

## **Comparison of the torque characteristics of ferromagnetic rotor double stator brushless DC permanent magnet motor**

### **ABSTRACT**

The paper describes the comparison of torque characteristics of ferromagnetic rotor double stator brushless DC permanent magnet motor (BLDC). Normally, most of researcher used non-ferromagnetic rotor in double stator topologies to avoid saturation and higher production of cogging torque due to unsymmetrical flux distribution. Furthermore, parallel magnetic circuit is usually used for rectangular permanent magnetic due to easy fabrication cost rather than series magnetic circuit. But, in this research both parallel and series magnetic circuit is being applied using rectangular permanent magnet. Structure of the double stator BLDC with series magnetic circuit is proposed. Finite Element Analysis (FEA) is used as a tool to calculate the torque and cogging torque of each model. The Total harmonic distortion (THD) of the torque waveform is used for evaluation of the best torque characteristics. Furthermore, motor constant square density,  $G$  is used in comparing other model that's been reported. Based on the result, it is found that a proper selection of stator and rotor width could result lower THD on torque waveform due to good flux distribution. The double stator with series magnetic circuit topologies has several advantages compared to parallel magnetic circuit. However, consideration on cogging torque and magnetic saturation on the rotor should be taken account in designing this kind of double stator BLDC. Conclusively, the paper provides guidance in type selection of double stator BLDC with ferromagnetic rotor.

**Keyword:** Double stator; THD; Fundamental torque