

This paper presents a dynamic model for an interior permanent magnet (IPM) machine with a space-vector modulation-based voltage source inverter. The dynamic model considers spatial harmonics, cross-coupling and magnetic saturation. In order to include the nonlinear electromagnetic characteristics of the IPM machine, the dynamic model is built based on the current-flux look-up tables obtained from finite element analysis (FEA). The model is co-simulated with the drive system, which considers the effects of the modulation technique and the switching frequency. The dynamic performance of a 60/8 IPM machine is analyzed using the dynamic model at different operating conditions and then validated with the torque waveforms obtained from FEA. The results show that dynamic performance can be analyzed accurately and more quickly using the dynamic model presented in this paper.