MAGNETICALLY LEVITATED MINI WINDMILL ARRAY TOWARDS POWERING HYBRID VEHICLES

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Abstract:

In this project we are proposing a mini windmill array which can be used for harnessing energy to power hybrid vehicles while moving from the wind energy. We propose the use of magnetically levitated windmill for this project for the purpose of minimizing the frictional losses so that we can convert lesser wind speeds into significant electrical energy. As a first step towards the project, in this semester we designed a 3D coil and verified different parameters of the coil like inductance, resistance, voltage for one coil and we also verified these parameters for 2 coils which are connected in series and parallel. we will generate electromotive force (EMF) in the coil and we also verify ohms law. The material that we used for coil is copper. We have used COMSOL Multiphysics for the design.

Highlights:

> **We have two types of windmills – HAWT, VAWT.**

> **HAWT- Horizontal axis wind turbine**

> **VAWT- vertical axis wind turbine.**

> **VAWT windmills uses wind efficiently than HAWT**

> **Maglev windmills doesn't have friction due to absence of ball bearings.**

> **Maglev windmills rotate even at low winds.**

> **We are using Neodymium magnets to suspend the rotor over the stator.**

Working Design

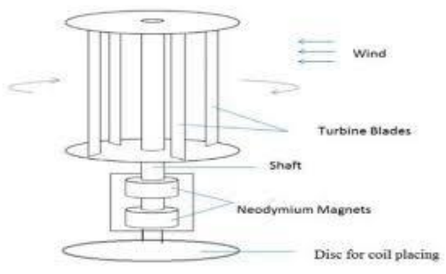


Fig 1.1

WORKING MECHANISM

> Magnetically levitated windmill will rotates in a vertical Axis.
> It consists of Neodymium magnets, Rotor, stator, blades or wings, coils and shaft.
> Neodymium magnets are placed in such a way that exactly repel each other and responsible for suspending the rotor over the stator.
> Coils and normal magnets are placed in stator and some more magnets are placed in rotor which is facing opposite to stator the rotor will rotate with the help of wind.
> When the rotor rotates it produce an electricity which is due to the change in magnetic field.

Coil Design

Fig 1.2

> We designed a coil in COMSOL Multiphysics and the material we used is copper.
> In fig 1.2 is a 5.5 turns of copper coil with radius of 20mm.
> In that coil we varied different parameters like inductance and resistance with respect to change in number of turns, Radius and Axial pitch of coil.

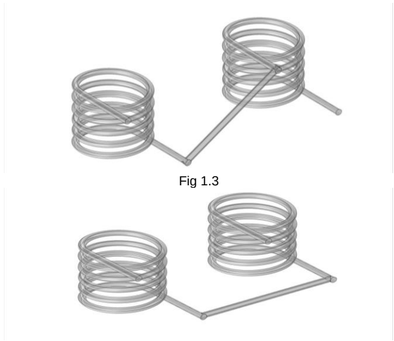


Fig 1.3

Fig 1.4

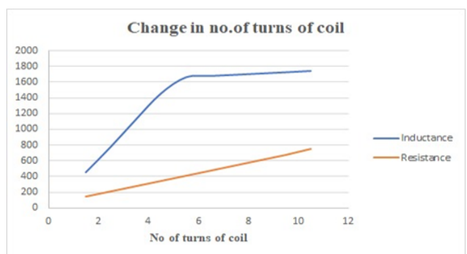
Series and parallel connection coils

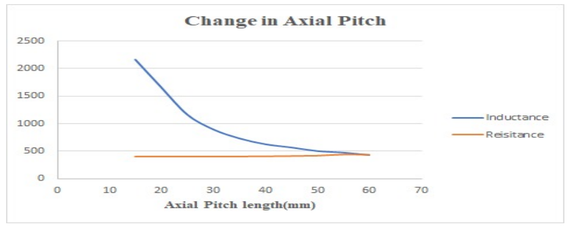
> The fig 1.3 and fig 1.4 is a 5.5 turns of copper coil with radius of 20mm are connected in series and parallel.

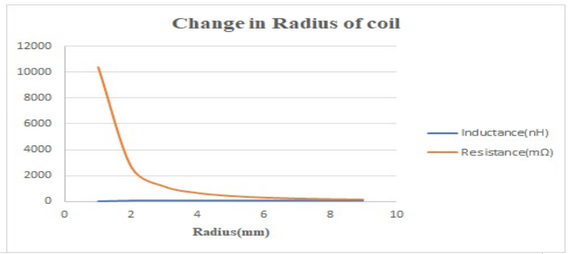
> In that coils we varied different parameters like inductance and resistance with respect to distance between the two coils.

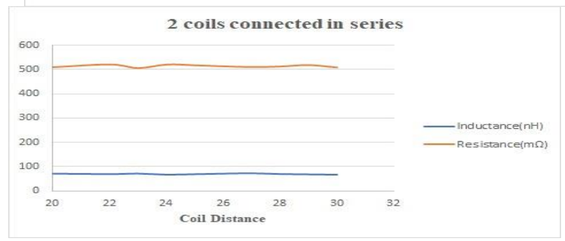
> In series and parallel connection, we varied 20cm to 30cm distance between two coils by increasing 1cm.

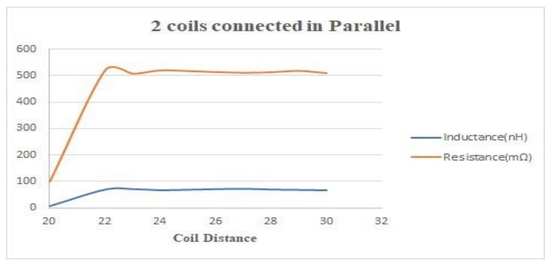
Results











Conclusion

We observed different parameters like Inductance, Resistance with respect to change in no. of turns, change in Axial Pitch, Change in Minor radius of the coil. As of now in this project we designed coil in this semester in the upcoming semesters we will make a prototype and we will measure the actual current and voltage of the windmill.