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## A New Magnetic Field Modulation Type of Brushless Double-Fed Machine

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Recently, brushless double-fed machines (BDFMs) have been widely developed due to the wide application prospects in electric power generation fields with variable speed, constant voltage and constant frequency performances and speed regulating systems using large capacity motor. The magnetic field generated by the two sets of windings, which are both located in the BDFM stator, indirectly coupled through the modulation of the rotor, thus resulting in the disappearance of the brush and slip ring. So the machine stability can be enhanced consequently. However, BDFM usually suffers from large size and low power density compared with that of permanent magnet (PM) machines because of the low airgap flux density provided by field windings. In this paper, a new magnetic field modulation type of brushless double-fed machine (MFM-BDFM) is proposed, which consists of a stator with two sets of windings and a rotor with permanent magnets (PMs) mounted on the rotor surface. The stator can be divided into an outer part and an inner part with different tooth number and different winding pole-pair number. The outer stator part adopts a conventional tooth-slot structure and the field windings are wound in its slots. The inner stator part is composed of segmental iron cores, which cling to the outer stator teeth, and the armature windings are housed between the neighboring iron segments. Compared with the conventional BDFMs, the excitation field provided by both of field windings and PMs are coupled with the armature windings field based on the indirectly modulation function of iron cores on inner stator part instead of the rotor, hence performing a high air gap flux density and an enhanced power density. The operation principle of proposed MFM-BDFM will be described and the electromagnetic performances will be calculated and analyzed in the full paper.

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