Bachelor thesis:

Optimization of Electrical DC Motor in Automobile Radiator

An AC controller that sometimes referred to as a driver, is known as the device that controls the speed of the AC motor. With controller, speed control of AC motors became possible as well as DC motors. Longer lifespan and less maintenance in AC motors are advantages over DC motors. Use of DC motors is more economical, where AC sources are not available. Dc motors are widely used in automobiles because batteries are source of power in them. Therefore, optimal performance and lifespan of dc motors are very important in automobiles.

The aim of this project is optimization of an electric motor in automobile radiator. At first, an industrial motor was investigated. The measurements and manufacturer's data were considered as a benchmark. The motor was redesigned through 2D and 3D finite element method (FEM) using ANSYS Maxwell software. The analytical design of DC motors is presented in this work and an algorithm based on sensitivity analysis is proposed. In the new design the rotor and stator core are the same as before but the winding is different. The new model was simulated by FEM software and the results are compared with the benchmark.

The new motor prototyped and tested. The experimental data were presented and compared with the benchmark. The results show that in new motor the efficiency increased by 6.3%, copper losses decreased by 32.7%, no-load current decreased by 23% and in the same RPM back EMF increased by 4.4% while the cost remained low as compared to previous motor.

Keywords: DC motor, Design of DC motor, Optimization of DC motor, Simulation of DC motor, DC motor winding

Master thesis:

Designing and Implementation a Sensorless Control Algorithm for a Sample Synchronous Reluctance PM Assisted Motor

The light electric vehicles are commercialized by Permanent magnet (PM) motors in the recent years. Due to the high cost of rare earth PMs and environmental limitations, the structures without or with low number of PMs that maintain the application constraints, can be a good choice. synchronous reluctance motors can be a proper candidate for this application. Choose proper value for the number of flux barriers and their end position can reduce the torque ripple. In order to, assist the synchronous reluctance motor (SynRM) for improving its capabilities, especially torque density and power factor, low number of PMs can be inset in the flux barriers.

The control of PM assisted synchronous reluctance motor is not as simple as commercial BLDC motor or other surface permanent magnet motors. They preform various saturation level and different saliency ration in each loading conditions which many loading condition is very possible in EV applications.

In this work the following stage will be done:

1- Study on Motor
2- Study on Control
3- Motor simulation
4- Control Simulation
5- Implementation
6- Documentation