INTEGRATED
ENGINEERING SOFTWARE

COUPLED ELECTROMAGNETIC/ THERMAL SYSTEMS

Hybrid simulation tools for electromagnetic design analysis

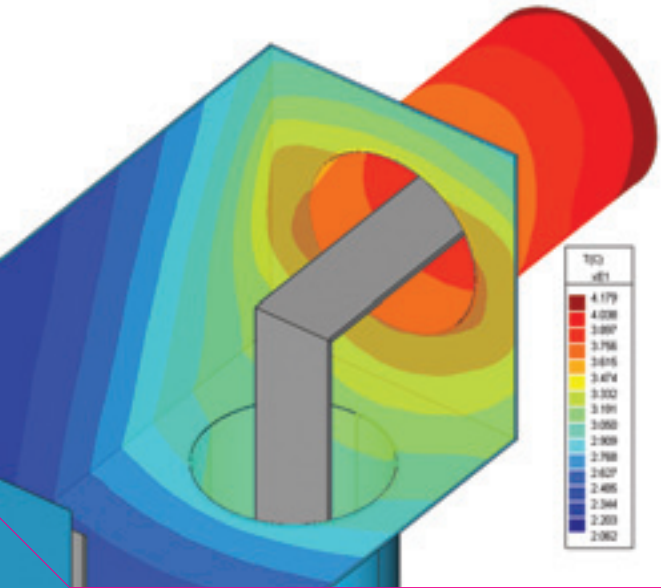
Complete Solutions for Engineering and Scientific Design

SOFTWARE THAT
LIVES UP TO THE
POWER
OF YOUR
IDEAS

Eddy current heating produced by time varying magnetic fields can be either a primary design goal, or an undesirable side effect. Predicting the temperature rise in conducting bodies is a challenging analysis problem requiring coupled electromagnetic and thermal field solutions. To handle these applications, **INTEGRATED ENGINEERING SOFTWARE** has developed **INDUCTO**.

For systems that can be modeled as **2D** or Rotational Symmetric, **INDUCTO 2D** combines the **OERSTED** eddy current and **KELVIN** thermal solvers. For systems that require a full **3D** analysis, **INDUCTO 3D** integrates the **FARADAY** eddy current and **CELSIUS** thermal solvers.

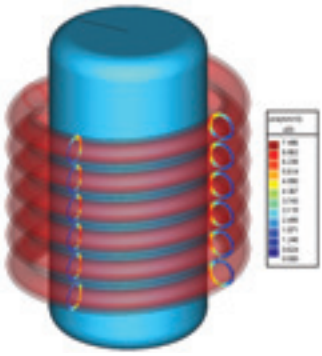
Temperature contours showing heating effects of eddy currents induced in metal switchgear enclosure



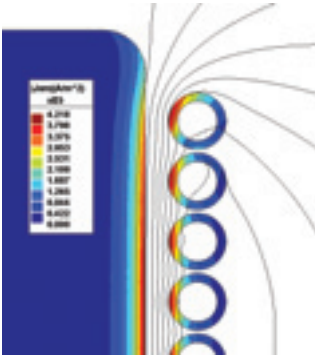
Electromagnetic Eddy Current Field Solvers

Accurate calculation of induced eddy currents is the foundation of coupled electromagnetic/ thermal simulations.

Eddy current field simulations can be performed using either self-adaptive **Boundary Element Method (BEM)** or **Finite Element Method (FEM)** solvers. **BEM** is particularly well suited to open region problems (encountered in air core inductors) while **FEM** can easily accommodate transient problems.



Current density contour plot in 3D model of copper tube induction coil



Current density contour plot in workpiece and coils in Rotational Symmetric model

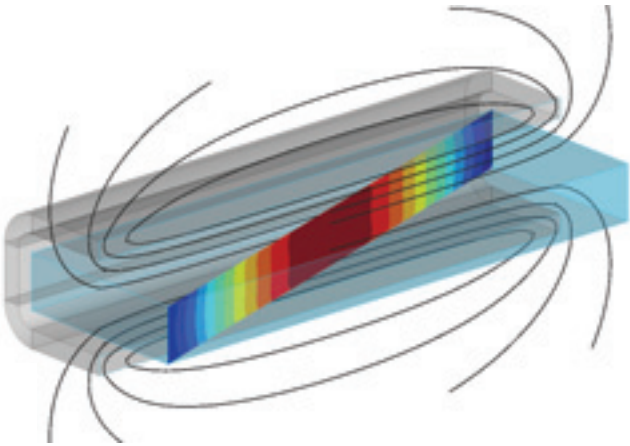
Coupled Electromagnetic Thermal Solution

Having obtained the eddy current solution using the electromagnetic solver, the resulting Joule heating power is automatically transferred into a distributed heat source for the thermal solution.

The resulting heat source can be used for several types simulations:

- As a constant source for a static analysis to obtain steady-state temperature distributions
- As a step source to study time and spatial dependent transients
- As a completely general time varying source to simulate alternate heating and cooling regimes

Magnetic field lines and temperature contour plots for aluminum slab inside solenoidal induction coil



OPTIMIZE YOUR DESIGNS

USING INTEGRATED API, PARAMETRIC AND/OR SCRIPTING CAPABILITIES

Both **INDUCTO 2D** and **INDUCTO 3D** programs come complete with **API**, **Parametric** and **Scripting** capabilities.

Parametrics provides an easy to learn GUI based method of testing models through their range of operating conditions, as well as modifying basic designs to obtain optimum performance.

The **INTEGRATED API** enables the direct control of program functions by utility scripts or macros created in tools such as Excel, MATLAB® and Visual Studio. **Scripting** can control the entire process of model creation and testing.

MATLAB **Enabled**

MathWorks Partner

PUT OUR SOFTWARE TO THE TEST

Send us your model, whatever the level of complexity. **We will show you how to get results from your exact design** – no packaged demos.

Contact us for an evaluation and start improving productivity today. A live demo is also available.

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