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The Investigation of Cogging Torque Reduction Technologies

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Cogging Torque is essential torque component on permanent magnet motor having teeth and slots and also this is an important characteristic of some applications such as electrical steering motor which requires precision position control and lower acoustic noise. There had been investigated variety techniques to reduce cogging torque during several decades and most of them show common feature for some reduction of motor performance.

In industrial fields, many engineers have been tried to reduce cogging torque, but this is not simple problem to find root cause because it could be affected by many factors and its unbalance. In this paper, the definition of cogging torque will be explained again with some equations as theoretically, and the variety of design techniques for low cogging torque will be summarized with theory and calculation result by finite element method. And also, the strength and weakness of each method will be compared. And then all the potential factors will be defined through logic tree analysis for rotor and stator respectively, the sensitivity of cogging torque by each factor will be analyzed. The correlation study between design factors and cogging torque will be used the result of finite element method considered realistic situations because of many design factors. And the sensitivity analysis will be used by statistic method. In the end of paper, the cogging torque including each harmonic order will be summarized with major factors. This paper will provide some tips for the solution of cogging torque failure problem in the actual field.

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