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EFFECT OF MAGNETIC FLUX ON ROTOR-STATOR ARRANGEMENT OF NEODYMIUM PERMANENT MAGNET

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ABSTRACT

The use of crude oil to produce energy become limited and gives threat to the earth. There are various alternative sources that have been developed today such as solar, wind, hydro, etc., but are not sustainable or constant with time due to its nature. Recent development in 'free energy' shows some technology that allegedly approaching commercial and magnet motor is one of the most promising technologies. Magnet motor is a free energy device that can generate energy with the repellent force of permanent magnet in cylindrical arrangement. The arrangement of permanent magnet in rotational array configuration produces a cyclic motion indefinitely; which is so called perpetual motion device. The torque produced by perpetual motion device may be used to drive electric generator to produce free electricity. In this paper, neodymium permanent magnet was arranged in rotor-stator configuration by using block shape (12.7 mm x 12.7 mm x 25.4 mm thickness) N42 grade magnet. A preliminary design was conducted and the effect of magnetic flux was investigated on the rotational movement of the rotor. Based on the experimental result, it had confirmed that cogging effect could be eliminated. This was achieved by cancellation of magnetic flux in different arrangement of permanent magnet in the stator.

Keywords: neodymium, NdFeB, magnetic flux, magnet motor.

INTRODUCTION

Magnet is a material that has its own energy. It does not need to be powered up instead of supplying its energy to power something. If two pieces of magnet bar, which the poles are known, are placed side by side to each other, when positioned on the same poles, the magnet may repel to each other. This repellent force will keep on acting if the same poles are brought close to each other. There are various kind of magnets exist in this world. In order to spin a huge/gigantic power generator, huge torque is required [1-4]. Huge repellent force between magnets is seen as a good indication where huge torque may be generated. Huge repellent force usually is associated with magnet's properties [5-7]. The denser the magnetic flux/field is, the higher the repellent force produced. One of the strongest magnets in the world (neodymium magnet, so called neo magnet) may be used as a generator driver. Neo magnet is also known as Neodymium magnet (NdFeB or NIB) is a type of permanent magnet which is made from an alloy of neodymium, iron and boron [8]. This magnet is identified as the strongest permanent magnet in the world [9] and usually may be found in everyday life applications for instance: toy cars, toy airplanes, electric vehicle, machineries, electrical appliances, computer's hard drives, high-quality speakers, robots, as well as in conventional internal combustion engine vehicles. Neo-magnet is so strong and it has been reported widely on its application and well documented elsewhere [10, 11]. High strength in repellent and attraction forces of neo magnet has made this magnet widely used as one of the main elements in electrical generation device. A lot of literatures around the globe have documented neo magnet applications in electric generators and motors with improved efficiency. However, there is lack of efforts made to show that neo magnet is used as a motion driver. Neo magnet in rotor-stator configuration may be used to demonstrate the extended application of the magnet as the motion driver. A research effort is carried out to investigate the magnet's potential with a view to develop a truly clean free energy.

THE PROCEDURES

Industrial magnetic finite elements (FE) software was used to study the magnetic repellant characteristics. Neo magnet grade N42 was used in the development works. The magnets were arranged in a way that they repel to each other. North poles of the stator were placed to face the north pole of the rotor. Various repellent angles were tested to study the motion and cogging generation. Analysis from the FE software is used to study the acted forces and flux characteristics.

RESULTS AND DISCUSSIONS

Preliminary concept design

A proposed design is introduced to investigate the magnetic flux, has a configurations of magnets arrangement in rotor and stator. Figure-1 shows the concept of preliminary design of the first configuration with an aligned arrangement of magnets on the stator. From Figure-2, the 7mm gap between magnets will produce 19.2 Newton repellent force each. FEA package of JMAG Designer ver.12.0 is used as a solver in this design.

The magnet specifications for concept design are from Neodymium (NdFeB), block shape (12.7 mm × 12.7 mm × 25.4 mm thickness), magnetized on thickness, grade N42, with NiCuNi plating. Figure-2 shows the magnet repellent force for N42 NdFeB between two magnets.

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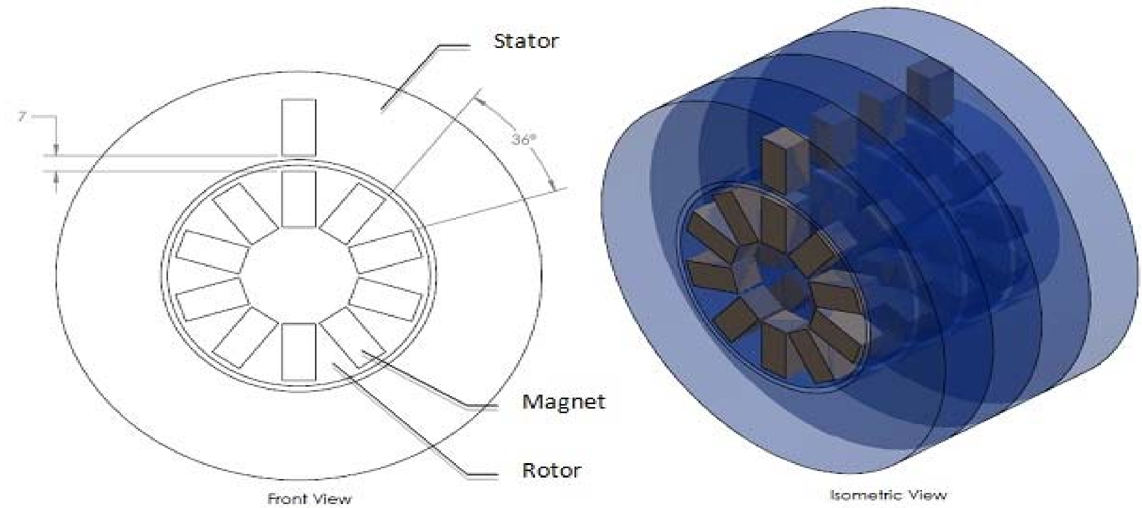

Figure-1. Rotor-Stator arrangement.

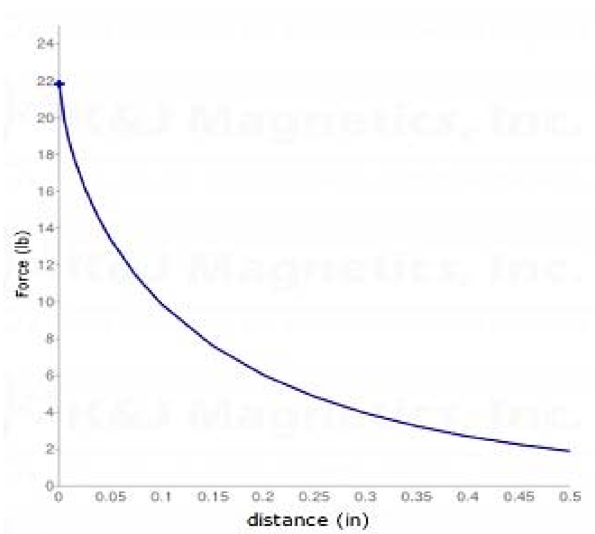

Figure-2. N42 NdFeB repellent force between two magnets.

Initial performances of the proposed design on FEA

Figure-3 illustrate the magnetic flux density distribution under static conditions, with two situations; (a) at maximum repellent force; stator magnets are aligned with rotor magnets, and (b) at minimum repellent force; stator magnets are in-between rotor magnets. It can be observed that for maximum repellent force condition, the rotor can be rotated as in Figure-3(a), but it will stop rotating at the minimum repellent force condition due to the 'void flux' or cogging conditions; force of rotor magnets in-between the stator magnet as shown in Figure-3(b). To overcome this problem, another arrangement of stator magnet is investigated as shown in Figure-4, with a rotation of 9° between magnets. Figure-5 illustrates the magnetic flux density distribution under static conditions for the proposed design. The expected result with this stator configuration is to overcome the problem of void flux in-between the stator magnets.

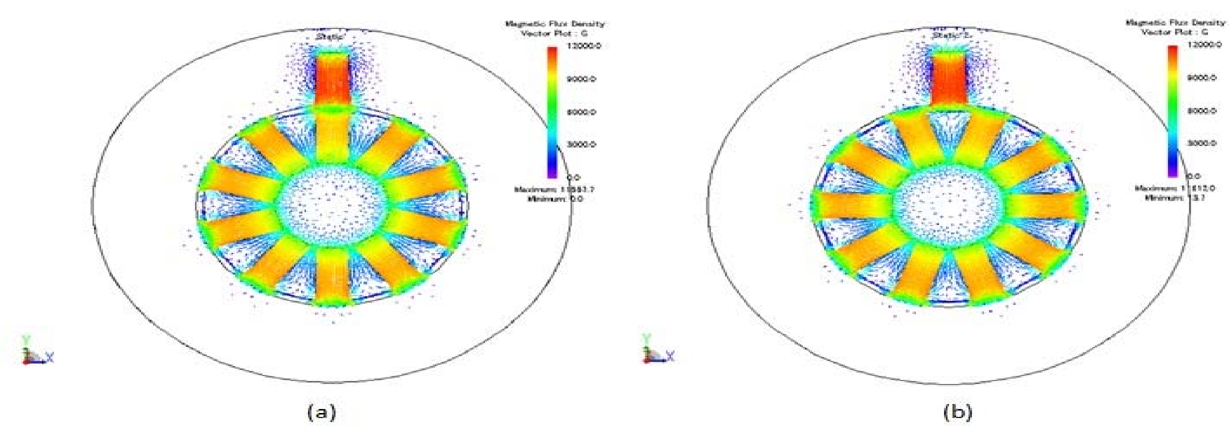

Figure-3. Magnetic flux vector diagram of (a) stator magnet aligned with rotor magnet (b) stator magnet in-between rotor magnets.

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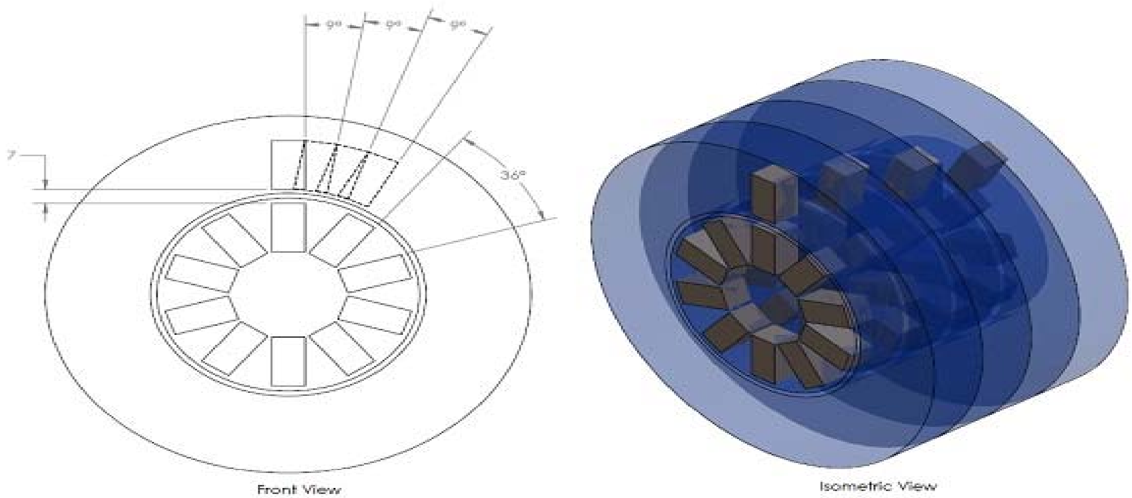

Figure-4. Rotor-Stator arrangements – Second configuration.

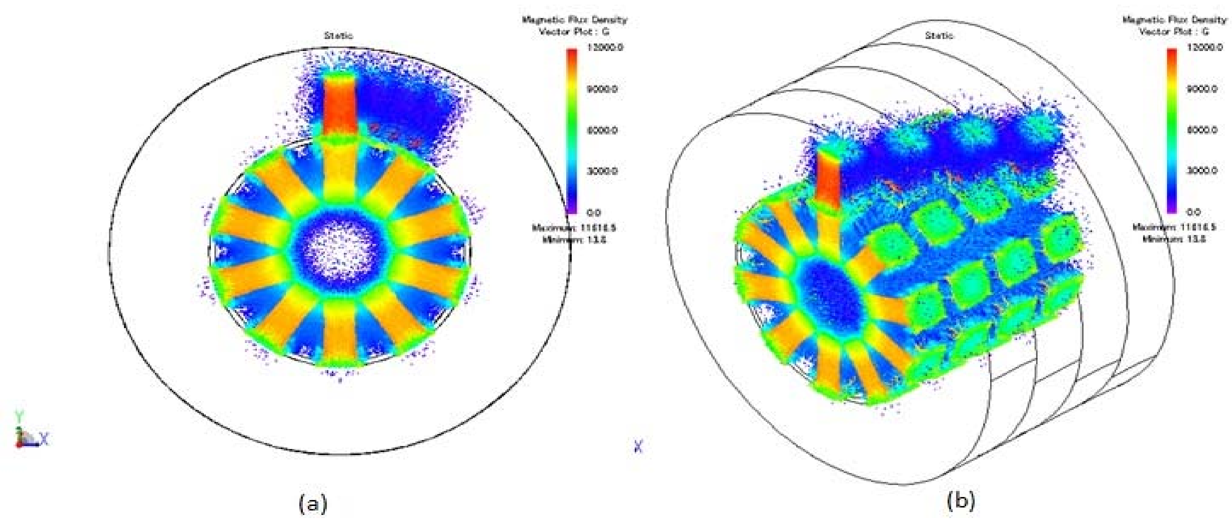

Figure-5. Magnetic flux vector diagram of second configuration concept design (a) front view (b) isometric view.

Results of the second configuration concept design

Figure-6 shows the assembly of second configuration concept design. The investigation of second configuration based on experimental model shows the void flux in-between stator magnets is eliminated and the rotor is rotating freely without any force before it stop. To explain this phenomenon, further investigation need to be examined on the flux density distribution particularly at the void flux area.

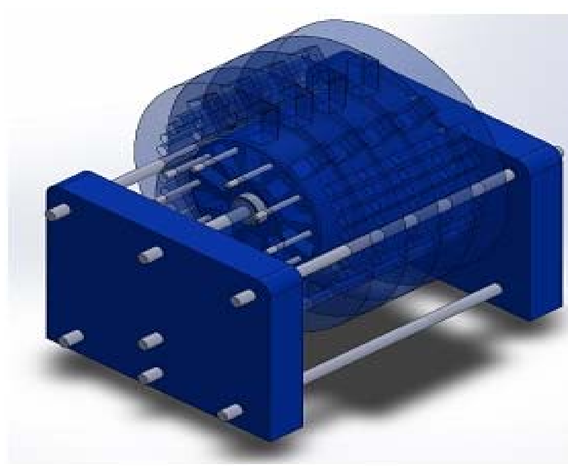

Figure-6. Rotor-Stator assembly model – Second configuration.

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CONCLUSIONS

At this stage, design studies and performance analysis of concept design is presented. There are two configurations in the concept design; (1) stator magnets is aligned and (2) stator magnets is rotated 9° between each other. It is found that the 'void flux' occurred in the rotor magnet arrangement at the minimum repellent force condition in both configurations of concept design. In the first configuration of concept design, the rotor stop rotating when it approaches the minimum repellent force condition due to the void flux conditions. In the second configuration, the void flux is eliminated with the arrangement of stator magnets and the rotor is freely rotating without any force before it stops. This phenomenon needs further investigation and analysis on the void flux conditions. Further experiments need to be examined by manipulating the rotor and stator magnet angle when it approaches the void flux conditions.

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