

# **SIMULATION OF PHYSICAL FIELDS IN ANSYS WORKBENCH)**

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## **ABSTRACT**

This work deals with possibilities of interoperability between modern CAD systems and Ansys Workbench. In this work, modern CAD systems are represented by Autodesk Inventor 10 Professional, which can be used for creating 3D models of electric machines and devices. A big advantage of this CAD program is the possibility to interoperate with Ansys 10 Workbench. This program is used for modelling of physical fields with the use of Finite Element Method. Interconnecting these two programs may be very useful in design of new electric machines and devices. Simulations of e.g. thermal fields, electromagnetic fields or structural analysis is very interesting for company, which wants to change the design or characteristics of an electric machine. Models of physical field can help to prevent failure of the machine.

## **1. INTRODUCTION**

The present time, many companies encounter problems in development of a new electric machine and device. One of the biggest problem, is the time consuming and expensive tests, which must undergo any product before the serial production. In some cases, it is necessary - on the basis of the tests analysis - to change the construction and implement next tests again. Some of these steps can be avoided thanks to possibilities of new programs, which enable creation of 3D realistic models of electric machines and/or apparatus. With the help of other programs, it is then possible to accompany these models with simulation of physical fields. Wide variety of programs for creation 3D model (also graphical documentation) exists, e.g . Autodesk Inventor and Solidworks. Ansys is probably the best known and widespread used commercial program for modeling of physical fields.

However, classical version of Ansys is very difficult to understand and any user must have very good knowledge of background questions and hereof program. For a company it practically means exercise at least one's specialist that has to concentrate only upon this type of work. For this purposes, a new supplement of the Ansys – Ansys Workbench - has been released. This series is much more user-friendly. So that time needed for simulation of physical fields is cut down.

## 2. ANSYS WORKBENCH PROGRAM

Program Ansys series Workbench works as well as classical version hereof program on principle of the method of final elements. Workbench Environment offers standard spectrum possibility for load and definition boundary conditions – with maximum stress on simplicity and „*neighbour liness*“ environment, which very good matches CAD parameters.

Workbench Environment has the following philosophy: user simple and catch it environment offers prepared algorithms procedure, basic engineering exercises, no expectant knowledge theory method, not even complicated software system. User can choose from the physical problem - for example statics, dynamics, or warm and whole running setting, calculation and interpretation make in environment interactive menu. Mentioned at least some from inside algorithms, examining strategically important attributes calculation:

- Adaptive *meshing* (generation grating) with automatic refinement nets on choice surfaces
- Generation of „intelligent nets“ insusceptible existence elements wrong quality
- Automatic iterative action adaptive refinement nets on the basis setting convergence criteria. Makes it possible to define requisite category accuracy result calculation whole model or with reference to his definite part.
- Automatic selection for given to exercise optimum problem.

Likewise as classical series program makes it possible to this program pursuit following calculations:

- a) Structural analysis (statics and dynamics).
- b) Thermal analysis.
- c) Analysis magnetic field.
- d) Analysis electromagnetic field.
- e) Analysis fluxion.

Since the series Workbench is relatively young yet, it has some limitations. For example, Ansys 9 Workbench is the first version, which will prove reckon in 3D space static magnetic field, further Ansys 10 Workbench is again capable in addition reckon current conduction in 3D objects.

## 3. POSSIBILITIES COOPERATION WITH CAD SYSTEMS

Company Ansys Inc. arbitrated improves possibilities of cooperation between their products series Ansys and modern CAD programs. Thanks to that, it is now possible to transfer models made by many CAD systems to the environment of Ansys in a very simple way. Following tables includes titles and version supported CAD systems, from which there are possibilities to implement transmission model to the simulation programs series Ansys.

With ANSYS one can use an existing native CAD geometry directly with no translations, no IGES, and no middle geometry formats. ANSYS has native, bi-directional, integration with the most popular CAD systems for over 10 years and also provides integration directly into the CAD menu bar making it simple to launch the ANSYS world class simulation directly from a CAD system.

The ANSYS Workbench Environment uses a unique plug-in architecture to maintain associativity with the CAD systems for solid and surface models, allowing to make design changes to a CAD model without having to reapply loads and/or supports. One can either pick the CAD dimension to change directly, or enhance the design iterations with the Parameter Manager. The ANSYS Parameter Manager in Workbench provides an easy way to set up multiple design scenarios by simply filling out the Parameter Manager spreadsheet and ANSYS will automatically update the geometry and run your multiple solutions!

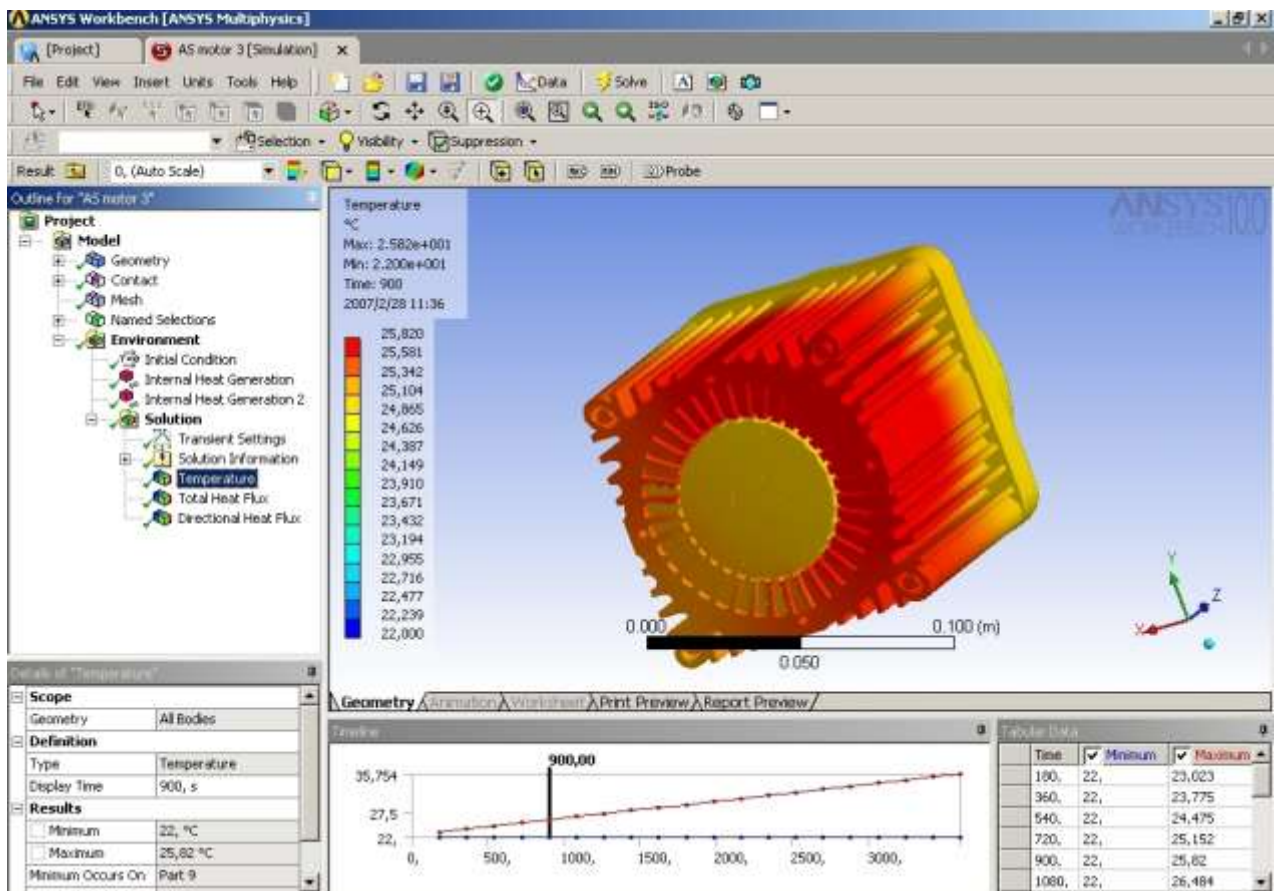


Figure 1.: Thermal simulation in Ansys Workbench.

#### 4. CONCLUSION

Program Autodesk Inventor Professional is a high - quality CAD program that makes it possible to generate 3D models. For the models, it is possible to easily create graphical documentation and even animated presentation of the single products. From the point of view of electrical engineering, there is a big advantage of cooperation between Autodesk Inventor Professional and Ansys 10 Workbench. Thanks to capabilities of these programs, it is possible relatively simple to create realistic 3D models of electric machines and/or apparatus and to carry out on this models simulation of different fields (electromagnetic, heat,

flux etc.). Work in program Ansys 9 Workbench isn't exacting as with some other programs which work with the final elements method. Bases of the program can be understand in a short time.

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