

Preface

The drop in prices of rare-earth permanent magnet (PM) materials and progress in power electronics have played an important role in the development of PM brushless machines in the last three decades. These machines have recently become mature and their high efficiency, power density and reliability has led to PM brushless machines successfully replacing d.c. commutator machines and cage induction machines in many areas.

The axial flux PM (AFPM) brushless machine, also called the disc-type machine, is an attractive alternative to its cylindrical radial flux counterpart due to the pancake shape, compact construction and high torque density. AFPM motors are particularly suitable for electrical vehicles, pumps, valve control, centrifuges, fans, machine tools, hoists, robots and manufacturing. They have become widely used for low-torque servo and speed control systems. The application of AFPM machines as generators is justified in wind turbines, portable generator sets and road vehicles. The power range of AFPM brushless machines is now from a fraction of a watt to sub-MW.

Disc-type rotors can be embedded in power-transmission components or flywheels to optimize the volume, mass, number of parts, power transfer and assembly time. For electric vehicles with built-in wheel motors the payoff is a simpler power train, higher efficiency and lower cost. Dual-function rotors may also appear in pumps, elevators, energy storages and other machinery, bringing added values and new levels of performance to these products.

The authors believe that this first book in English devoted entirely to AFPM brushless machines will serve as a textbook, useful reference and design handbook of AFPM machines and will stimulate innovations in this field.

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