

NEW POSSIBLE APPROACH TO MODELLING IN POWER ENGINEERING

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ABSTRACT

Currently are many possibilities of computer simulation in power engineering. Demands in this branch are very specific, because there is necessary in most cases to simulate multiple technical disciplines. Not only electrical network is to solve, but also connection with mechanical equipment and other devices of power engineering. There are software packages capable to simulate simple problems, but also very complex tools, which can solve differential problems. One of the most powerful tools that meet all there requirements is Dynast. Now new library for electric components was developed to make creation of model easy and fast.

1. INTRODUCTION

There are many software packages capable to solve demanding power engineering problems. The most popular is package EMTP-ATP, which is system concerning on digital simulations of transient phenomena of electromagnetic as well as electromechanical nature, but basically it is not a general simulation tool for all disciplines. Beside that are widely used following tools: 20-sim (University of Twente), Dymola - Dynamic Modeling Laboratory (Dynasim AB, Lund), Multisim 7 - Electronic Work bench (www.interactiv.com), Simplorer (Ansoft Corporation) and PSCAD (Cedrat, HVDC Research Centre). Some users prefer use of general computing, programming and simulation package like Matlab (The MathWorks Inc.), with simulation tool Simulink and library SimPowerSystems or a free alternative like Octave (Octave Consortium) or Scilab (Scilab Consortium) with Simulink like tool Scicos.

In filed of very complex problems especially with some nonlinear behaviour Dynast modeling tool is very powerful. Developed from the end of seventies at the Czech Technical University in Prague, Dynast admits system models characterized by a set of algebro-differential equations, by a block diagram, by a physical model in the form of a multipole diagram or by a combination of the above approaches.

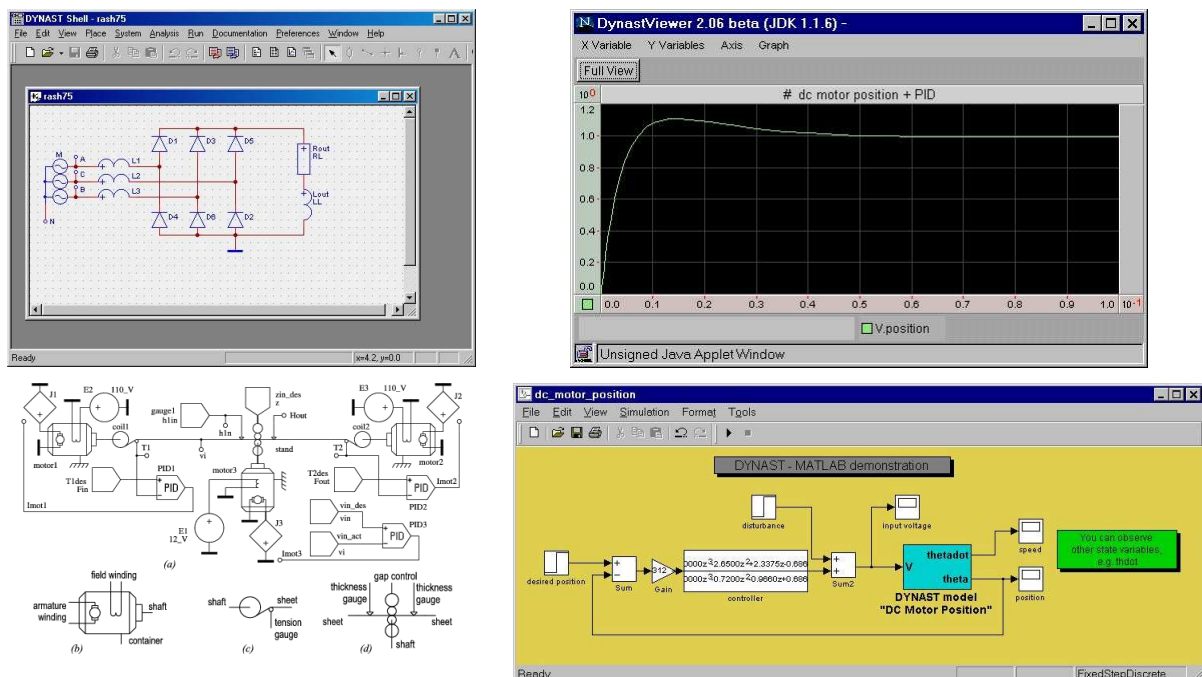
The multipole diagrams allow for portraying the actual physical structure of the modeled real systems without deriving any equations or constructing any graphs. Block and multipole diagrams can be submitted to DYNAST in a graphical form using a web-based Java applet, in more sophisticated OrCAD schematic capture editor and in new integrated graphical development system. This implies Dynast to be very universal simulation tool.

If the model is nonlinear, DYNAST is capable of linearizing it. DYNAST then can compute the required plant transfer-function poles and zeros, and export them to MATLAB in an M-file. After designing the digital control in the MATLAB environment, the resulting

control structure can be implemented in Simulink while the controlled plant model remains in DYNAST. Simulink installed on the client computer can then communicate with the remote DYNAST at each time step across the Internet exploiting the Simulink S-function.

Dynast works on Windows 9X/NT/2000/XP and computing core on some UNIX system. Some limited versions were historically designed for Microsoft MS-DOS and even CP/M.

Dynast is a fully commercial software package, but offers free online simulation demo through computation server and a student version, where the maximum number of simultaneously solved equations is limited to 16. Additional information can be obtained at www.icosym.cvut.cz.

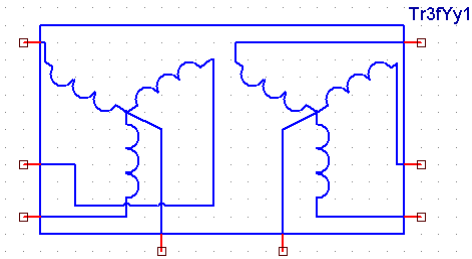


2. NEW LIBRARY DESCRIPTION

To improve Dynast possibilities in branch electro power engineering a library of subsystems for rapid model creation with usual elements was developed. Library includes in this moment basic electrical network equipments:

- electric lines
- transformers
- supply sources
- power loads

All submodels parameters are reconfigured for description usual in power engineering, so no preparation calculations are needed before model creation and technical data of equipment can be directly used. Next pictures show for example schematic picture and parameter list of three-phase transformer:



Submodel Properties

Three Phase Transformer Y-y

OK
Cancel
Help

Name: Tr3fYy1 Type: Tr3fYy.mod

Parameters:

Parameters from a catalog:

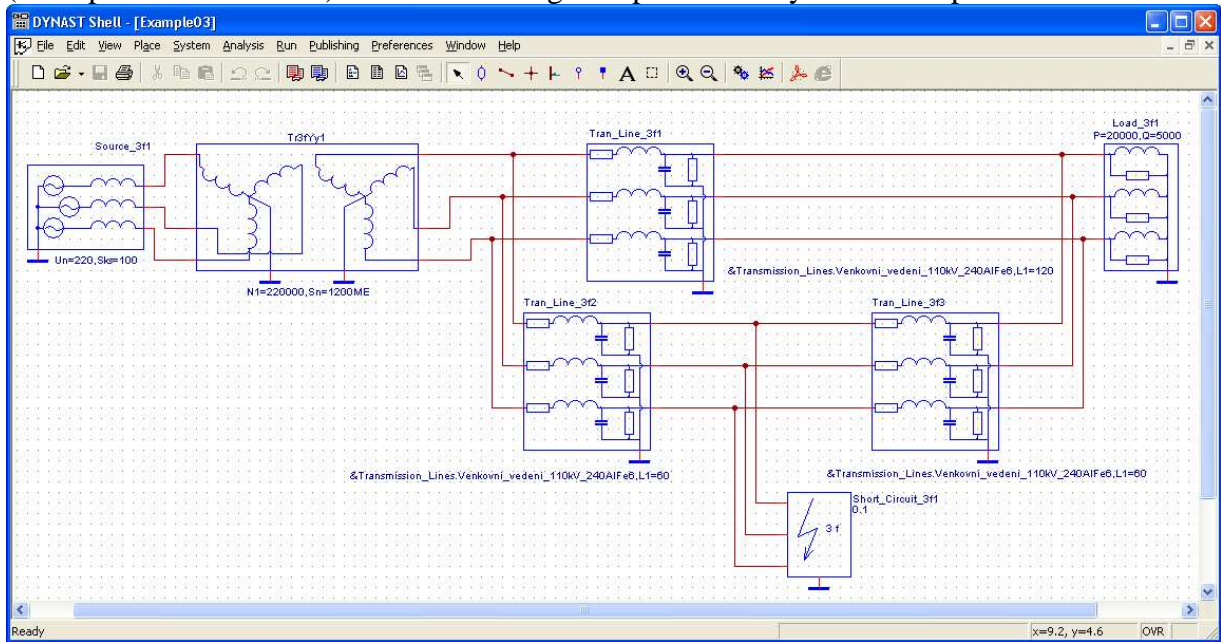
Parameter	Value	Description
Sn	20ME	[VA] Jmenovity zdanlivy vykon
Un2	110k	[V] Jmenovite napeti vinuti 2.
I0	0.2	[[%] Proud naprazdno
Uk	10	[[%] Napeti nakratko
dPk	0.3	[[%] Cinne ztraty nakratko
dP0	0.05	[[%] Cinne ztraty naprazdno
Freq1	50	[Hz] Jmenovita frekvence

10¹⁵ 10¹² 10⁹ 10⁶ 10³ 10⁰ 10⁻³ 10⁻⁶ 10⁻⁹ 10⁻¹² | π Expression...

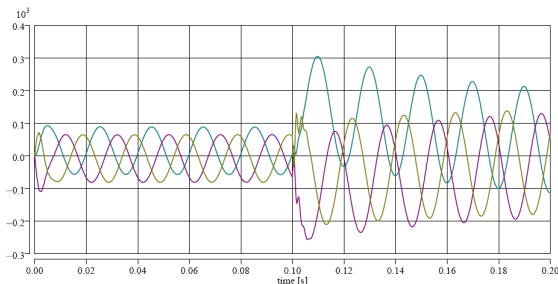
Beside that all parameters can be loaded from technical data catalogue saved in a simple external ascii file in following format:

Transformator25MVA
N1=22000, N2=110000, Sn=25ME,
Un2=110k, I0=2.0, Uk=9.0, dPk=0.78,
dP0=0.20;

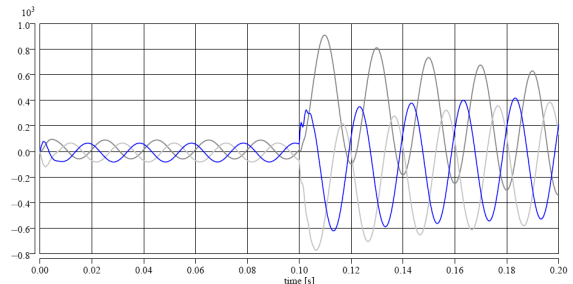
Example of basic model simulation of power supply, transformer, two lines, load and fault (three phase short-circuit) on one line using new power library show next pictures:



Currents in Line 1



Currents in Line 2



4. CONCLUSION

New submodel library for Dynast simulation tool significantly improve possibilities and application of this tool in branch electro power engineering. Prepared elements are helping to make model creation more easy and fast.

5. REFERENCES AND BIBLIOGRAPHY

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