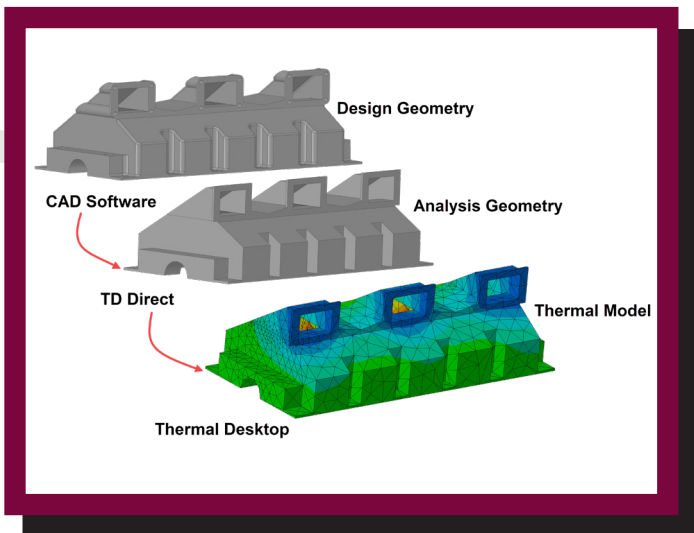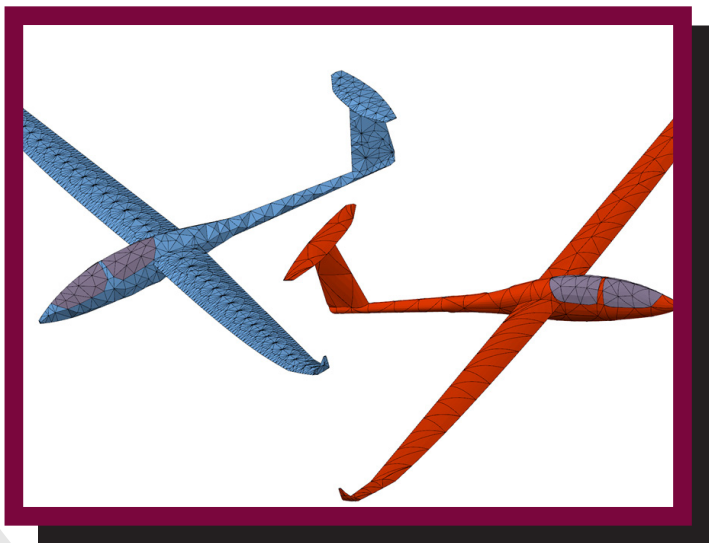# C&R TECHNOLOGIES®

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.

Curved elements capture the geometry with far fewer nodes, allowing the mesh density to be driven by the thermal solution requirements instead of the geometry

CRTech TD Direct® fills the gap between design geometry and C&R Thermal Desktop®. TD Direct is built in ANSYS 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 you have 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 to create 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," 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 dimensional 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 provides the ability to mark portions of the geometry as "Domains" which become Domain Tag Sets in Thermal Desktop. For example, the intent may be to 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 to a domain called "Fin_Convection." In Thermal Desktop, the air node would be tied to the tag set
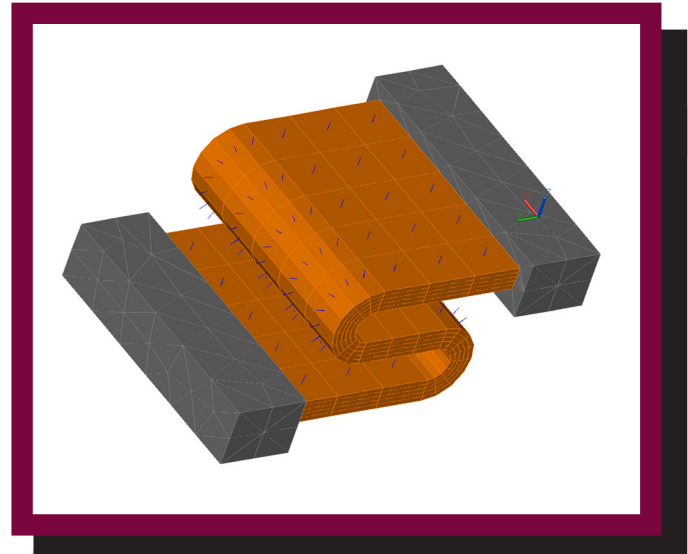
TD Direct®

"Fin_Convection_Surfaces," which would automatically associate it with all of the individual surfaces, even if those surfaces have changed geometrically and remeshed.

Mesh Controls

Global controls allow the specification of 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

• Simplify and repair design geometry to make it suitable for meshing

• 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

• Send area, volume, or position of geometry to Thermal Desktop for user logic

• Markup geometry with Domains to quickly select objects for contactors, heat loads, and more

• Advanced thermal finite elements for faster solving models • Triangular and quadrilateral surface elements • Tetrahedral and pyramid solid elements • Curved elements for thermal-centric modeling

• Powerful mesher • Global and local mesh control • Swept meshes across faces or solids • Non-manifold (hybrid 2D/3D) meshes • Independent, Matched, or Merged meshing options for contacting geometry

• 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

Material Orienters used when modeling composites follow the geometry contour, as shown for this curved ribbon thermal strap.
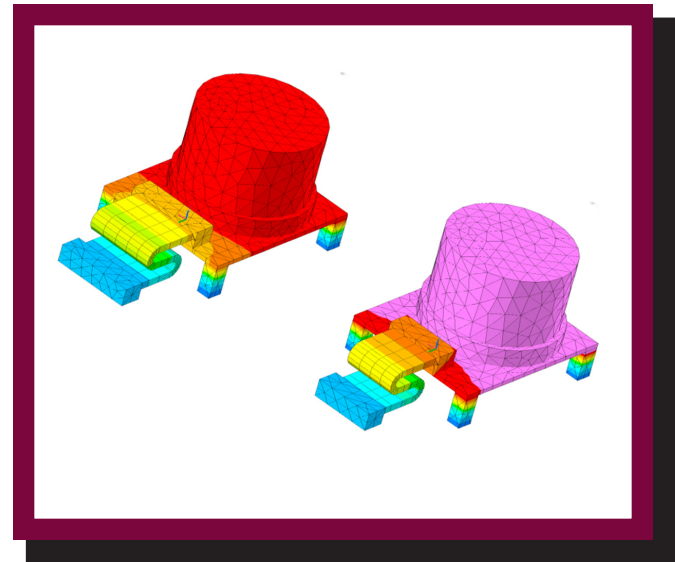
Evaluating the effects of reducing the width of a thermal strap using the integrated design process of TD Direct.

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