A Design And Fabrication Of Magnetic Transmission System

Atul Balasahab Thube
Student
Department of Mechanical Engineering
Samarth Group of Institution College
Engineering University of Pune, Maharashtra, India

Sumit Laxman Vishwasrao
Student
Department of Mechanical Engineering
Samarth Group Of Institution College of
Engineering University of Pune, Maharashtra, India

Trushant Shivdas Jadhav
Student
Department of Mechanical Engineering
Samarth Group of Institution College of
Engineering University of Pune,Maharashtra India

Krushna Chandrasen Gholap
Student
Department of Mechanical Engineering
Samarth Group of Institution College of
Engineering University of Pune, Maharashtra, India

Prof. Bhausaheb Parashram Kolhe
Asst.Professor
Samarth Group of Institution College
of Engineering, Belhe.

ABSTRACT

This project explains the concept, of design and prototype of magnetic transmission system in our project. Magnetic transmission become interesting area for research in last year. In this Several transmission have been developed by all of these transmission system required maintenance, lubrications . The Time and money required to maintain in these transmission system in our project. We research on the contactless transmission system in this transmission system that we use neodymium magnets. These magnets are in 12 times stronger than the normal speaker magnets. So there is no contact between two gears and motion is transmitted through magnetic field. So no longer sustainance required as lubrication, and no wear of gears.

Keywords: *Contactless, Frictionless, Magnetic, Drive System***.**

1. Introduction:-

The power of transmission in mechanical in most important machines, and it is commonly achieve in the use of gear of transmissions. Mechanical gear transmission has a high torque densitys but the frictions occurs in them and which is often the cause of the gear failures. Also the noise is heated and vibration are presents so the reliability of these gears is decres. it is higher and more taken care of the energy conservation and therefore the environment as well as when design the new product. The goal is to decress the noise vibration to simplify maintenance is higher and it decres the heat and reduce Measurements. The magnetic gear are the new type of gears which attracts the attention of the constructors because of the possibility to overcomes and in these some of these problem. These are noncontact gears where the power and torque transmissions is achieve with the help of these magnetic force. Friction wear and fatigue are these is not present in magnetic gears they do not require lubrications and they can be applied as per as protective mechanism against overloadings.

1.1 Problem statements

Power Transmission is significant part in industry and automobile and other sector. When Power transmission comes mechanical gears also comes but life of mechanical gear diminish due to friction and wear. Failure due to

Overload and improper periodic lubrication and maintenance

2.0 Objectives

1) Reduce Friction and wear and expand life cycle of gear by implementing magnetic gear.
2) Avoid Failure during overload and overheated condition.
3) Reduce Noise, Vibration by contactless power transmission.
4) Avoid Periodic lubrication and maintenance.
5) Reduce overall cost of system.

Scope:-

1..Magnetic gears are becoming competitive alternatives to conventional gears. They present no contact and no wear. They do not produce debris and they do not require lubricant, being able to be run at abroad range of temperature ranging from -270ºC up to 350ºC.

2.They present integral anti-jamming properties and there is a clutching effect if the applied torque outstrip a limit therefore protecting the output from overloads. This effect is entirely reversible without any damage or wear. This technology is recently increasing making it available for consideration for aerospace uses. The radically different behavior against torque overloads, the isolation of vibrations, the absence of sustainance, the compatibility with sand or dust, broad temperature range and the through wall capability are some properties that make these devices enticing for aerospace and other future applications.

2.1 SELECTION OF PARTS :-

1) **Neodymium Magnets:** Neodymium Magnets are 12 times stronger than normal speaker magnets. so we choosethese magnets for better result

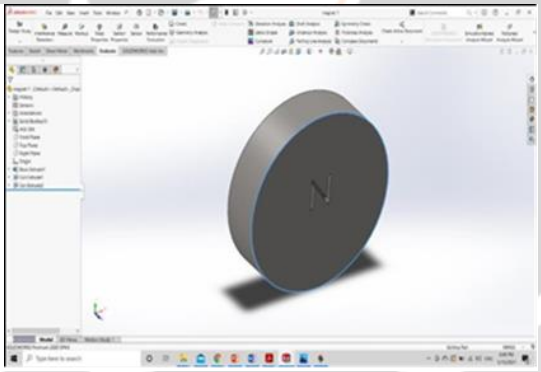

Fig -1: Disc magnet with diameter 20mm and thickness 5mm

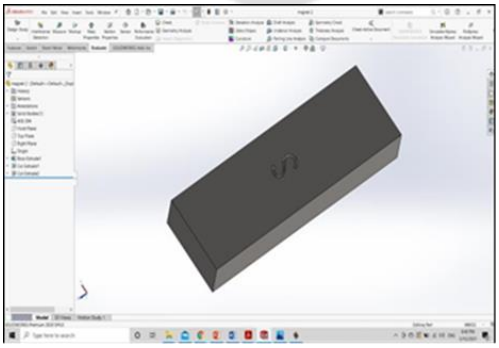

Fig. 2: Rectangular Magnet

- Rectangular magnets with 30 mm Length 20 mm Width and5mm Thickness

2.2 Housing Bearing:

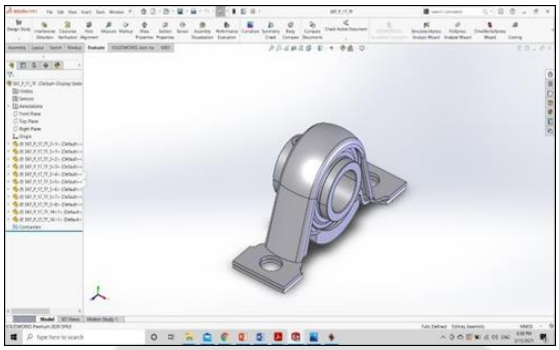

Fig 3: Housing Bearing

Housing bearing with Internal Diameter 20 mm.

2.3 Nut and Bolt:

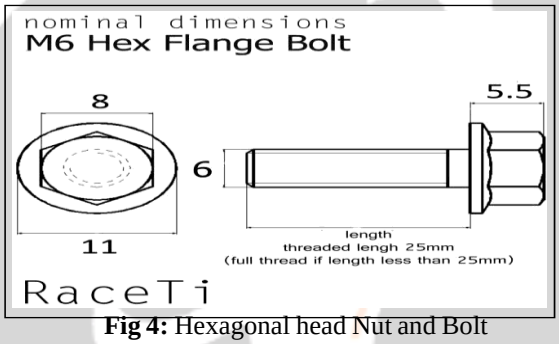

Fig 4: Hexagonal head Nut and Bolt

We use M10 tread Hexagonal head not and bolt. These nutand Bolt easily available at low cost.

2.4 Motor:

Fig 5: Motor

We use motor in prototype model to rotate one shaft and then this motion transfer to another shaft using magnets.

3.0 DESIGN OF COMPONENTS

1) **Nylon Gears:** We use nylon material for making gears wheel. In this gear wheel 20 mm diameter and 5 mm thickness slot machined to mount disc magnet.

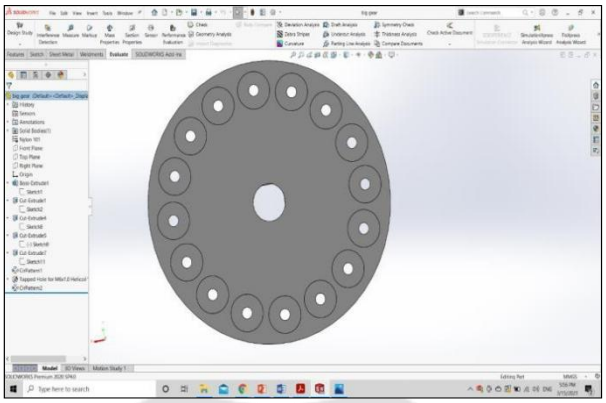

Fig 6: Nylon Big Magnetic Wheel

Nylon wheel with outside diameter 150mm and Internaldiameter 20 mm.

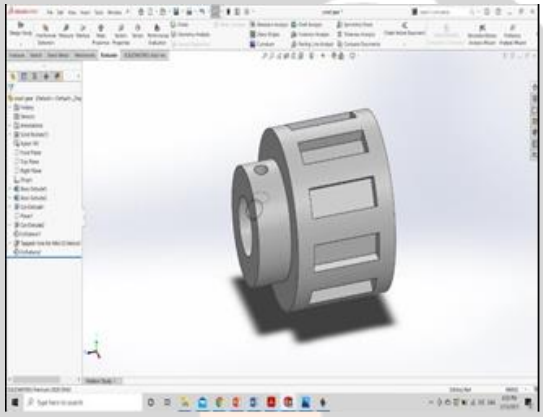

Fig 7: Nylon Small Magnetic Wheel

Nylon wheel with 60 mm ouside diameter and 20 mm inside diameter. Slot machined on wheel outside diameter with 30mm length 10mm width and 5 mm thickness.

1. Square Tube Frame :

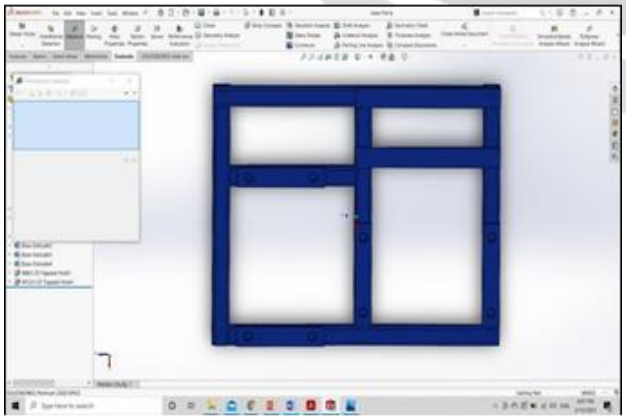

Fig 8: Square Tube Frame

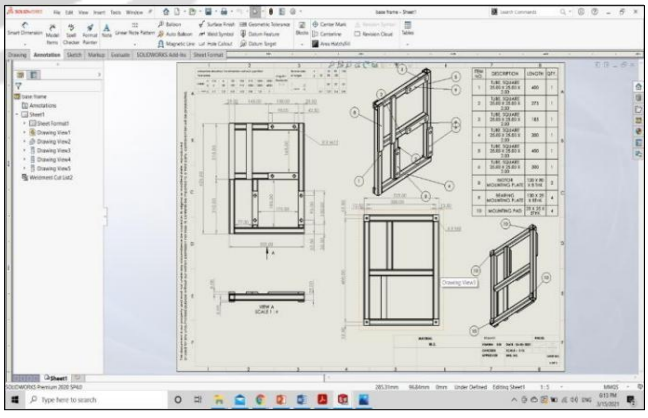

Fig 9: Drawing of Square Tube Frame

4.0 Design Of shaft :

Solid Shaft with 20 mm outside diameter and 285 mm Length on which nylon gear wheel get mounted and these shaft mounted in housing bearing.

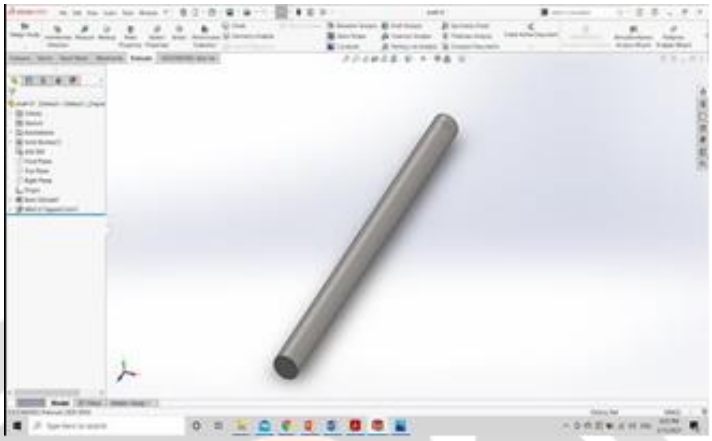

Fig 10: Shaft

4.1 ASSEMBLY OF PROTOTYPE MODEL

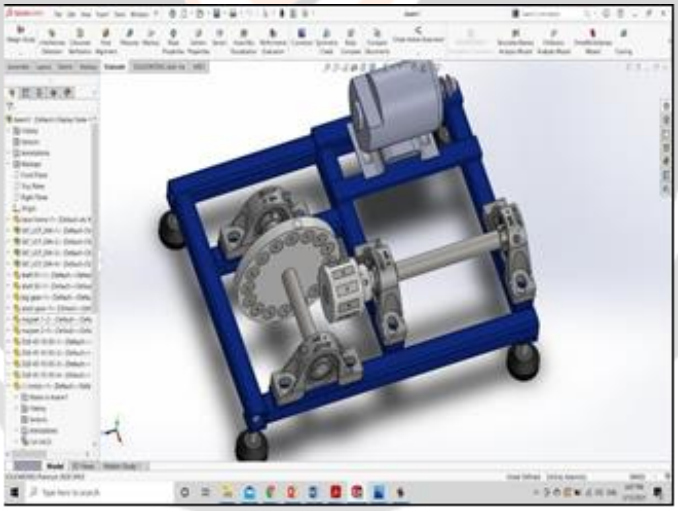

Fig 11: Assembly of prototype moto

POWER OUTPUT

We have motor having,

Rated RPM-4000

Rated Power-62.14watt

From above data,

I/P Power = (Rated Power*I/P RPM) / Rated RPM

Sr. No.	Drive Gear RPM	Input Power (Watt)
1	140	2.2
2	290	4.3
3	460	6.8
4	590	8.7
5	760	11.2

Now, we have to calculate Slip,

Slip = ((I/P RPM – O/P RPM) / I/P RPM) * 100%

Sr. No.	Drive Gear RPM	Driven Gear RPM	Slip (%)
1	140	140	0.0%
2	290	280	3.4%
3	460	440	4.3%
4	590	560	5.1%
5	760	720	5.3%

Further we calculate O/P Power (w),

O/P Power = I/P Power*(1-Slip)

Sr. No.	Input Power (Watt)	Slip (%)	Output Power (Watt)
1	2.2	0.0	2.2
2	4.3	0.0	4.2
3	6.8	0.0	6.5
4	8.7	0.1	8.3
5	11.2	0.1	10.6

5.0 COST ESTIMATION

Cost estimation may be defined as the process of forecasting the costs that must be estimated to manufacture a product. These expenditures take into a consideration all expenditure involved in a design and manufacturing with all related services facilities such as grinding, turning, welding, assembly as well as a portion of the general administrative and selling costs.

6.0 PURPOSE

1. To determine the selling price of a product for a quotation or contract so as to ensure a reasonable profit to the company.
2. Check the quotation supplied by vendors.
3. Determine the most cost effective process or material to manufacture the product
4. To define standards of production performance that may be used to control the cost

TABLE 2: Operational cost

Sr. No	Part Name	Qty.	Amount
1	Neodymium Magnets disc	16	1600
2	Neodymium magnets	10	1400
3	Frame with Welding	1	2000
4	Housing Bearing	4	1000
5	Nut And Bolts	10	200
6	Small and Big Gear with machining	2	3000
7	Motor	1	2000
8	Rod with machining	2	1500
		Total	12700

7.0 ADVANTAGES & APPLICATIONS

ADVANTAGES

- Make System without physical contact hence no friction, wear or vibration.
- Achieve higher transmission efficiency.
- Make system easy to maintenance.
- Reduce maintenance effort.
- Reduce overall cost of system

APPLICATIONS Industrial Application:

Turbine Generators:
- Key drivers: reduce weight + increase reliability
- Non-contact gearbox or integrated gearbox / generator

Energy Storage Flywheels:
- Commercial power utility back up
- Off-grid renewably-generated energy storage

Gearing For Drilling Motors:
- adapt high speed to high torque for drilling
- Isolation of drill bit axial / thrust loads from motor

Robotics:
- Easy movement's arms for other parts
- Less constraints in motion

- Reliability

8.0 FUTURE SCOPE

Magnetic gears are becoming competitive alternatives to competing gears. They present no contact and no wear. They do not produce debris and they do not require lubricant, being able to be operated at a wide range of temperature ranging from -270ºC up to 350ºC. They present inherent anti-jamming properties and there is a clutching effect if the applied torque exceeds a limit therefore protecting the output from overloads. This effect is entirely reversible without any damage or wear. This technology is recently increasing making it available for consideration for aerospace uses. The radically different behavior against torque overloads, the isolation of vibrations, the absence of sustenance , the compatibility with sand or dust, wide temperature range and the through wall capability are some characteristics that make these devices attractive for aerospace and other future applications.

9.0 CONCLUSIONS

MGs potentially have high efficiency and dependability due to their contact-less operation, overload security and little to no sustenance. Magnetically geared machines have appeared as a new class of electrical machine with high torque density. Several topologies have been proposed and further study is needed to ascertain their merits.

Contact less Transmission done with no Noise, no wear and tear of gear, no periodic lubrication and sustenance required.

10.0 REFERENCES

[1]. Pushman M. Tlali (M 014) was born in Leribe, Lesotho in 1987. He received his BEng in Electrical and Electronic Engineering at Stellenbosch University, South Africa in 2012. He is currently pursuing his MScEng degree in the field of electrical machines. His research interests are in the optimal design of magnetically geared electrical machines.

[2]. Rong-Jie Wang (M 000-SM 008) received the PhD(Eng) degree from Stellenbosch University in 2003. He is currently an Associate Professor in the Department of Electrical and Electronic Engineering of Stellenbosch University. His research interests are computer-aided design and optimization of electric machines, computational electromagnetics and thermal modeling of electric machines. He has published more than 50 journal and conference papers and was a co-author of the monograph Axial Flux Permanent Magnet Brushless Machines (2nd ed., Springer 2008).

[3]. Stiaan Gerber (M 013) was born in Bellville in South Africa on February 20, 1986. He received his BEng (cum laude) in the field of Electrical and Electronic Engineering with Computer Science at Stellenbosch University in 2008 and his MScEng (cum laude) in 2011. He is currently studying towards his PhD in the field of electrical machines, with specific focus on magnetically geared electrical machines. His main interests in the engineering field are electrical machine design, numerical optimization, renewable energy power generation and finite element methods.