1TH INTERNATIONAL WORKSHOP "ADVANCED METHODS AND TRENDS IN PRODUCTION ENGINEERING"

ENGINEERING ANALYSIS AND ITS APPLICATON AT ITPM

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Abstract: *Engineering analyses are important helpers for increasing quality of the products. It is important when students and teachers can make the acquaintance of those tools. ITPM has implemented one of those systems within the Academic grant offered by SolidWorks Corp.*
Key words: *Engineering analysis, FEM, SolidWorks, COSMOS*

1 INTRODUCTION

Nowadays, when high quality and low price requirements are placed, we need tools enabling keep quality at low cost. One way is the Engineering analysis (EA). Using EA we can foresee behaving our product and its environment. EA uses a lot of numerical method to solve equation formulas of the physics model.

From the informatics point of view EA is generally problem of the collaboration of different mathematical models solving technical problem.

Subject of the EA is collaboration group of different analytical respectively modeling systems (open analysis system).

2 USING AND INSTRUMENTS OF THE EA

Using EA we can solve different kind of behavior of the product that can be described via physics principles, like acoustics, aerodynamics, dynamics, mechanics, kinematics, optics, stress, thermodynamics, heat transmission, vibration etc.

Currently construction is design of the technical system combining function, shape, material, manufacturing technology, price etc. It yields necessity of the collaboration of the experts and specialists and using very complex software.

CAD systems are used the most often for the part design of complicated entities (e.g. dies, forged pieces, castings, whole assemblies). Beside CAD are used miscellaneous mathematical systems commonly based on the finite element method (FEM). Databases of the material characteristic are commonplace (fig. 1).

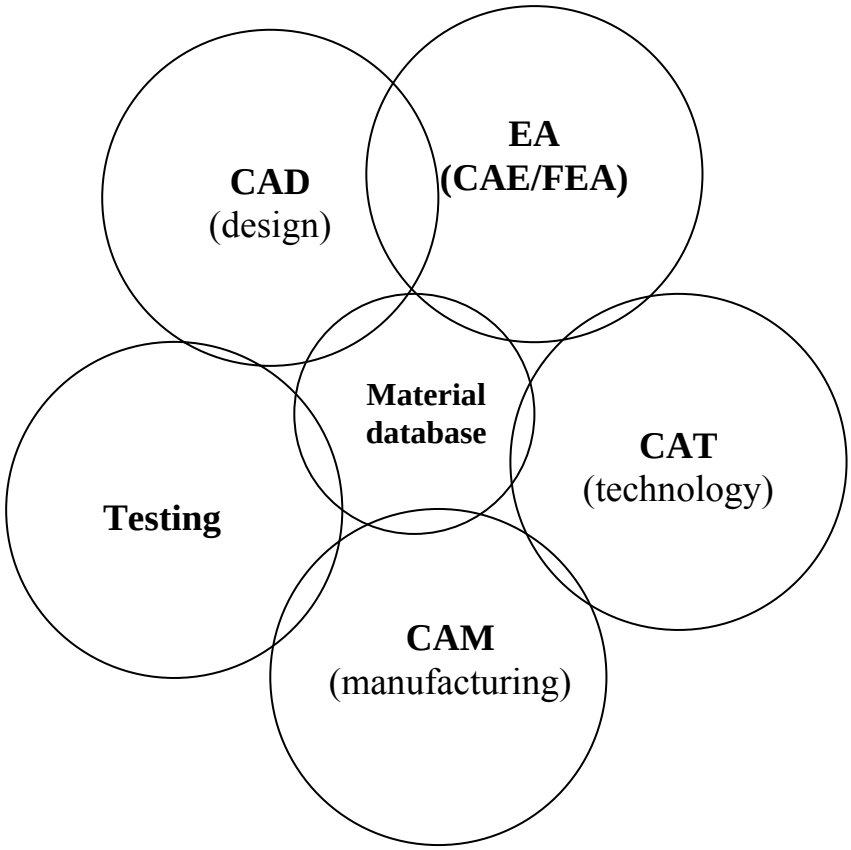

Fig. 1 I*nformational interconnection software application for creation of a new work*

The most used mathematical methods are based on the FEM. Well known and widely used software packages like MSC.FEA, MSC.AFEA, MSC.MARC, MSC.ADAMS (produced by MSC Software), COSMOS produced by SRAC, ANSYS, FEAT (produced by SCIA CZ) etc. There are a lot of the software packages (sometimes freeware as well) but mostly targeted to the buildings. It supports girder construction only.

It is good thing when students cat get familiar with some of above mentioned software even when they can use it for a long time. It can help them to choose their future professional orientation.

3 ITPM, SOLIDWORKS AND COSMOS

In the end of the last year (2003) ITPM obtained educational version of the SolidWorks produced by SolidWorks Corporation including COSMOS software by Structural Research and Analysis Corporation (SRAC). This software our Institute obtained thanks to grant offered by SolidWorks Corporation.

3.1 SolidWorks

SolidWorks (SdWs) is parametrical modeler usable in traditional all engineering fields but it have wide possibilities so it is used in another industries, for example glass industry. The big advantage is the modularity of this software:

- FeatureWorks (for parameterization of the models imported from another CAD system)
- PhotoWorks (visualizing models, used generally for presentations)

- SolidWorks Animator (creating animations, for presentations or quick checking functionality of the product)
- SolidWorksToolBox (toolbox of the normalized parts)
- SolidWorksMoldbase (automate creating base of the molds)
- SolidWorksPiping (for piping)
- eDrawings (viewer)
- 3DInstanteWebsite (creating web presentations of the design)
- PDMWorks (manages shared data in the groups of the users)
- SolidWorks Utilities (tools making use of the SdWs easier)

ITPM obtained in this educational release PhotoWorks, SolidWorksAnimator, FeatureWorks, SolidWorksToolbox, SolidWorksUtilities and eDrawings modules.

This all allows students acquaintance of the parametric modeler and 3D modeling, creation presentations and basic of the animations. This increases their value on the employment market.

3.2 COSMOS

Later we will speak about CosmosWorks (one of the COSMOS modules) but now about COSMOS generally.

COSMOS package uses FEM for analysis engineering designs and depending on used CAD system appropriate version can be chosen. SRAC, producer of the COSMOS package, has developed modules, installable into variety of the CAD system. It allows run EA directly on the model created in CAD system. It means that a tool for EA seems to be part of the CAD system. Then any data need not to be exported and imported among software systems.

COSMOS consist of following modules:

- COSMOS/DesignSTAR (for CAD systems CADKEY, CATIA, Thinkdesign, Helix Design System, I-Deas, Artisan, IronCAD, MechanicalDesktop, MicroStationModeler, Pro/Desktop, Pro/Engineer)
- COSMOS/Works (for SolidWorks)
- COSMOS/DesignSTAR for SolidEdge (for SolidEdge)
- COSMOS/DesignSTAR for Invertor (for Autodesk Invertor)

For users working with large or very complex models can use package COSMOS/M offering its own modeler.

Usage similar tools such the COSMOS decreases production costs. Allow shortage of the development time, decrease costs for testing, increase quality of the design, increase production rate and quickly bring product on the market. And all this is due to create precise analysis allowing designers make optimalization and tests in design phase.

We implemented SolidWorks software and for EA COSMOSWorks, FEM tool fully integrated into CAD system SolidWorks. Designers use one tool and both software packages works together with the same data. COSMOSWorks allows solve following problems:

- linear stress
- frictions and contacts in assemblies
- distortion
- stability
- heat conduction, base frequency and vibration
- optimalization

Designers' common problems, like too high stress, cooperation of parts, overheating, malfunctions and weight can be solved by COSMOSWorks.

Beside implemented modules – COSMOSFloWorks can help designers with problems of fluid flow and gas flow, turbulence, pressure etc. and COSMOSMotion for analysis kinematical and dynamic mechanism, simulation motion parts and assemblies. Both mentioned modules enlarge applications where COSMOSWorks can be used for.

4 CONCLUSION

SolidWorks system with CosmosWorks and its modules CosmosFloWorks and CosmosMotion is significant complement teaching and training at the ITPM. We will use it for bachelor study and new themes for bachelors.

Application of above mentioned systems means benefit for students. It become them familiar with 3D modeling and using EA. Students can see possibilities of such systems, they can see results of theory of the EA they learned and phases of the real design.

5 USED SYMBOLS

CAD - Computer Aided Design
CAE – Computer Aided Engineering
CAT – Computer Aided Technology
CAM - Computer Aided Manufacturing
EA – Engineering Analysis
FEA - Finite Element Analysis

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