COOPERATION OF MODERN CAD SYSTEMS WITH PROGRAM 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. This program facilitates the creation of professional technical documentation, which can be used in the production process in particular. Another of its functions is the creation of animated presentations. The presentations are primarily employed in product promotion. A big advantage of this CAD program is the possibility to interoperate with Ansys 10 Workbench. This program is used for the creation of models of physical fields with the use of Finite Element Method. Interconnecting these two programs may be very useful when designing new electric machines and devices. Simulations of e.g. thermal fields, electromagnetic fields or structural analysis may prevent errors that would otherwise be discovered only much later - at the prototype stage.

1 INTRODUTION

Designing new electric machines is a very complex issue requiring that companies spend substantial sums for tests. Tests take place at all stages of development and are essential for verifying the functionality of new products. The tests are carried out at individual test items, which have to be manufactured. However, design errors may be discovered during these tests; it is thus necessary to produce other test items following the elimination of the error. This process is very time consuming and requires large technological and financial resources. Nevertheless, the combination of modern CAD programs and computational analysis programs may prevent certain design errors as early as the creation of design documentation. New CAD systems enable to create real 3D models of electric machines from which full design documentation is then compiled. These models can then be transferred into the Ansys environment. The program allows that models of physical field distribution more or less corresponding to real behaviour of these fields in the actual machines can be created and applied to the 3D models. Error analysis can thus be carried out and the design can be modified before the first prototype is produced.

Physical field computations are most frequently made in Ansys. Most people know the

standard version of this program. As this version is aimed at research computations, its user environment is very complex. The result is that companies which decide to utilize this program have to employ specialists or reserve certain employees who will deal with the program on a long-term basis. The creators of the program have been aware of this disadvantage and decided to create a new version of Ansys. It was named Ansys Workbench. This series is very user friendly and its graphic environment is more well-arranged compared to the standard version. Full support of 3D models is a very good feature in this series.

2 PROGRAM ANSYS WORKBENCH

Ansys Workbench employs Finite Element Method in the same way as the standard version. The environment in the Workbench series offers a standard choice of various types of load and peripheral conditions and ensures as easy and friendly environment as possible.

The creators of Ansys Workbench employed the following theory: The program is based on an easy control and preparation of computations requiring only basic engineering knowledge of the problems being solved. This program does not require that its users know the methodology. Users may carry out analyses of physical fields in several ways. They can, for example, choose between a static or dynamic analysis or between a computation of the entire model or only its part. The program includes many features that make users' work more comfortable. One of them is the Adaptive Mesh feature, which includes the following tasks:

- automatic creation of a mesh of elements with selected size;
- generation of an "intelligent mesh" that does not admit incorrectly selected elements;
- automatic iteration of a mesh based on standard settings in order to achieve the convergence of computations;
- automatic selection in order to obtain optimum option for the issue.

Similarly as with the standard version, the following computations can be made:

- Structural analysis
- Temperature analysis
- Analysis of magnetic fields
- Analysis of electromagnetic fields
- Flow analysis

As the Workbench series is rather young, the program, however, has certain limitations. For example Ansys 9 Workbench was the first version of this series that enabled computations of static magnetic and electromagnetic fields in the 3D environment.

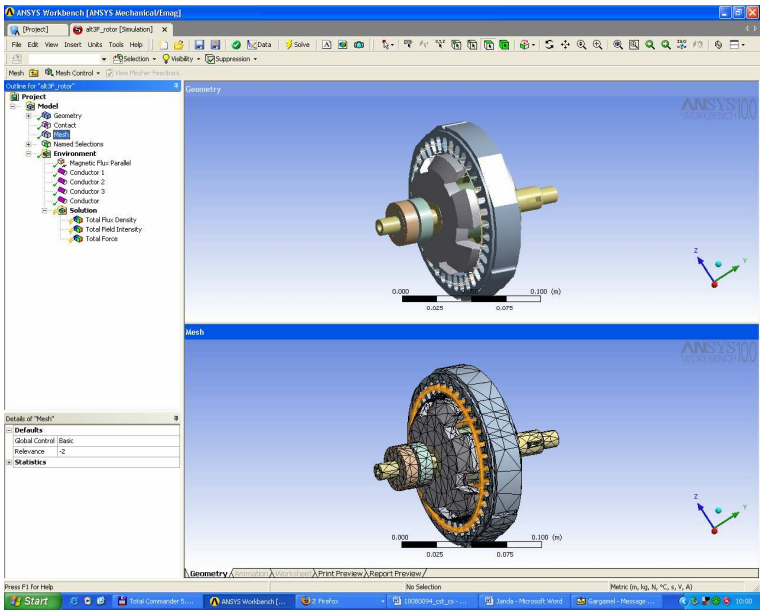

Fig. 1: *Ansys Workbench user interface*

3 POSSIBILITIES OF INTEROPERABILITY BETWEEN ANSYS WORKBENCH AND MODERN CAD SYSTEMS

Ansys Inc. has realized the benefits of interoperability between its Ansys programs and modern CAD systems. The result is that it is now very easy to transfer models of electric machines from a large number of various CAD systems into the Ansys environment. The following table contains names and versions of supported CAD systems from which it is possible to transfer 3D models into the Ansys environment.

CAD system	ANSYS Environment	Workbench Environment
Unigraphics	v18	NX/v18
Pro/E	Wildefire & 2001	Wildefire & 2001
Catia	v4/v5r10	v4/v5r10
Autodesk Inventor		R6/R5.3
Autodesk MDT		v6/v5
Solid Edge		v14/v12
SolidWorks		2003/2001 Plus
Parasolid	v14	v14

The Ansys environment enables to use the existing geometry created in one of the aforementioned CAD programs without having to convert it into one universal format. Ansys is compatible with the most favourite CAD systems available on the market in the last 10 years. What is more, the Ansys option is included in command menus of these programs; hence the interoperability of these programs is much faster and simpler.

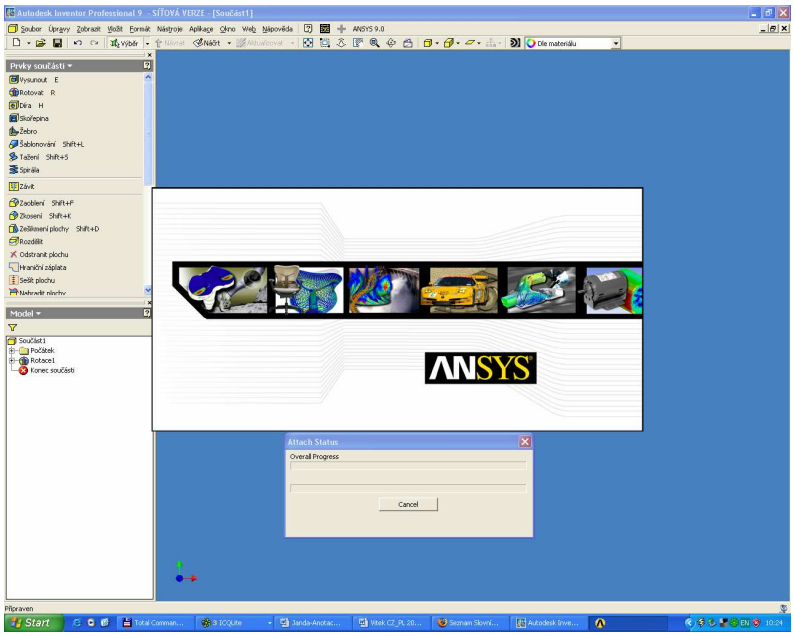

Fig. 2: *Transfer 3D model from Autodesk Inventor to Ansys Workbench*

4 CONCLUSION

Autodesk Inventor Professional program is high quality CAD system which makes possible simple 3D models creation. From these models it is possible to create graphic documentation and animated presentation of individual products in a simple way. In practical application the cooperation between programs Autodesk Inventor professional and Ansys 10 Workbench is a great advantage. Thanks to possibilities of these programs it is simple to create real 3D models of electrical machine and to simulate physical field (electromagnetic, warmth, flow etc.) on the created model. Work in program Ansys 10 Workbench isn't demanding for user skills as with some other programs which are working on finite element method. Basic skills can be gained in short time. Professional user skills require lot of time and study.

5 ACKNOWLEDGMENTS

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