The Improved Startup Performance of ALA Rotor Motor

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Abstract—The axially laminated an isotropic (ALA) rotor motor has many advantages over the conventional counterparts. However, the startup process of the inverter-fed prototype presents severe oscillation and asynchronous operation. To improve the startup performance, an additional mechanical damper is mounted on the shaft of the rotor. Once the oscillation occurs, the damper will put into effect. A reverse damping torque is then applied to weaken the oscillation and ensure the synchronism. By using this method, the startup performance of the motor is remarkably improved and the load capability is enhanced as well.

To find out the cause of the oscillation, the small disturbance approach is applied to the dynamic model. The synthesis reveals that the poor electromagnetic damping is the critical factor resulting in instability, due to the lack of damping windings on the rotor. To reinforce the stability, the combined systematic damping factor should be increased. In addition, the effects of the mechanical damper on motors with different saliency ratios are discussed. Finally, the experimental results are presented to verify the theoretical analysis and design purpose.

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