Contribution ID: **140** Type: **Poster**

Multi-physical Fields Simulation and Structural Design for Energy Storage Coils with Brooks-type geometry

Monday, 19 June 2017 13:30 (1h 30m)

The most prominent advantage of Brooks-type coil is that it can obtain the highest energy storage density and the resistance of per unit inductance coil is smaller. However, the biggest problem of the Brooks-type coil is that there is a very large fringe field around it. For preventing electromagnetic radiation interference, it is necessary to consider the safety distance between the coil and the switch elements and their control circuits when constructing the whole energy storage system. In addition, the current-carrying inductance coil in the magnetic field will be subjected by the electromagnetic force. Solving the problems of energy storage density, electromagnetic interference and electromagnetic vibration effectively is one of the key technical problems of inductive energy storage system research. Based on the coils with Brooks-type geometry, this paper firstly constructs the multi-physical fields simulation environment of the coil by using ANSYS software. And then analyzes the mutual influence among the energy storage density, electromagnetic force and electromagnetic interference by conducting simulation analysis of electromagnetic field - force field for the coil. At last, the optimized calculation of the coil structure is carried out. In order to design a coil structure with better comprehensive performance, the appropriate electromagnetic force and the lower limit of electromagnetic interference are determined as the constraint of the optimization problem. The coil turns, turns width, outer diameter and other structural parameters are taken as variables. And the optimization goal is obtaining the maximum energy storage density. The work in this paper offers important theory analysis and testing foundation for investigating the inductive pulsed-power supply with higher energies.
Key words—Inductive storage, Brooks, Energy storage density, Electromagnetic interference, Electromagnetic vibration, Structural design

Primary author: MA, Shangang (Qinghai University)

Co-authors: Mr LI, Huajie (School of Water Resources and Electric Power, Qinghai University); Prof. LI, Zhaonian (School of Water Resources and Electric Power, Qinghai University); Mr LIANG, Bin (School of Water Resources and Electric Power, Qinghai University); Mr LIU, Lianghao (School of Water Resources and Electric Power, Qinghai University); Prof. SI, Yang (Clean Energy Efficient Utilization Key Laboratory of Qinghai, Qinghai University)

Presenter: MA, Shangang (Qinghai University)

Session Classification: Poster session I - Pulsed Power Physics and Technology, Components and HV Insulation

Track Classification: Pulsed Power Physics and Technology, Components and HV Insulation