

Abstract

The main aim of the thesis is to investigate the issues related to static charging for storage system of Hybrid Electric Vehicle (HEV). Here main focus has been given to make comprehensive literature review related to the state of art technologies available across the globe. After review the focus has been given to the mathematical modelling, analysis and design of static wireless charging for storage system of hybrid electric vehicle.

The analysis part has been done using two tools (1) mathematical modelling and (2) ANSYS Electronics Desktop software modelling of the coil. There are many types of choices available like: square, circular, double D, spiral, zigzag etc. The most suitable geometry for static charging is square type. In the present research, square and circular topology of the coils have been considered, their mathematical modelling, simulation and practical model has been prepared.

Both types of coil topologies have been compared for their performance and efficiency. The performance is covered under different misalignments in all the 3 directions (X-axis, Y-axis and Z-axis). Distances of Z-axis are covered for 0 mm to 200 mm, while Y-axis misalignment starts from -100 mm to +100 mm. Certain conclusions are made related to performance parameters of the coils like self and mutual inductances, magnetic flux densities and magnetic field strength at different misalignment levels. All the parameters have been graphically presented and analytical results are also tabulated.

The coil topologies with its parameters are stored in a subsystem with its model. This model then imported in ANSYS Twin Builder (software used to analyze the subsystem of coil) and connected with power electronic circuits components. We have seen and plotted the properties in the form of waveforms as well as tabular form for further analysis. Here system parameters are changed and the predicted output is achieved for most appropriate and suitable results. The results are then used for the hardware preparation of the entire model to build a prototype of the charging system. The results obtained are validated as per various international, national standards and very superior performances achieved.
