2020 INFORINO
Moscow, Russia
14-17 April, 2020

E-Learning Resource for Electric Machine Design

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E-Learning Resource for Electric Machine Design

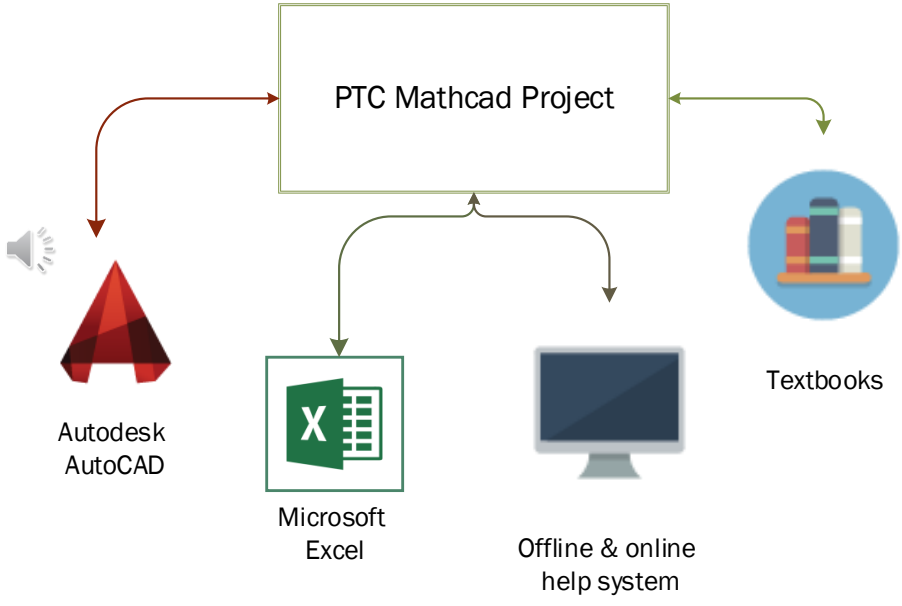
E-learning resource "**Educational Design of DC Machines**"

- is used in Master course on Electromechanics (MPEI)
- combines classic design techniques and new features of computer technology
- created for use at both full-time and extramural educational forms using distance learning technologies
- combines several technologies: Mathcad environment, Excel, AutoCAD and HTML-based help system

The basic goal is to obtain new knowledge and skills when achieving a typical result → information technologies are used for educational purposes, not in order to accelerate work and automate documents making (like in industrial design).

E-Learning Resource for Electric Machine Design

- The core of the resource is E-book in Mathcad format – fully completed design project (reference option)
- Excel file – for dynamic export of data from Mathcad and transfer it to AutoCAD
- Excel file – for multilingual support
- AutoCAD - for automated construction of geometric elements based on project data
- Help system (in HTML format) – project description; work principals; recommendations; resources and support



E-Learning Resource for Electric Machine Design

The central part of the project is the Mathcad e-book

- performs calculations
- display graphs
- fill out tables

E-book consists of areas for data entry; hyperlinks to recommendations in the project help system; protected calculation areas

To enhance visual representation selection tables are implemented (Excel component in Mathcad)

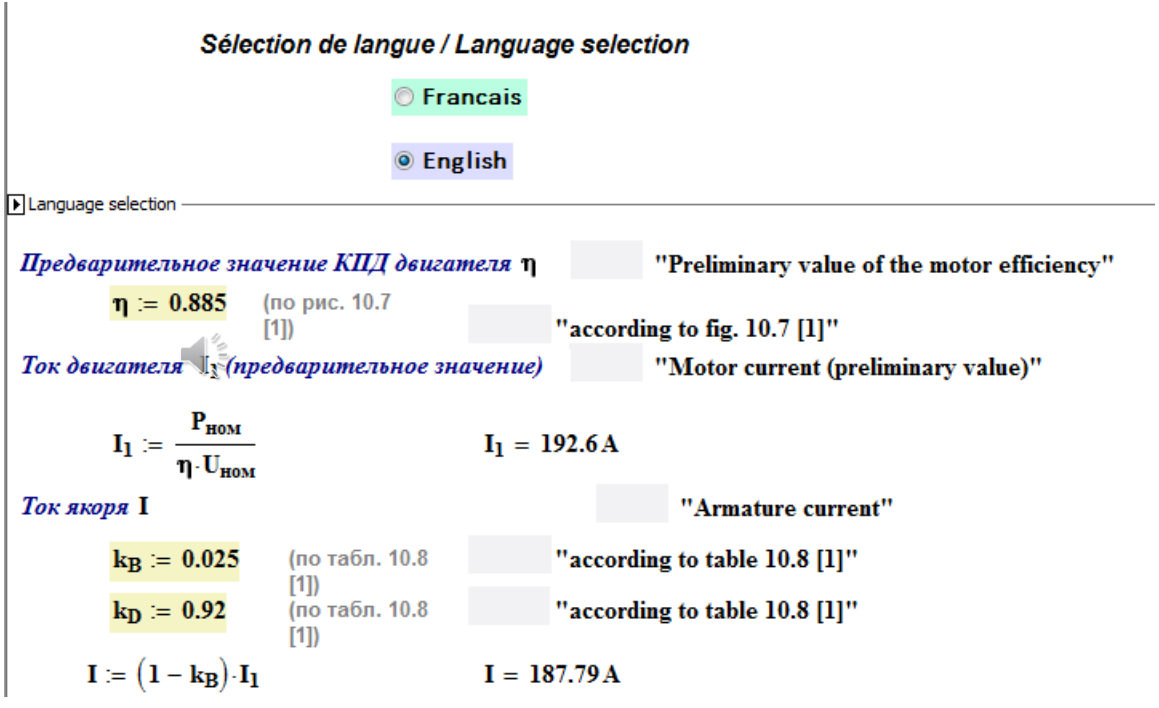
- Excel conditional formatting tool is used for indication

Selection of collector bars

Option Number	Up	K=Up*Z	Wc=N/2K	Uк.m=2p*U/K
1	1	27	**5,0**	65,2
2	2	54	2,5	32,6
3	3	81	1,7	21,7
4	4	108	1,3	16,3
5	5	135	**1,0**	13,0

E-Learning Resource for Electric Machine Design

- Partial multilingual support is implemented in the project file (mainly in Russian with added translations)
- Excel file contains translations of names and references
- It is associated with project e-book using built-in Mathcad component “File Input”
- Languages can be switched instantly by radio button
- To add new language – just add new column in Excel dictionary file



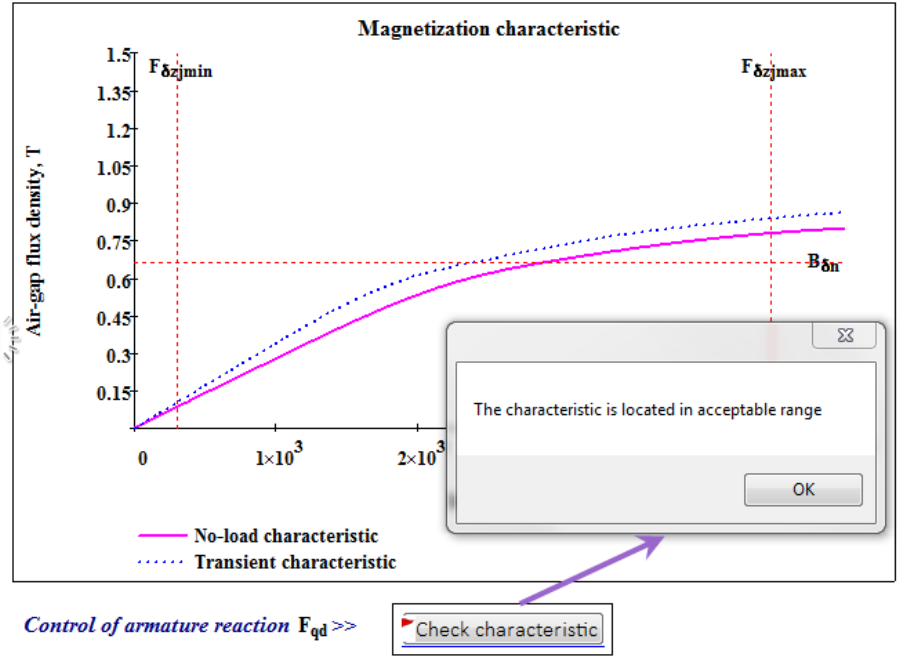
E-Learning Resource for Electric Machine Design

Obviously, calculated results may not be realistic (it is up to student until instructor's final check)

But at some complex points, the project contains comprehensive check of the output data

The check is implemented using the "Push Button" control with several input variables. The verification algorithm, which relies on the value of the input variables, is the part of the program code of the control element itself.

The check is optional and not blocking



E-Learning Resource for Electric Machine Design

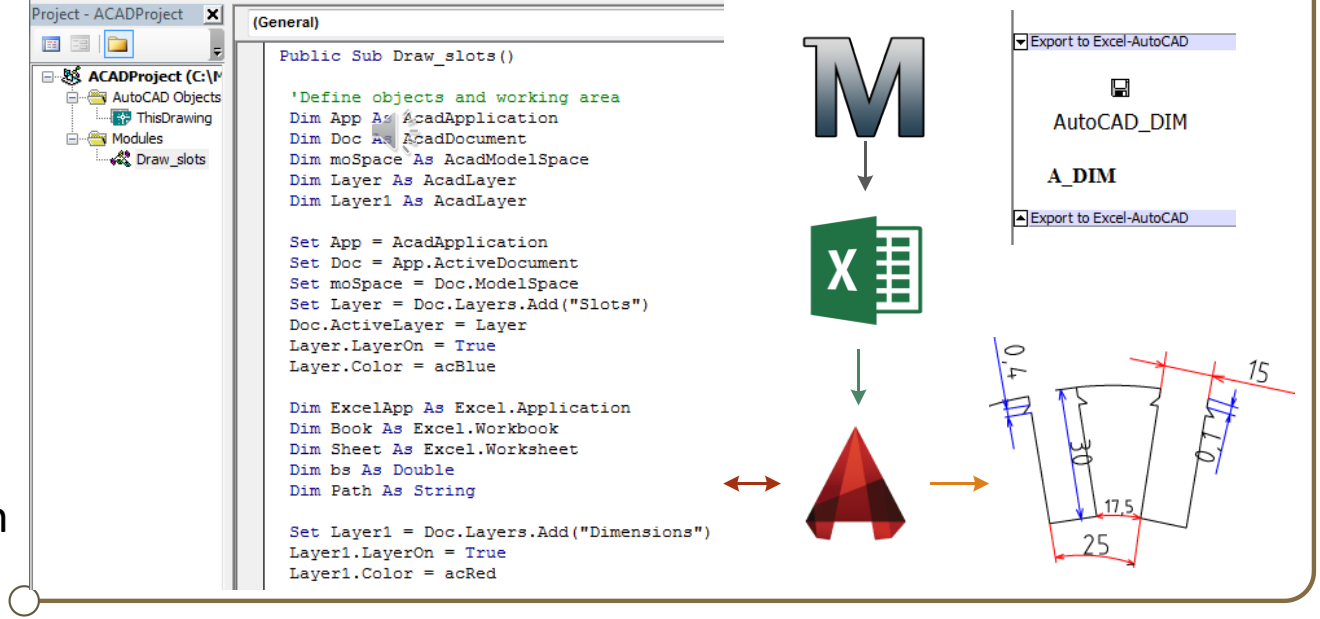
After completion of all stages of the project Mathcad e-book becomes final document

But electric machine design must be completed with some drawings

To reduce routine work machine dimensions are dynamically exported to Excel file using “Data Output” component

Then student runs AutoCAD with VBA-code, which is used to built a model with actual dimensions from Excel file

Mathcad-AutoCAD integration



E-Learning Resource for Electric Machine Design

MPEI digital educational environment for full-time and extramural studies

- use directly from within MPEI university network
- connect from Internet through MPEI VPN server

VMware View client launches the prepared virtual machine with Mathcad environment

Files could be transferred through USB flash drive or shared network resource

CONCLUSION

The e-learning resource presented combines

- educational design of DC electric motor
- study of new information technologies

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Thank you for attention!

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