Optimal Design of the parameters of Nd-Fe-B Magnets for Hub Motor

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Abstract

This study concentrates on the optimal design of magnets of electric bicycle. Using Maxwell Workbench and Taguchi Methods, the structure of rare earth magnets was analyzed. The target the work is to fit the National standard of electric bicycle and to save the materials cost. We would get the optimal formula of the rare earth elements, including Pr, Fe, Tb, Dy, B, Ho, Cu, Al and Gd, for a magnet called N40H by Taguchi Method analysis . The parameters of the new magnet were and put into the database of Maxwell in order tosimulate the motor，for which the model number is ZYJZ-128SX350W, with new magnet. The results revesl that the torque is 8.52 N.m, the motor speed is 199.6 RPM, the power is 178.09 W and the efficiency is 82%.

The specifications met the National stanadard while the material cost is reduced by 14%. The measured parameters were put into the Maxwell's material database for motor simulation. The simulated output performance of motor is similar to the measured data up to 85%, The results shows that the design procedures comparising Maxwell Workbench and Taguchi Method can reduce not only the material cost but alaso the time and risk in development of motor.

Keywords：Rare earth magnet, Rare earth elements, Maxwell, Taguchi Method, N40H