WINDING LESS ROTOR Based Electric Motor

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PROJECT REPORT

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Number of pages attached with this form	36
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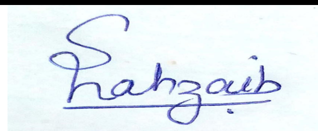

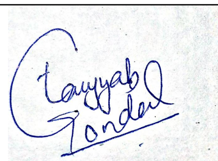

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Note 1: This paper must be signed by your supervisor
Note 2: The soft-copies of your project report, source codes, schematics, and executables should be deli vered in a CD
Note 3: Submit the report and software to the Degree Projects Coordinator, Electrical Engineering Department

Declaration

“No portion of the work referred to in the dissertation has been submitted in support of an application for another degree or qualification of this or any other university/institute or other institution of learning”.

Acknowledgements

We are very grateful to Allah (SWT) for showering His countless blessings upon us. We willingly express heartiest appreciation to all those who pro-vided us the confidence to complete this project in time. We pay special tribute to our final year project supervisor for their expert advice and motivation. At the end, we would like to take this opportunity to thank our friends and parents who helped, encouraged and highly motivated us to achieve our goals.

Winding Less Rotor based Electric Motor

July 7, 2020

Abstract

DC motor is a motor, which converts electrical energy into mechanical energy. In an electric vehicle, the DC motor is extensively used, so when DC motor draws energy from these vehicles. Then the energy which the motor has absorbed from the battery is almost equally distributed among the stator and rotor. Because of energy going to the rotor, it affects the battery and efficiency of car and motor. The reason behind this is the I^2R losses that occur in the winding of the rotor. Now, if we use the permanent magnets in the rotor instead of the winding, it will eliminate all the losses and increase the efficiency of the battery of the vehicle by almost 50 percent, which is why, we are trying to make a DC motor, which has no winding in the rotor. And because of this, there will be no losses. Besides this, there are many other projects in which we can use this DC motor to increase the efficiency of the product.

Acknowlegdment

We are very grateful to Allah (SWT) for showering His countless blessings upon us. We willingly express heartiest appreciation to all those who provided us the confidence to complete this project in time.We pay special tribute to our final year project supervisor for their expert advice and motivation. At the end, we would like to take this opportunity to thank our friends and parents who helped, encouraged and highly motivated us to achieve our goals.

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Chapter 1

Introduction

The motor which converts electrical energy into mechanical energy is called a DC motor. It is one of two basic motors: the other type is the alternating current or AC motor. Among DC motors, there are shunt-wound, series-wound, compound-wound, and permanent magnet motors. DC motor has a stationary set of magnets in the stator and an armature with one or more winding of insulated wire wrapped around a soft iron core concentrating the magnetic field. The winding usually has multiple turns around the core, and in large motors, there can be several parallel current paths. On the commutator, every end of the wire winding is connected. The commutator allows each armature coil to be energized in turn and connects the rotating coils with the external power supply through brushes. (Brushless DC motors have electronics that switch the DC current to each coil on and off and have no brushes.) In a DC motor, when armature conductors carry current in the presence of stator field flux, then a mechanical torque is developed between the armature and the stator. DC motor, namely, consists of two major parts. The stator is the stationary part that keeps the field winding, gets the supply, and forms the outside portion of the motor. The DC motor's stator consists of 2 or more magnet pole pieces, and that too permanent. Here, a coil is wounded on a magnetic component to form the stator. The rotor is the inner rotating part that carries out the mechanical rotations. This part consists of windings connected to the external supply circuit via commutators. Ferromagnetic materials are used in the construction of stator and rotor, and an air-gap separates the parts. In electric vehicles, DC motor is used to move the wheel of the vehicle. DC motor draws electrical power from the DC battery for the excitation of the rotatory magnetic field. Due to the winding of the rotor losses occur, which decrease the battery life.Fig. 1.1 shows a simple DC Motor:

Figure 1.1: DC Motor

1.1 Motivation

Permanent Magnet DC motor is excessively used in the automotive, industrial, and household products because of its high efficiency, high torque, ease of control, and lower maintenance. In electric vehicles, when dc motor draws electrical power from the battery, it decreases the battery life. To overcome this problem, we have to design a motor, which will increase the battery life of the vehicle, reduces the power losses, and also increase the efficiency of the DC motor. In this project, we also less the maintenance cost of the motor.

1.2 Objective

Our main goal objective is to develop a motor that will eliminate the losses in the winding of the rotor. For this, we will use a magnetic rotor instead of a winding rotor to produce a constant magnetic field inside the rotor. In this project, we decrease the maintenance cost and power losses of the DC motor.

1.3 Methodology

The main disadvantage of using a DC motor in the electric car is that it decreases the battery life, and power loss occurs because of the losses in the winding of a rotor. To solve this problem, we have developed a solution we will use a permanent magnet rotor in the Dc motor instead of a winding rotor. By doing this, the power loss in the motor will decrease, and the motor's efficiency will increase.

1.4 Oragnization of Report

We organize our report in such a way that

1. In our report, chapter 2 includes the literature review we discuss the previous tasks which were performed related to our topic. In this, we will do proper research on existing work, and we will study it and then share our understandings. In this way, we will able to know about the merits and demerits of winding less rotor motor. We can also add figures (for proper understanding) with proper citation required if we took another person's work.

2. In chapter 3, we will discuss the requirements specification and is divided into functional and non-functional requirements. Now in functional requirements, there are two categories which we prioritize the requirements. In non-functional requirements, there are further three categories, one is product requirements in which we will discuss the platform and its specifications than comes the organizational requirements in which we will discuss the deliverables and standards and last but not the least is external requirements, in this, we will discuss the security, moral and safety.

3. Chapter 4 will discuss the project design in which we will talk about the methodology, diagrammatical explanation, and the design description in which we will discuss the modules and their description.

4. Chapter 5 will discuss the implementation strategy, stages, key components, and user interfacing in our project.

5. Now chapter6, which will assess the design and implementation phases .it covers following steps, one is unit testing then function testing and then comes the results. Comparison is also done.

6. In chapter 7, we will conclude our project and tells about some ideas for future work.

Chapter 2

Literature Review

In the literature review, we will discuss the existing published work on widening less rotor based motor, with the help of this our doubts will be cleared as there is a progressive development in the field of technology. As we studied different research papers on different protocols, various techniques are applied to the winding rotors to decrease the copper losses and many other purposes. We will discuss the published work with proper citation.
In this research paper, an analytical method is given to design a permanent interior magnet brushless DC motor for a kind of electrical impact wrench used for loading and unloading car bolts. Brushless DC motors are popular in a wide range of industrial applications, such as computer peripherals, servo controls systems, and electrical tools, due to their robustness. An Interior permanent magnet brushless electric motor is an important category of these motors. It is constructed with the permanent magnets inserted into the steel rotor and does not need to be glued, such as mounted permanent magnet motor. [4]
In this article, the author tells us about the construction of the stator magnetic circuit is constructed using steel lamination. Steel lamination in the stator can be either slotted (inner rotor design) or slot less (outer rotor design). It also tells us about the construction of the permanent magnet rotor, and it can consist of various poles based on the application. The torque will increase with the number of poles, but it will cause maximum speed to decrease. [5]
In this article, the author tells us about the Brushless dc motors having surface-mounted permanent magnets, and non-overlapping stator windings are a prefunded format for many applications. Compared with conventional

overlapping winding machines, they can have higher efficiency and lower torque, while the simpler winding arrangement can be significant as regards cost-effectiveness. However, due to the large effective air gap and asymmetric field [3]

In this article, the author tells us that the DC motor principle is to convert direct current (DC) electrical energy into mechanical energy. It consists of a stator (inductor) an armature (rotor) with the winding of insulated wire, which are energized by a commutator through brushes. A stator magnetic field B is created by a permanent magnet or excitation coil supplied from the DC source. The rotor winding (armature conductors), which rotate, is placed in this stator magnetic field B. [6]

In this article, the author has told us about the conventional brushless dc motors made using a permanent magnet rotor. This magnet rotor is placed inside the wound stator. The writer has also talked about the single type of DC motor. To create this motor, you have to put the stator inside the rotor, which is the exact opposite of Brushless Dc motor. Using this technique it will give us many advantages. First, if we put the stator inside the rotor, then we have to make a bigger size of a rotor. This rotor will be bigger than any DC rotor. If we have a big rotor, we will get more inertia, which results in the rotor's smooth functioning, if we operate the rotor at low voltage. Another advantage of placing the stator inside the rotor is that in the big-sized rotor, the stator can produce high torque, and this torque will be much larger than the other DC motors. Because of the stator's torque, the magnetic flux will increase, and the rotor can also contain more poles because of its larger size, the magnetic flux of the rotor will further increase. [1]

In this article, the author has told us about the Permanent Magnetic Rotor. This motor is very reliable, and you can buy this motor at a very low amount. The reason for this is very simple. In the construction of the Permanent Magnet Motor, there is a need for slip rings. To make this motor, they have to use the Permanent Magnet rotor, that's why the motor is called the Permanent Magnet Motor. The reason behind choosing the permanent magnet is that they are rare earth magnets, which increases the steady-state response of a motor and increases the performance and quality of motor.

On top of that, the prizes for Rare Permanent magnet are also decreasing. That's why these motors can be made at a very low price. Because of their low prices and high efficiency and performance, these motors have replaced the induction motor. [2]

Chapter 3

Requirment Specification

3.1 Product Requirment

ID	Priority	Details
NR-01-001	1	**Performance:The performance of our project is satisfied.**
NR-01-002	1	**Accuracy:This project has a precise delivery.**
NR-01-003	1	**Easy to Use: The project is easy to use for anyone**
NR-01-004	1	**Reliability:The project is reliable.**
NR-01-005	2	**Portability:: The project can be made portable**
NR-01-006	2	**Modifiability:This can be modify with user requirements.**
NR-01-007	1	**Accessibility:The project is access able to anyone**

Table 3.1: Product Requirement

3.2 Organizational Requirement

ID	Priority	Details
NR-02-001	1	**Delivery:** The system development process and deliverable documents shall conform to the process and deliverables defined in the document "CIIT-CE-02H Degree Project Student's Handbook".
NR-02-002	1	**Standard:** The standard of the final product shall be of undergraduate level or above.

Table 3.2: Oraganizational Requirement

3.3 External Requirement

ID	Priority	Details
NR-02-001	3	**Security:** This is a degree project having no strict security requirements.
NR-02-002	1	**Ethical:** The application will not use any type of unethical electronic material while project development and execution.
NR-02-003	1	**Legislative:** The application shall not use any private or confidential data, or network information that may infringe copyrights and/or confidentiality of any personnel not directly involved in this product.
NR-02-004	3	**Safety:** The application shall not use any private or confidential data, or network information that may infringe copyrights and/or confidentiality of any personnel not directly involved in this product.

Table 3.3: External Requirment

Chapter 4

Project Design

4.1 Methodology

The project was formed by the two major parts. One is a rotor, and another one is the stator. For the stator, we will use the winding, but we will need a DC voltage for the stator winding. This DC voltage will be given to the stator by a DC battery. When 12 V DC is given to the stator by the DC battery, the stator will produce a magnetic field. In this magnetic field, the North and South Pole will be produced. After this, for the construction of the rotor, we will use a shaft. In the shaft, we will place the permanent magnet. This permanent magnet will have its field. The field which is produced in the stator will interact with the permanent magnetic field of the rotor. When two fields interact with each other, then from the interaction, two processes will occur, North will repel the North (repulsion process), or North will attract the south (attraction process will occur). When attraction or repulsion process occurs, a force will be produced, which will act as a torque. This torque will cause the rotor to start moving. When the rotor rotates, the motor will start doing its operation. Between this operation, the rotor's magnetic poles get locked with the poles of the stator winding. We have read in DC machines in which DC motor contains the commutator on the rotor, which changes the rotor's pole. By the changing of these poles, the motor will start operating at a normal position. But in the case of our project, we can't change the poles of the rotor, because we use the permanent magnetic rotor. So we have to change the magnetic poles of the stator by the use of a switching circuit, which is controlled through an Arduino. In our project, we will use the plane bearing to reduce the friction between the rotor and other stationary parts of the motor. When the motor starts operating, then we will cover the motor by a metallic plate for the good look of our project.Fig. 4.1 shows the Project Module of our Project:

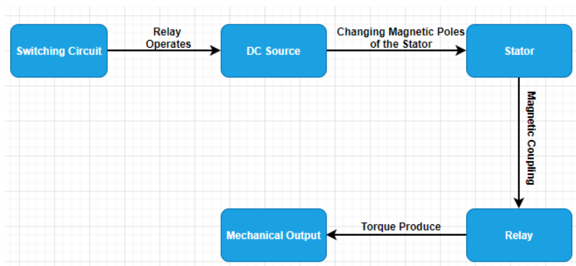

Figure 4.1: Project Module

4.2 Architecture Review

4.2.1 Stator

For the rotation of the rotor, the stator is used. When the DC voltage is given to the stator, it will cause a magnetic field inside the motor to produce. From the magnetic field, North and South Poles will be generated, which will interact with the rotor's magnetic field, causing the rotor to rotate. The word stator is derived from the word stationary, which means it's a stationary part of the motor, and it's also an important part of a motor. The purpose of the stator is to rotate the rotor. Fig. 4.2 shows the stator which is used in our project:

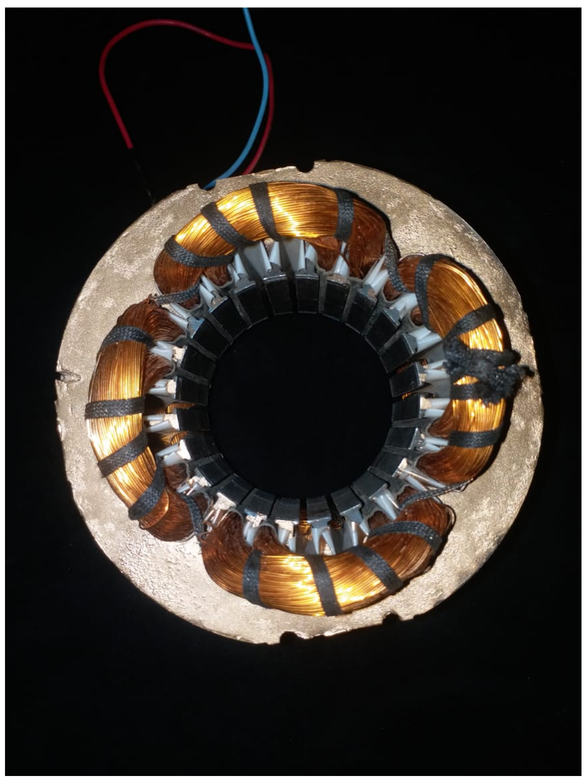

Figure 4.2: Stator of Electric Motor

4.2.2 Rotor

In the motor, the rotor is the rotatory part. In our project, we will use a permanent magnet as a rotor. We will set the permanent magnet so that it will interact with the stator field winding. When the interaction occurs, the attraction or repulsion process will produce. From this, a force will be generated, which will act as torque, and it will cause the rotor to start moving.Fig. 4.3 shows a Rotor which has been used in our project:

Figure 4.3: Magnetic Rotor

4.2.3 Shaft

In our project, we will use bearing around the rotor and stator so that it will reduce the friction between the rotor and the other stationary part of the motor. In electrical motor, the bearing is used to support and to check the rotor, to keep the air gap small, and shift the load from shaft to the motor. The bearing will able to do its function in every condition (motor speed decreases or increases). Fig. 4.4 shows a simple Shaft:

Figure 4.4: Electric Motor Shaft

4.2.4 Bearing

In our project we will use bearing around the rotor and stator so that it will reduce the friction between the rotor and the other stationary part of the motor. In electrical motor, bearing is used to support and to check the rotor, to keep the air gap small, and shift the load from shaft to the motor. They will able to do its function in every condition (motor speed decreases or increases). Fig. 4.5 shows a Plane Bearing used in our Project:

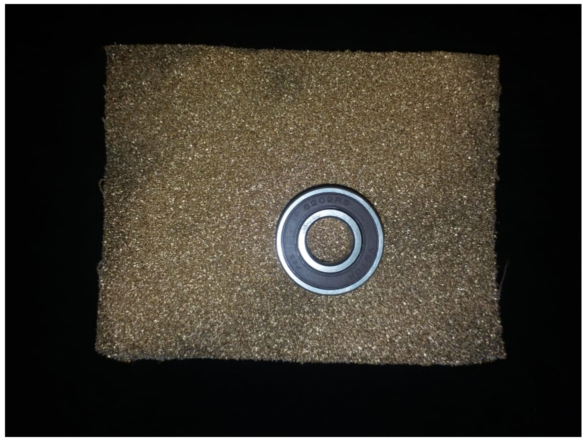

Figure 4.5: Bearing

4.2.5 Frame

The frame is used for the protection of our motor in the project from water or any other thing which can harm the motor. It also protects the person because if a motor doesn't have a frame, and a child or any other person touches the motor, then he/she will get shocked. We also use the frame to make the project look good. Fig. 4.6 shows a Metallic Frame for our project:

Figure 4.6: Electric Motor Frame

4.2.6 DC Battery

A battery that converts chemical energy into electrical energy by a chemical reaction process is called DC Battery. There are two types of battery one is primary, and the other one is secondary. The primary battery is not used for a longer time, but a secondary type of battery is used for a longer time, and it can be rechargeable. DC battery only flows in one direction and uses the direct current. The DC battery is only helpful for powering the low power electronic items. These items include mobile, laptops, etc. In the project, we are using the DC battery, which is applied to the motor's electric vehicle. This car battery will give voltage to the stator's winding, which will cause the winding of the stator to produce a constant magnetic field.Fig. 4.7 shows a DC Battery of Electric Car:

Figure 4.7: DC Battery

4.2.7 Arduino

Arduino is open-source software, project, and community of users who design and use single-board microcontrollers and microcontroller kits to create digital devices. In our project, we have used the Arduino only for switching purpose for changing the magnetic poles of the stator, which are generated by the DC battery. Fig. 4.8 shows a simple Arduino:

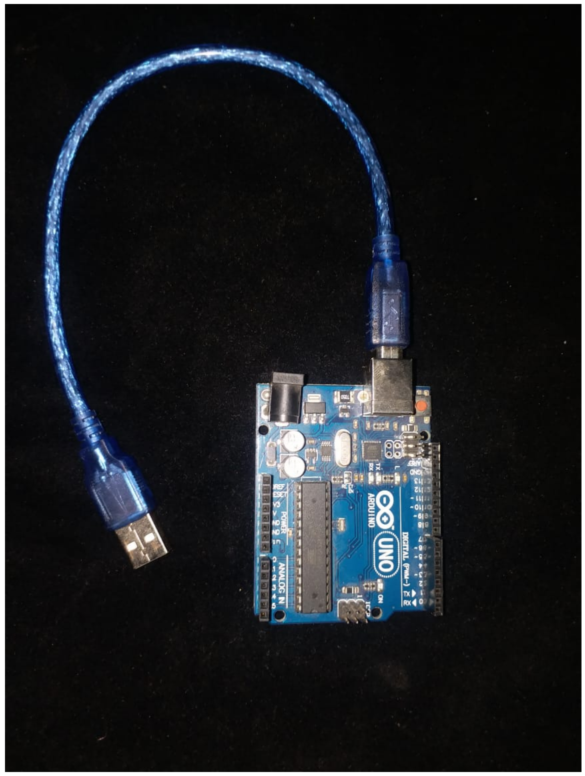

Figure 4.8: Arduino

4.2.8 Relay

A relay is an electrical tool. The relay consists of a set of input terminals of one or more control signals and a set of interactive points. Switching can be several contacts through many forms of communication, such as making contacts, breaking up contacts, or your combination. For our project, we use transfers to provide exchanges. As a result of this change, it converts stator magnet poles.Fig. 4.9 shows a simple Relay:

Figure 4.9: Relay

4.3 Design Description

4.3.1 Battery

- DC Battery

4.3.2 Stator

- Winding
- Varnish

4.3.3 Rotor

- Permanent Magnet

4.3.4 Bearings

- Plane Bearings

4.3.5 Shaft

- Linear

4.3.6 Frame

- Metallic Frame

4.3.7 Switching Circuit

- Arduino
- Relay

Chapter 5

Implementation

5.1 Development Stages

To construct a DC motor winding less rotor, we use a permanent magnet instead of the rotor field winding. For this purpose, we build a stator which produces the rotating magnetic field and a rotor which provide a constant magnetic field. For the construction of a DC motor, we follow different steps which are given below.

5.2 Initial Design of a DC Motor

5.2.1 Stator

As the name suggests, the stator is the stationary part of the motor. In an electrical motor, the stator provides a magnetic field, when DC voltage passes through its winding. In our project, we use a stator that has four-pole winding and stator consists of 24 slots. For the winding on the stator, we use 26 gauge wires to provide a DC magnetic field. For winding, we calculate 190 and 180 turns of each slot. The difference between Slots (Pitch of the stator) is 4 and 2. For 190 turns coil, we have slots difference four, and for 180 turn's coils, we have slot differences 2. For four-pole winding, we provide pole face to face. For Example, if one coil of 190 and 180 turns provides the North Pole in front of its coil, produce the same North Pole. Afterward, we construct a two-pole winding stator, which provides only two poles north and south. For the two-pole winding of the stator, we use 22 gauge DC wire, and also we calculate the 190 and 180 turns. The difference between slots (pitch) is 2 and 4. For 190 turns coil, the slot difference is four, and for 180 turns coil difference is 2. In this stator, one side of the stator produces a north pole when the electric voltage is passed through that coil. On the opposite side coil, the stator would produce the South Pole, which is the opposite of the other. Hence, we produce a two-pole stator with the help of this field.

5.2.2 Rotor

As the name suggests, the rotor is the rotatory part of a DC motor. In our project, we use a permanent magnet rotor which contains magnetic field, when this magnetic field interacts with the magnetic field of the stator, then rotor starts rotating. For the four-pole stator, we construct a rotor in which we fitted the silver material rotor on the shaft. We use a four-pole permanent magnetic rotor, and the permanent magnet is surface mounted on the stator shaft. This permanent magnet rotor has the same magnetic flux as the generated magnetic field of the stator. IN 4 pole winding of the stator, when North and South are generated by given DC voltage to the stator winding, the magnetic poles of the stator and rotor comes in interact with each other. Similarly, for a two-pole winding stator, we use two poles, permanent magnetic rotors. In this rotor, the permanent magnet is inserted inside the rotor. This rotor is placed inside the stator, when stator provides a magnetic field by passing the DC voltage through its winding, hence north, and south poles of the stator generated. These two poles of the stator are come to interact with the two-pole insert mounted rotor which provides a torque. As a result of this, the rotor starts rotating.

5.2.3 Bearing

Bearing is an important part of the Dc motor, which provides the shaft of the rotor to move freely. There are many types of bearing Ball Bearing, plain bearing, fluid bearing, etc. In our project, we use plane bearing, which provides no friction to the rotor's shaft, when the rotor starts rotating, this bearing reduces the friction of the rotor shaft.

5.2.4 Varnish

The varnish insulates the coils of the transformer, armature coil, motor winding, and different electric generator parts against arc. As well it protects these parts from corrosion and moisture. The varnish is a highly insulating coating with excellent corona resistance. In our project, we implement the varnish on the stator winding to insulate the wire winding with the stator's body. Also, this varnish prevents the binding coil from corrosion.

5.2.5 Switching Circuit

When we run the project on direct DC Supply, the poles of the stator generated, and poles of the permanent magnetic rotor come to interact with each other, then the motor takes a step. After a single step, the poles of the rotor and stator got locked/ stuck. At that time, the response of the motor is just like a stepper motor. To overcome this problem, we need to provide the changing magnetic poles mechanism on the stator (As in a dc machine commutator provide alter poles to the rotor). For this switching, we use Arduino and a Relay to provide changing magnetic poles on the stator. Fig. 5.1 shows a simple Switching Circuit:

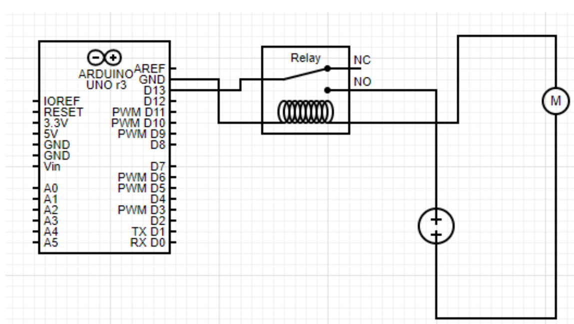

Figure 5.1: Switching Circuit

5.2.6 Flow Chart

Fig. 5.2.6 shows a Flow Chart for our Project:

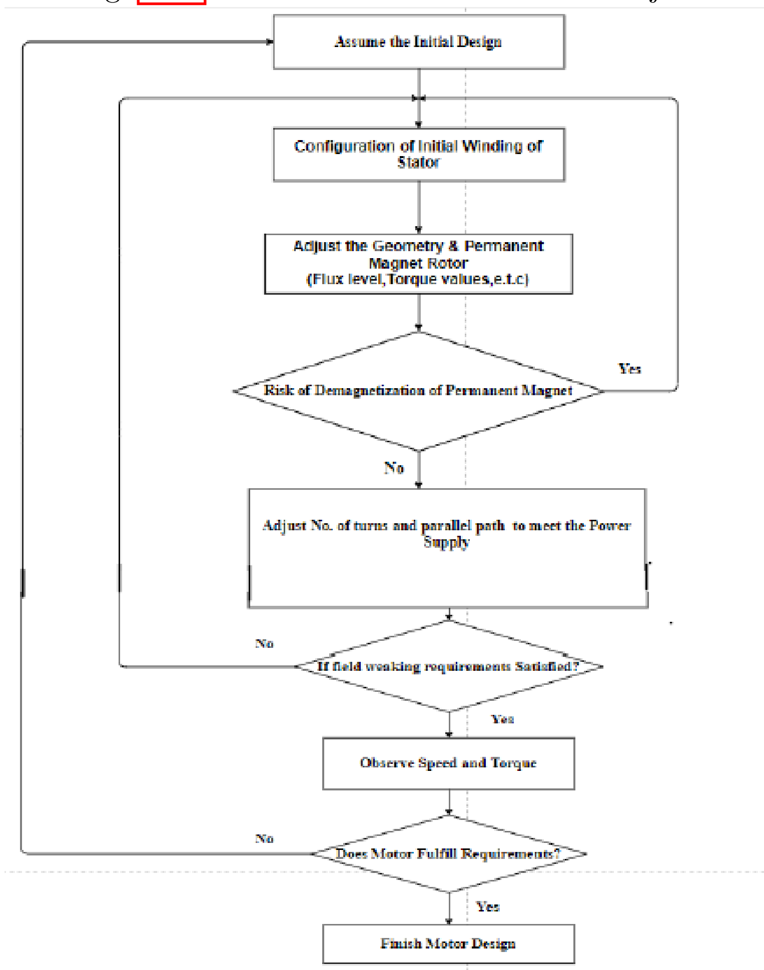

Figure 5.2: Flowchart of Winding Less Permanent Magnet Rotor Based Electric Motor

Chapter 6

Evaluation

6.1 Ideal Case

In the case of squirrel cage and rotor winding motor due to no conductors increased in the rotor, some of the losses occur in these rotor windings or plates. Due to this, the efficiency of the rotor is decreased. In the case of a simple dc motor, the commutator is used to change the rotor poles. Where some of the losses occur across carbon brushes of the commutator. let we have a circuit of which is given below.
Given below is the figure for the equivalent circuit model of the armature. The induced armature voltage, E_A is represented by a voltage source, connected via two brushes to the rest of the circuit. The armature winding resistance is R_A, and the terminal voltage is V_T. The armature circuit equation is

$$V_T = E_A + I_A R_A$$

In our project case, we use a permanent magnet instead of armature winding, so there is no voltage drop across the rotor. Hence all the applied voltage is given to the motor. So there are no I^2r losses in the rotor, and hence the efficiency of this motor will increase.Fig. 6.1 shows a Equivalent Circuit of a DC Motor Armature:

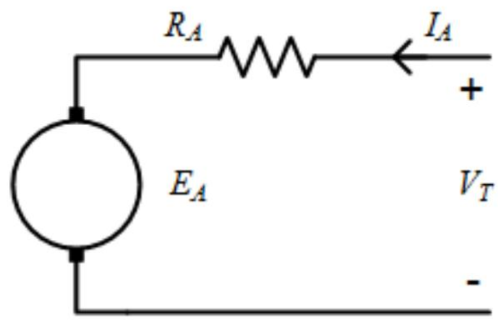

Figure 6.1: Equivalent Circuit Model of a DC Motor Armature

In the designing of our winding less rotor based dc motor, we have the following evaluation, which is given below.

6.2 Stator

In this project, we have designed two stator one stator is consist of 4 pole winding and the other stator consist of 2 pole winding. In 4 pole winding, we use 26 gauge dc wire. The body of stator is made of iron sheets. Our stator consist of 24 slots which have slot difference is 4 and 2. In slot difference 4 is the number of turns of coil passing through the slot is 190. On the other hand, in which slot difference is 2, the passing number of turns of coil is 180.According to the Formula of Faraday's Law "When the magnetic flux linking a circuit changing, an electromotive force is induced in the circuit proportional to the rate of change of the flux linkage.

$$Emf = L\Delta\phi/\Delta t$$

This induced emf field comes to interact with the field f the permanent magnetic rotor.

6.3 Rotor

In our project, we use surface permanent magnetic (SPM) in which the permanent magnet is mounted over the rotor. The area of one piece of the permanent magnet is 6 cm. The length of the rotor is 6.5 cm, and the diameter of the rotor is 4cm. After mounting the permanent magnet, the total diameter of the rotor is 5.2 cm. The thickness of the permanent magnet is 1.7 cm.

6.4 Shaft

In our project, the Length of the shaft is 20 cm, and also the diameter of the shaft is 1.5 cm.

6.5 Bearing

In our project, we put the 3.7 cm bearing in the motor.

Chapter 7

Conclusion and Future Work

7.1 Conclusion

We had designed a Winding less Electric Motor in which we are using a stator and a permanent magnetic rotor. The main idea of using the Permanent Magnet rotor was to eliminate the I^2R losses in the rotor and increase the motor's efficiency. The cost of this motor will be much less than the other motors, and people can easily buy it. In this project, we are using the rectifier to convert Ac voltage to DC voltage. And this Dc voltage will be given to the stator, which will cause the magnetic flux to produce the field winding of this stator.
On the other side, in the rotor, we are using the permanent magnet. When the field of the permanent magnet interacts with the magnetic field of the stator, it will cause the attraction or repulsion process. Because of this attraction or repulsion, torque will be generated, and it will cause the rotor to start rotating. When the rotor starts rotating, the motor works act like a stepper motor. In this, poles of the permanent magnet and poles of the stator get locked, which stops the rotor from rotating. For continuous rotation, we use a switching circuit which provides the stator winding different positive cycle. A simple Brushless Dc motor commutator acts as this switching process, which changes the rotor's pole. In this project, we can't change the poles of the rotor because we mounted the permanent magnet on the rotor's surface. So we have to change the position of the pole on the stator side. In the project, for the switching circuit, we use a controller for the stepper motor circuit. After this, our motor start rotating continuously as the stepper

motor is working.

7.2 Future Work

Our final product, which has been developed, works as designed. Although much time and work have been invested in designing and developing this product, there are still many other ideas that were not developed because of time constraints. For further ideas, first, we have to remove the iron losses which occurring in a permanent magnet. To remove these losses, we fixed the magnet in the proper slots, causing the lifetime of the magnet to increase. With the help of this solution, the efficiency of the dc motor will increase. If we use a high-quality magnet instead of a local magnet, the DC motor's efficiency will increase because a high-quality magnet has a strong magnetic field. Due to this strong magnetic field, the speed of the rotor will increase. For no friction between the shaft and frame of the Dc motor, we use a high-quality type of bearing.

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[4] Chengyuan He* and Thomas Wu*. “Brushless Permanent Magnet Motor Design For The Electric Impact Wrench System”. In: (2018).

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Submission Form for

PROJECT MILESTONES

CUI-WAH-ECE-DP-13F (revision 1.4)

Dated: ______________________________

Project Plan should be for full two semesters.

PROJECT INFORMATION:

PROJECT ID		NUMBER OF MEMBERS	4

TITLE	WINDING LESS ROTOR BASED ELECTRIC MOTOR

No.	STARTING WEEK DATE	DESCRIPTION OF MILESTONE	DURATION IN WEEKs
1	2-Sep-2019	Literature Review	8 Weeks
2	2-Nov-2019	Searching the Parts of the Project	4 Weeks
3	2-Dec-2019	Collecting the Components of the Project	8 Weeks
4	1-Feb-2020	Designing of a Motor	8 Weeks
5	2-Apr-2020	Finalizing the Project Model	2 Weeks
6	3-May-2020	Testing and Debugging Errors	6 Weeks
7	6-Jun-2020	Project Report Writing	2 Weeks
8	20-Jun-2020	Presentation for our Project	3 days
9	23-Jun-2020	Final Meeting and Hand Over	1 Week

Supervisor's Signature