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Article / Book Information

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Thesis Outline

This thesis investigates the impact of magnetostriction on motor vibration and acoustic noise using both analytical and experimental approaches. Typically, electromagnetic forces are recognized as the primary source of motor vibration; however, this work demonstrates that magnetostriction also plays a significant role, a factor that has been overlooked so far.

Chapter 2 presents a comprehensive literature review on the studies concerning the impact of magnetostriction on electric machine vibroacoustic performance. Chapter 3 lays the foundational knowledge necessary for understanding the subsequent content of the thesis. Chapter 4 details an experimental setup designed for measuring magnetostriction and the measurement results for three core materials. Chapter 5 compares magnetostrictive vibration and acoustic noise among three stator cores fabricated from the three core materials. Chapter 6 experimentally evaluates the relationship between deformations caused by magnetostriction and electromagnetic forces on stator teeth. Chapters 7 and 8 analytically and experimentally investigate the impact of magnetostriction on a switched reluctance motor model and an interior permanent magnet synchronous motor model, respectively. The experimental data presented in these chapters confirm that magnetostriction significantly influences motor vibration and acoustic noise and should not be disregarded in motor design and analysis.