

Electric machines with axial magnetic flux

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Abstract. The paper contains information on the performance of axial machines compared to cylindrical ones. At the same time, various constructive schemes of synchronous electromechanical converters with permanent magnets and asynchronous with short-circuited rotor are presented. In the developed constructions, the aim is to maximize the usage of the material of the stator windings. The design elements of the axial machine magnetic system are presented. The FEMM application depicted the array of the magnetic field of an axial machine.

1. Introduction

The study of the axial electric machine, little researched in the past, is a theoretical and practical interest for their design and production in order to increase the efficiency of their use in relation to the use of the cylinder machine with radial magnetic flux.

In this context, the interest refers to the performance of the electric machine with axial magnetic flux relative to the radial magnetic flux.

At present these performances are obvious, namely: reduced axial dimensions, use of cold rolled steel with reduced magnetic losses, reduction of stamping waste, increased stator and rotor cooling surface removed from the stator package, possibility of replacing the mechanical rigid coupling between Stator and rotor with magnetic one.

Some of these performances, particularly eloquent, are seen in the use of axial magnetic flux motors to drive certain mechanisms: centrifugal electric pumps, fans, and, when used as generators, can be driven by wind and water turbine engines. When coupling the axial machines with the above-mentioned mechanisms, the rotor can be cumulated with the traction or drive mechanism, thus making it possible to couple and compensate the unilateral electromagnetic forces between the stator and the rotor. Moreover, in these machines it is possible to obtain reduced angular velocity, since the diameter is increased, allows the stamping of a large number of notches and hence a large number of poles.

The purpose of the paper is to study the construction of synchronous electric machines with axial flux with permanent magnets; the study of stator windings used in electric machines with permanent magnet rotors and the use of inexpensive axial machine manufacturing technologies.

2. Electromechanical converters of various constructions

According to the studied and analyzed sources [1], [2], it was concluded that this type of machines can be classified as follows: with a disc rotor or with multiple disk rotors; with a rotor and a stator, with flat winding on the stator (Figure1); with two rotors and a toroidal winding stator (Figure 2);

