Ansys

Ansys + Engrana

"I especially appreciate the intuitive nature of SpaceClaim. The tool figures out what I want to do before I tell it – SpaceClaim almost reads my mind."

Bill Wangard, Ph.D.
Founder / Engrana

Engrana Utilizes Ansys SpaceClaim in CFD Analysis

Simulation Preparation Challenge: Preparing Customer-Supplied Geometries for Analysis

Engrana utilizes Ansys SpaceClaim® as a key tool for preparing solid geometry for computational fluid dynamics analysis. Clients typically supply CAD files of solid geometry that often contain many details that are not relevant to the flow analysis. Engrana uses SpaceClaim to de-feature and simplify the solid geometry, as well as to decompose the geometry in order to produce high-quality hex-dominant meshes. Additionally, SpaceClaim is used to extract flow volumes from the solid geometry. Before SpaceClaim, geometry de-featuring was left mainly to clients, and cleanup was often a difficult, iterative task. The intuitive and user-friendly interface of SpaceClaim has made the process of transitioning to this tool a breeze, and it allows Engrana to free clients from the burden of geometry cleanup.

/ Using SpaceClaim for Design Optimization

Engrana utilizes SpaceClaim to perform computational fluid dynamics (CFD) optimization studies. Clients often want to explore the sensitivity of the CFD solution to geometrical changes. SpaceClaim makes it easy to incorporate geometry changes with very little effort. These design variants are solved in sequence to determine the optimal solution with respect to the changes of the parameter, thus aiding in the optimization of the design.

/ Incorporating SpaceClaim into the Workflow

Prior to his founding Engrana, Dr. Wangard became aware of SpaceClaim while at Ansys, a company that has integrated SpaceClaim 3D Direct Modeling as an option with the Ansys Simulation-Driven Product Development Process. Since then, Engrana has adopted SpaceClaim to manipulate and modify clients' geometry directly, eliminating time-consuming iteration loops.

"I've saved at least 50 percent of my time on the geometry part of my job with SpaceClaim and I highly recommend it to my engineering colleagues. In fact, increasingly my clients are using SpaceClaim as well."

While he is optimizing the client's design, Dr. Wangard can parameterize the geometry and easily assign dimensions in SpaceClaim.

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Dr. Wangard now uses SpaceClaim as his primary tool for concept modeling and preprocessing before simulation. He can easily sketch new concepts in 3D, edit existing CAD data, fix dirty geometry, extract fluid volumes and simplify models for meshing in GAMBIT. With SpaceClaim, geometry is no longer the bottleneck.

"SpaceClaim is like putty in the hands of an artist. It is intelligent and intuitive 3D design software that increases my productivity and my customers really appreciate being able to see the impact of geometry changes directly in SpaceClaim."
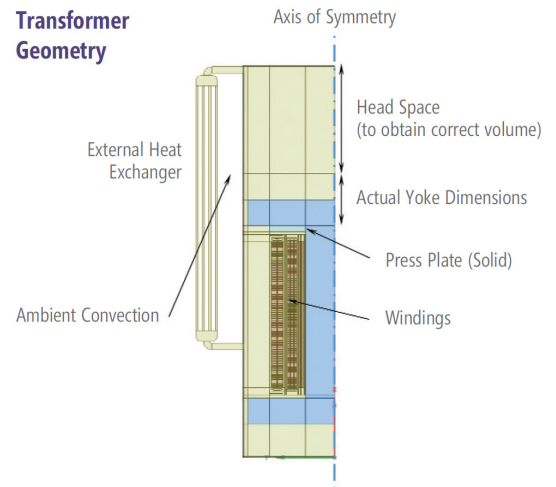

Figure 1: SpaceClaim model of a simplified Waukesha Electric medium-sized electrical power transformer. The geometry in blue represents the yoke and core. Low and high-voltage windings surround the coil. An external heat exchanger is used to dissipate electrical power losses to the environment.
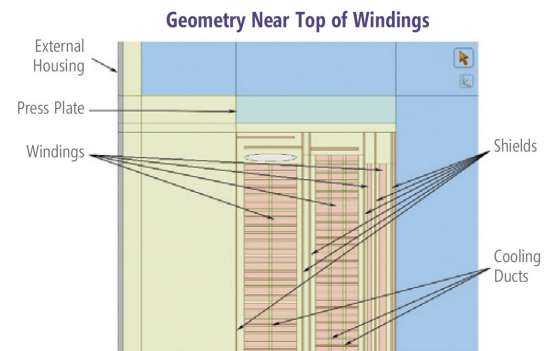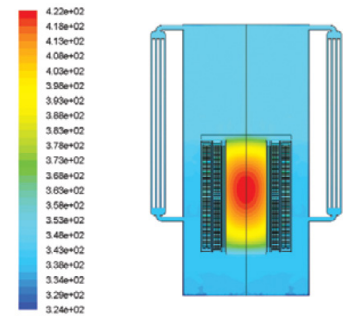

Figure 2: Magnification of the transformer geometry that shows the detail near the upper portion of the windings. Each of the windings, in addition to the coil, generate heat. The heated fluid convects to the upper portion of the transformer and is cooled by thermosiphon action through the external heat exchanger.

/ About Engrana

Engrana LLC (est. 2009) is a computational fluid dynamics (CFD) and thermal analysis consulting firm founded by Bill Wangard, Ph.D. Engrana (a contraction of Engineering Analysis) specializes in complex fluid flow problems involving mass transfer, multiphase flow, chemical vapor deposition, and external aerodynamics. Engrana serves a variety of medium- and large-sized companies as their virtual CFD analyst, employing commercial and open source CFD software such as Ansys Fluent, COMSOL, and OpenFOAM. In addition, Engrana develops customized mathematical lumped-model solutions using mathematical tools such as EES and MATLAB. Engrana's customers encompass a diverse spectrum of industries: consumer goods, electrical power transformers, construction materials, pharmaceutical, and CVD reactors.

Figure 3: Contours of the steady-state temperature distribution inside the transformer. Simulation was performed using Ansys Fluent 12.

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