IGES file that cannot be modified.

By using SpaceClaim as the base for TD Direct, these problems are all solved. SpaceClaim is a "direct modeler," which means simple CAD manipulations are carried out by pushing and pulling on the geometry, making it an easy to learn CAD system. Additionally, SpaceClaim can import virtually any CAD format, and it can modify the geometry without the history tree.

Link with Thermal Desktop

TD Direct establishes a bi-directional link between the CAE geometry and the thermal model in Thermal Desktop. When the link is established, the CAE geometry is translated into an AutoCAD part, a thermal mesh, or both. Symbols in Thermal Desktop can control dimensions in TD Direct, which means geometry changes can be controlled from Thermal Desktop. Any sort of changes in TD Direct can be updated with a single click to begin the synchronization. The ease of geometry manipulation in TD Direct combined with the rapid synchronization with Thermal Desktop removes many of the issues associated with an iterative design process.

TD Direct allows the user to mark portions of the geometry as "Domains" which become Domain Tag Sets in Thermal Desktop. For example, the intent may be use a conductor to attach all the internal surfaces between fins to an air node in the thermal model. In TD Direct, those surfaces can be assigned



TD Direct allows the user to mark parts of the geometry as "Domains" for use as a "Tag Set" in Thermal Desktop.

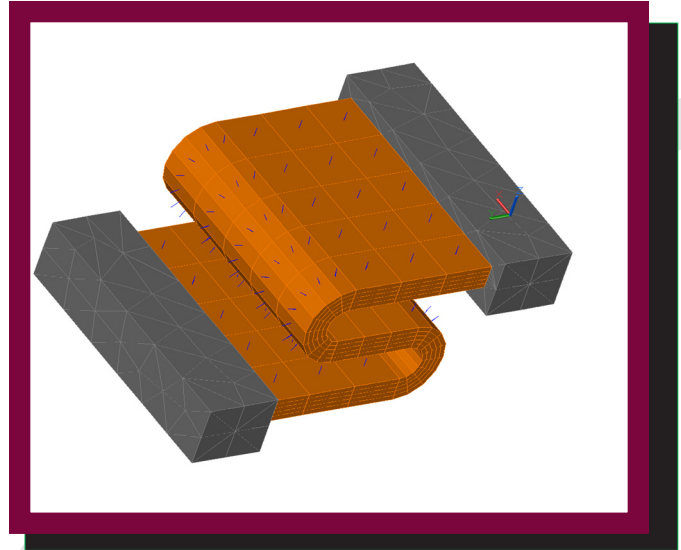
to a domain called "Fin_Convection." In Thermal Desktop, the air node would be tied to the tag set "Fin_Convection_Surfaces," which would automatically associate it with all of the individual surfaces, even if those surfaces have changed geometrically or remeshed.

Mesh Controls

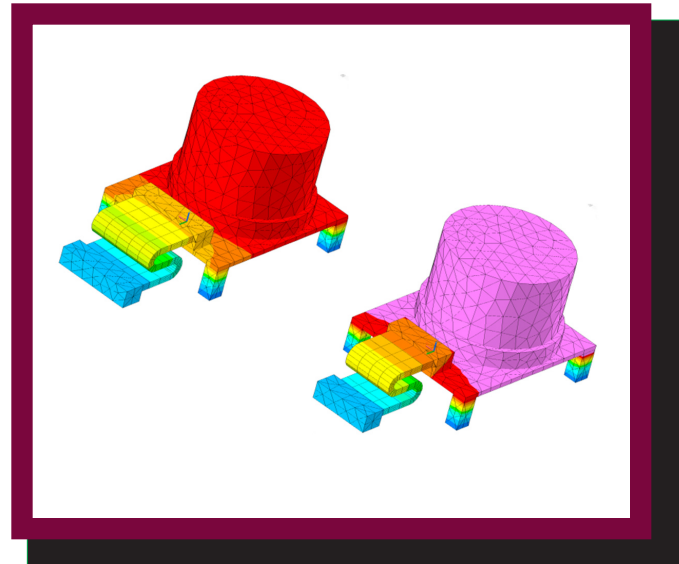
Global controls allow the user to specify initial mesh seeding size, relative scaling in Cartesian coordinates, curvature refinement, the option to ignore small features, and how to handle contacting geometry. Contacting geometry can be meshed independently, matched such that the two contacting bodies have identical meshes for easy contact later, or merged into a single body.

FEATURES

- Repair minor errors in geometry which cause problems when meshing.
- Simplify geometry by easily removing holes, fillets, etc. which produce unnecessarily dense meshes.
- Bi-directional link with Thermal Desktop • Synchronize geometry • Drive dimensions in TD Direct with Thermal Desktop symbols
- Thermal Model preparation • Specify submodels • Assign material and optical properties • Associate to radiation analysis groups • Specify material orienters for anisotropic materials
- One-button update of a complete thermal/fluid model if either the mesh or the geometry changes
 - Thermal Desktop Tag Sets are automatically generated and updated
 - Post-mesh editing operations (such as changing node type or setting initial conditions) are saved as scripts for automated updates
- Advanced thermal finite elements for faster solving models • Triangular and quadrilateral surface elements • Tetrahedral and pyramid solid elements
- Global and local mesh control
- Non-manifold (hybrid 2D/3D) meshes
- Advanced thermal modeling features for any contacting geometry • Matched meshes • Merged meshes • Control the priority of merged objects



Material Orienters used when modeling composites follow the geometry contour, as shown for this curved ribbon thermal strap.



Evaluating the effects of reducing the width of a thermal strap using the integrated design process of TD Direct.

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