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# DYNAMIC SIMULATION OF A PERMANENT MAGNET MOTOR WITH SINUSOIDAL AND TRAPEZOIDAL EXCITATION

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**Abstract**

Due to the brushes, DC motors suffer from a lower reliability, since the brushed wear down by operation and need time to time maintenance or replacement. Using a brushless DC motor (BLDC) can eliminate this drawback. Several simulation models have been proposed for the analysis of the BLDC motor drives. These models are based on state space equations, Fourier series and the d-q axis model. BLDC motor drive is widely used because of its particularly high mechanical power density, simplicity, and cost effectiveness. The torque of the BLDC motor is mainly influenced by the waveform of back EMF. Ideally, BLDC motors have trapezoidal back EMF waveform and are fed with rectangular stator currents, which give a theoretically constant torque. However, in practice, torque ripple exist, mainly due to emf waveform imperfections, current ripple and phase current commutation. The current ripple result from PWM or hysteresis control. The emf waveform imperfections result from variations in the shapes of slot, skew and magnet of BLDC motor. First a simple mathematical model of the BLDC drive is developed. The motor model is then simulated using MATLAB/Simulink, with sinusoidal and trapezoidal waveforms of back EMF.

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**Keywords** : Brushless DC Motor, Modeling, Commutation, Sinusoidal and trapezoidal.