

ADVANCED MOTOR DRIVER FOR MULTIPLE MOTOR CONFIGURATIONS

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Keywords: 9-phase PM motor, 3x3-phase PM motor, pulse-width-modulation, FOC, multipurpose motor inverter

ABSTRACT

3-phase motors are widely used and therefore well described in literature and research papers, though publication of research and literature on multi-phase motors is very limited [1]. This paper seeks to investigate the possibilities of designing an inverter for a 9-phase PM motor in collaboration with DACS A/S. It is presumed that a 9-phase PM motor will reduce the total losses by at least 5% as well as having a smoother torque output, higher winding factor, thinner cables and facilitating a simplified production. At the same time, the motor inverter capable of driving a 9-phase PM motor, can be configured to drive 3x3-phase motors. By having a single larger motor inverter driving multiple motors, instead of a smaller motor driver for each individual motor, the inverter cost per motor is reduced. Therefore, improving the efficiency and potentially lowering the production cost is highly desirable.

The approach is restricted to a proof-of-concept application where it is desired to rewinding a 3-phase PM motor to a 9-phase PM motor and compare their efficiencies. It is furthermore desired to implement a motor driver capable of driving multiple motors and motor configurations. This requires the following: Schematic design including choice of components, PCB layout design, Programming of an embedded microprocessor, mathematical modelling of PM motor, design of speed and current controllers and finally a test of the 9-phase PM motor efficiency increase.

Test rig, motors, components and facilities required for conducting the necessary system analysis and testing is provided by DACS A/S.

Acknowledgement

The authors of this work gratefully acknowledge Grundfos for sponsoring the 8th MechMan symposium.

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