



Shanming Wang, is a Professor of Dept. of E.E, and a vice director of the State Key Laboratory of Control and Simulation of Power System and Generation Equipment, of Electrical Engineering, Tsinghua University. In 2001 he received the Ph.D. degree from Tsinghua University, Beijing, China. After that he became a teacher in Tsinghua University. He was a visiting scholar in Stuttgart University in 2006 and in Purdue University in 2013. His research interests include vibration and its control of electric machines, analysis and control of electric machines, hybrid excitation PM synchronous machines, the simulation of electrical machines and power electronics systems, and fault analysis for electric machines and its protection. He published more than 90 papers and 20 patents in this area. Now he is an IEEE Senior Member. He was the editor of the IEEE Open Access Journal of Power and Energy (OAJPE) and a member of IEEE Nikola Tesla Award Committee from 2015-2018. He got National Award for Technologic Invention (second prize, 2012) “The Multi-Loop Analysis Method of AC Machines and Its Applications”.

Electromagnetic Vibration of PM motors and its reduction

With the development of Permanent Magnet (PM) material, PM synchronous machines have been applied in more and more applications not only in industry, but also in domestics. Because of the strong magnetic field and compact volume, the vibration of PM synchronous machines is getting serious. And more attentions have been paid to the problems of the vibration and noise of PM motors. The electromagnetic vibration of PM motors is divided into three groups according to the frequency of vibration, which include pole frequency, slot frequency, and switching frequency of power electronics related. The reasons for these three groups are presented, and the difficulties for their reduction are discussed. For pole frequency vibration reduction, one method by adding some permanent magnet (PM) interpoles to fill the force valley and then reduce the pole-frequency vibration for surface-mounted permanent magnet (SPM) synchronous machines, is proposed and verified by experiments on prototype motors.