MCIA Center
Innovation Electronics

MAGMOLIB

Presentation of Use and Dissemination of the Foreground

(Presentation part of PUDF)

Project Overview

Modelica Library of Detailed Magnetic Effects in Rotating Machinery

Started: *October 2013*
Ended: *December 2015*

- M A G M O L I B -

SP1-JT1-CS-2013-01, GA-620087 project and developed by MCIA research center a part of the CLEANSKY partnership, a Public Private Partnership between the European Commission and the aeronautical industry.

MCIA participants (mcia.upc.edu)

Dr. Luis Romeral Martínez
Dr. Antoni Garcia Espinosa
Dr. Jordi-Roger Riba Ruiz
Carles Colls Castro
Tomasz Dobromir Michalski

Project Overview

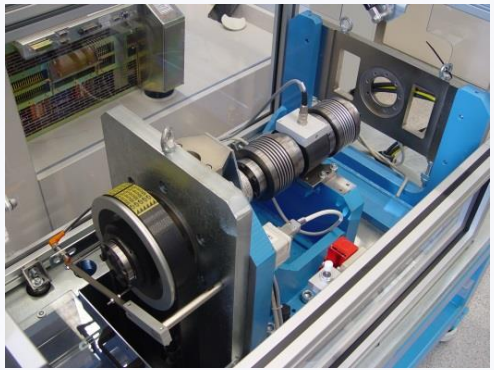
Modelica Library of Detailed Magnetic Effects in Rotating Machinery

Features

- New Pre-design tool for Rotating Motors in Modelica Language
- New Advanced Surface Mounted Permanent Magnet Synchronous Motor Model in Modelica Language
- FEM Database for the Advanced Model

Validation

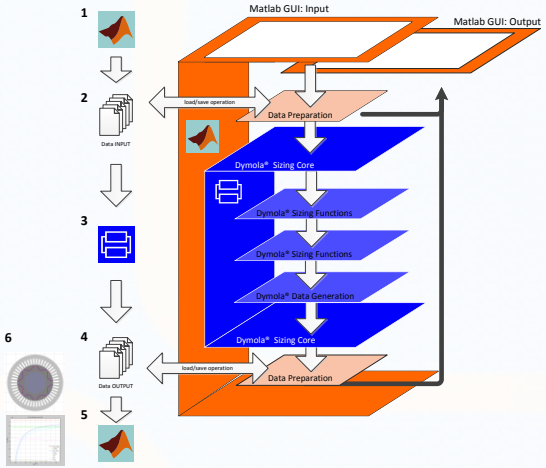
FEM Validated
Actual SMPMSM validation



Actual Motor Test Bench in MCIA facilities

Pre-Design Tool

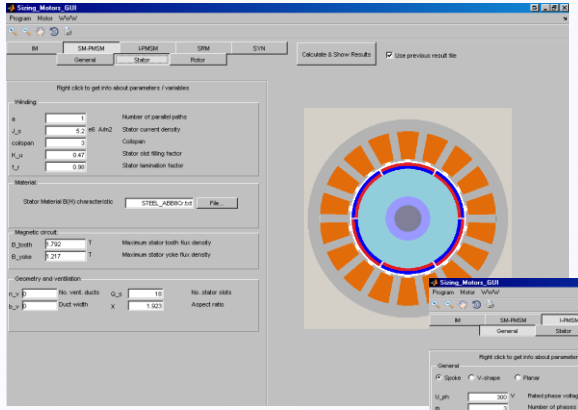
The program is able to pre-design Induction Motors (IM), Surface Mounted Permanent Magnet Synchronous Motors (SMPMSM), Internal Permanent Magnet Synchronous Motors (IPM) in their Spoke (embedded and non-embedded magnets), V-Shape and Planar configurations. It also performs pre-sizing for Switched Reluctance Motors (SRM) and externally exited Synchronous Machines (Syn).

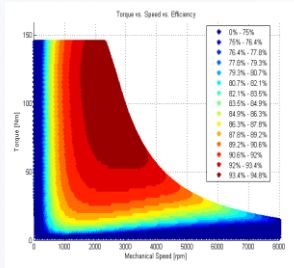


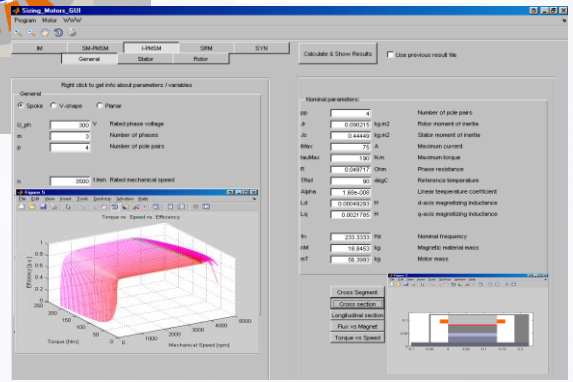
Dymola Sizing Core

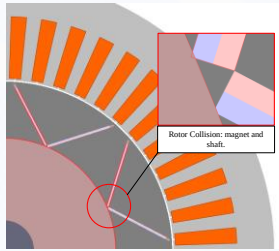
is GUI independent and process all sizing features.

Matlab GUI





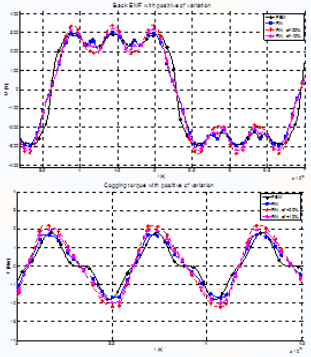


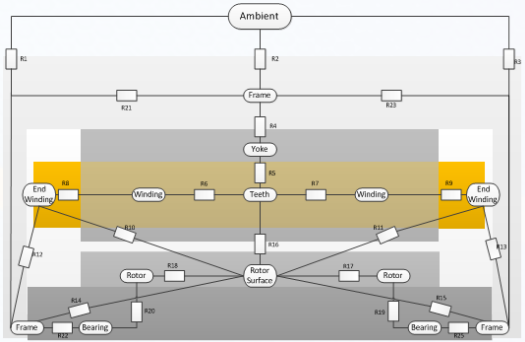


Advanced Model & DB-FEM

ADVANCED MODEL

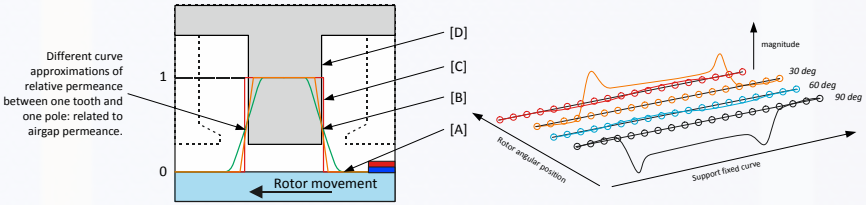
A Software library in MODELICA language with a set of SMPMSM models, which have been built by coupling electromagnetic and thermal dynamic reluctance networks. These models are able to replicate harmonic behavior of SMPSM machines in steady-state and dynamic operation when high accuracy results are requested

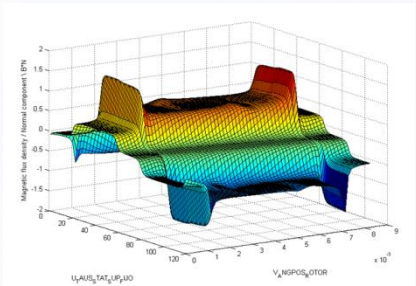


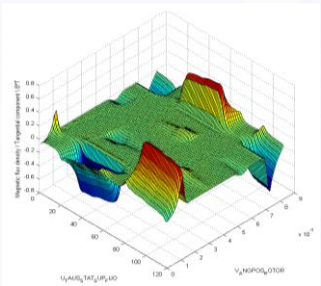


DB-FEM

Contains hundreds of motor variations to extract data about flux fringing on tooth or airgap flux density distribution. This is used find better approximations of permeance function in the advanced model. Further analysis can be performed with the provided raw data.







Dissemination

Project Website with more information and documentation:

http://magmolib.upc.edu/en

Paper presented in Modelica Conference 2015:

https://www.modelica.org/events/modelica2015/proceedings/html/submissions/ecp15118501_MichalskiGarciaespinosaRibaruizRomeralmartinez.pdf

All tools are available free through their corresponding gitlab repositories

Basic Pre Design Tool: https://gitlab.com/MAGMOLIB/basic-design

Advanced Models: https://gitlab.com/MAGMOLIB/Advanced_SMPMSM_Libraries

FEM Database is available via Google Drive at:

https://drive.google.com/folderview?id=0ByV4rjP4C_25ZFZvMkV6MEQyTGs&usp=sharing

And its corresponding tools via:

https://gitlab.com/MAGMOLIB/DB-FEM/

MATLAB® GUI is copyrighted and can be licensed by MCIA, please contact us for more information at MAGMOLIB@mcia.upc.edu or visit our website.