



Design of Electrical PM Generator with Doublesided Stator and Single Rotor (DSSR) Technology-Part I

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ABSTRACT: This paper present, power generation by using the permanent magnet generator with two stator and single rotor construction. In single sidegenerator, asper the volume itproduces heat but in double sided rotor heat produces is less due toits designaspects i.e. active air mass. In other words the double side construction having the better cooling characteristic. Hence its operational temperature is low [1].

The main advantage of this system, it consist of back to back rotor place in between the stator, hence the weight of rotor is less as compared to double sided rotor technology. Starting torque of this machine is low,hence it give an output instantly. They do not requireany rotor excitation because it's having self-flux and hence it do not produce more excessive heat so life of this system is more.

KEYWORDS: DOUBLE STATOR SINGLE ROTOR (DSSR), AFPM, TORUS, AFIR.

I.INTRODUCTION

In a 21th century the half of the world uses the permanent magnet technology. Among the top ten turbines manufacturer in the world preferred PM generators i.e. the 8% generators are permanent magnet. Working of this generator depends on axial flux & radial flux concept [8].Conventional synchronous generators have brushes and slip rings in rotor that increase its need for maintenance and reduce its reliability[8].

There is no need of rotor excitation for magnetisation,as well as it does not have cogging torque hence operation of this generator is frictionless & smooth. Rotor consist permanent magnet because itshaving more advantages like the growing demand, growth size , weight &reduce cost[1]. In [2] article shows that, for generation of the electricity by using the permanent magnet generator having two armature, one is stator which is fixed & second one is rotor which is rotary. In this paper also two armature, but stator armature is located in two sides of rotor & second one is the rotor armature they are located in between two stator , the stator is fixed & other armature rotor is rotates. Alsostarting torque is high because the weight of the rotor is less.

The permanent magnet generator having 2 types.

- Single sided PM generator
- Double sided PM generator

In conventional machine, air gap flux density has normally radial direction while, in AFPG, the air gap flux density present in axil direction [4].The permanent magnet has leakage flux is presented around the side of magnetwhich is present in axial direction and radial direction. The radial flux of normal generator is totally west hence we have construct the stator core which is made up of cast-iron and they have following two aspect.

- To increase the magnetic circuit area.
- To use some wastage flux in radial direction.



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The material used for permanent magnet is NdFeB (Neodymium iron type) because the temperature and corrosive resistance of this material is low; they are not demagnetized in less time span [8]. This is having the more advantage in the industrial character [8]. To generate more energy in a permanent magnet generator this is couple with single phase universal motor [2]. This paper describes how to build a PM generator with double sided stator and single rotor technology.

II. TYPE

The permanent magnet generator having following types

- Single sided PM generator
- Double sided PM generator

Single sided PM generator

This machine has only one stator and one rotor configuration. Single sided iron core permanent magnet generator is use as the bench mark of the construction of double sided iron core permanent magnet generator [1].

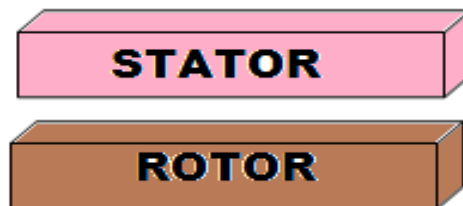


Fig-1 Single sided PM generator

Double sided PM generator

This specific machine has a back-to-back stator configuration which shares a common yoke and employ toroidally wound stator windings. In a conventional generator with a single-sided rotor, the stator yoke contributes to one third of the total active material mass. This is not advantages of this design because excessive amount of magnetic material require to maintain same power level [1].

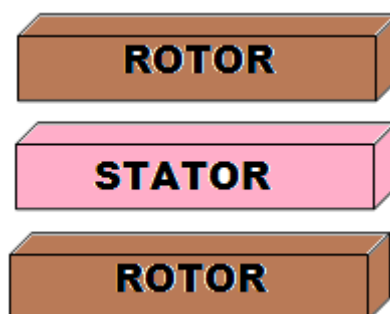


Fig-2 Double sided PM generator

III. DOUBLE SIDED PM GENERATOR

Two topologies of double-sided AFPG are axial flux single-stator-double-rotor (TORUS) and double-stator-single-rotor (AFIR). purpose of selecting double-sided AFPG with high power density is an important features. So comparison of power density between different topologies of double-sided AFPG to be necessary. Figure shows a double-sided rotor iron-cored radial flux PM generator. This specific generator has a back-to-back stator

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configuration which gives a common yoke and toroidally wound stator windings. In such a double-sided rotor design, active material volume and weight is more.

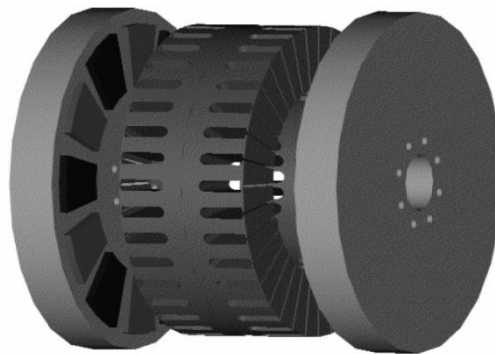


Fig-3 Double-rotor single stator

In double sided stator and single rotor consist back to back rotor placed between the two stator as shown in figure. This specific generator has a back-to-back rotor configuration with toroidally wound stator windings in circumference of the stator disc.

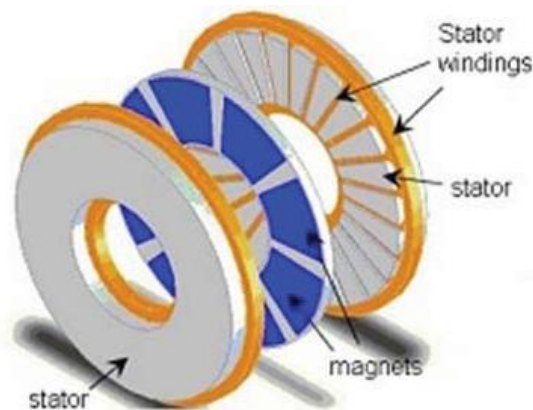


Fig-4 Double-stator single rotor

The construction details of AFIR is describe as follows.

IV.DESIGN ASPECT

The permanent magnet generator having two armature first one is stator and second one is rotor.

1. STATOR DESIGN

The coreless nature of the stator eliminated the lamination stamping during the manufacturing process of the stator winding. A popular coil shape for AFPM machine is toroidal-shape coil wound around an iron core. The PMG stator contains six coils of copper wire which mount on disk as per showing the above figure. Create these types of two disk so this acts as the stator. Fig 5 shows the total assembly of the stator.

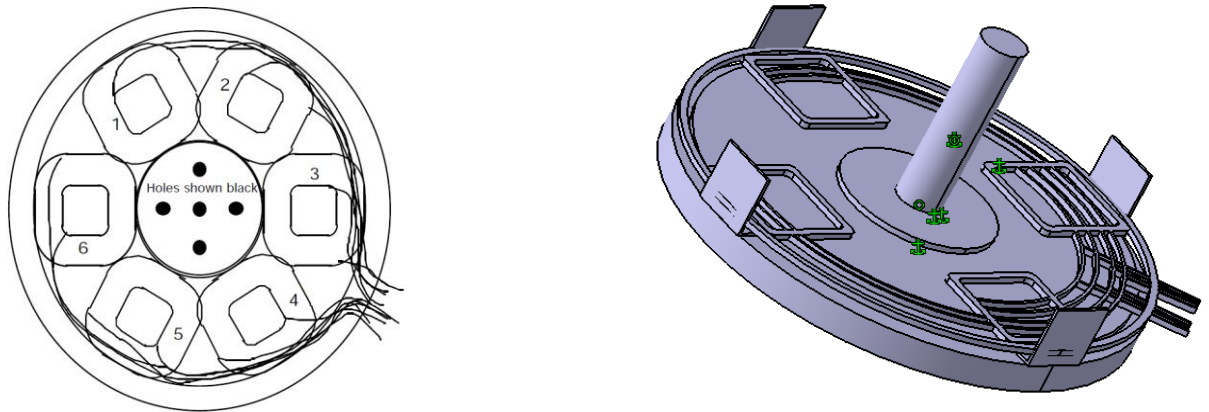


Fig-5 Assembly of stator.

2. ROTOR DESIGN

The material used for permanent magnet is neodymium Iron Core (NdFeB) because this material consisting the temperature and the corrosive resistance is less. That's works in more time they do not demagnetized, they do not having more structural stability.

The flux intensity of one magnet is 7cm.

The length of magnet is 5cm.

The width of magnet is 2cm.

The height of magnet is 1.2cm

The construction of the rotor disk is as shown in figure the rotor disk material is cast-iron.

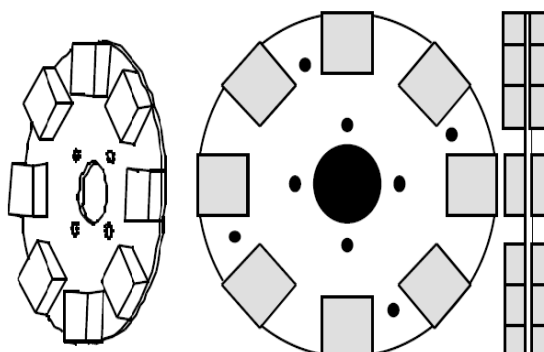


Fig-6 Assembly of rotor.

As shown in above construction, it consist of one solid iron plate. Neodymium Iron Core (NdFeB) magnets placed in both side of plate as shown in above figure.



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V.MATERIAL AND SPECIFICATION

Sr no	Equipment	Material	Specification
1	Stator	Insulating like resin	2 Disc
2	Rotor	Solid iron	Single Disc
3	Magnet	Neodynamic iron core (NdFeB)	Length- 5cm Width- 2cm Height- 1.2cm
4	Coil/Winding	Copper	Winding turn 600-700 per coil. Gauge of copper conductor -35 mm.

VI.CONCLUSION

The permanent magnet generator is used in Small & medium wind power plant to generate electricity. The main advantage of permanent magnet as comparing with electro magnet is, to minimize the rotor excitation and reduce the losses like heating.

In the single rotor condition the magnet in linear running character and higher effective ness. But we can generate the more power by use of single rotor and double stator, with small dimension and less weight of the generator.

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