LABORATOIRE D'ELECTROTECHNIQUE ET D'ELECTRONIQUE DE PUISSANCE DE LILLE

Master project, 2017-2018

— Force computation in finite element software —

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Context

In the electrical engineering field and more generally in electrical industry, the numerical simulation allows to obtain very accurate information about a system behaviour at an early stage of development. For instance, force calculation is a key parameter for electrical machine design for classical devices like turbogenerator, transformers and motors or more recent technologies used in Sustainable Development. Finite element calculations give more or less straighforward approaches to compute these quantities [1]. These approaches strongly depend on the magnetic properties of the part under investigation and its environment (air, magnets, magnetic steel …).

L2EP and EDF co-develop a finite element software, code_Carmel [2] for electric device study. Force computation has to be improved to analyze sustainable energy machine with new technology.

Objective

In order to use finite element modelling to compute forces, the hypotheses of calculations should be accurately defined and translated in user friendly modelling technics.

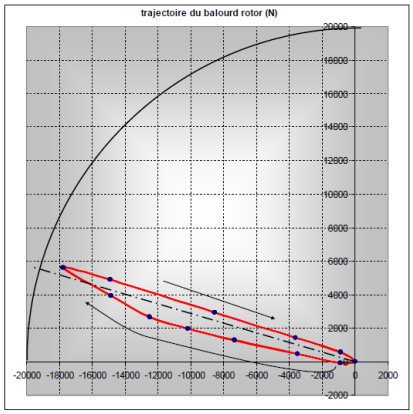

Figure 1: Finite Element computation of salient pole generator unbalance rotor

Work steps

1- Analysis of literature in force computations with finite element method
2- Implementation in finite element approach in code_Carmel.
3- Tests with several devices with or without magnets or magnetic steel
4- Comparison between calculation methods.

Key word

Force computation, Finite Element Method, Electrical machines

References

[1] Olivier Barré, Pascal Brochet "Méthode énergétique et travaux virtuels, application au calcul des forces locales associées aux champs magnétique et électrique » REE, juin 2006.
[2] http://code-carmel.univ-lille1.fr/