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Measurement of Harmonics and Mitigation of the EC Motors

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Abstract: *Electronically Commutated (EC) motors offer high efficiency and precision but suffer from harmonic distortions due to non-linear power electronics switching. These harmonics contribute to power losses, overheating, torque ripple, and electromagnetic interference, reducing overall motor performance and lifespan. This study focuses on measuring and mitigating harmonic distortions to enhance EC motor efficiency and reliability.*

Harmonic measurement is conducted using Fast Fourier Transform (FFT) analysis, capturing distortions at motor input terminals and within windings under various load conditions. To mitigate harmonics, passive filtering techniques, particularly series-parallel LC filters, are employed. MATLAB/Simulink simulations demonstrate that these filters effectively reduce Total Harmonic Distortion (THD) to 0.27%, outperforming conventional passive (10.92%) and choke filters (5.97%).

The results indicate that harmonic suppression significantly improves motor efficiency, reduces thermal stress, and enhances operational stability. These findings highlight the importance of harmonic control in EC motors, ensuring energy-efficient and reliable performance in industrial drives, electric vehicles, and other high-performance applications.

Keywords: Electronically Commutated

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