



# PROTOTYPING OF DESIGN FOR MAGNETIC LEVITATION AND PROPULSION SYSTEM FOR ROAD WAYS

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**ABSTRACT** - The search for alternative fuels and automotive drives are increasing day-to-day researchers are trying to develop a solution for this problems but they can't get solution for most of the problems and implementing the alternating fuel with replacing of combustion engine is also a challenging one. thus here we are in depth to create a electromagnetic operated vehicle, that could take us to next generation. this electromagnetic propulsion vehicle also have the suspension directed by the electromagnetic drive.

## INTRODUCTION

Nowadays, we see technology in automobiles is getting increased day to day life. And this development is making us decrease the defects that we are expertise in earlier. And also customers of various automobile company plan to get more comfy in their automobiles. This one leads to make luxury car with high in maintenance and also cost. Here, this is the paper that deals with making a new technology in cars. And we are in hope that this idea can help us in future to reduce the cost of automobiles mainly based on the fossil fuels burning .etc.,

## MAGTION BIKE (MAGNETIC LEVITATION BIKE):

This idea is similar to working of mag-levtrains .the mag-lev trains has set a speed record of 603Km/h (At high speed). and this is a electrically operated trains in which superconductors and electromagnets are used to run across countries and also to long networks inside their countries. And this idea of magtion bike is to use the e-bikes with the speed of 200Km/h .so that we can extend the use of this magtion bike more than the gasoline fueled bike. If this emerge into revolutionizing our world then we can save the fossil fuel for our future generation. Along with this there are no carbon dioxide

emissions and the running of the train is significantly quieter than other trains, trucks or airplanes.

## MAG-LEV TRAINS:

In a maglev trains primary coil assembly lies below the reaction plate. There is a 1-10cm (0.39-3.93 inch) air gap between that eliminates friction , allowing for speeds upto 500 km/h(310 mph).an alternating electric current is supplied to the coils, which creates a polarity of the magnetic field. This pulls train forward from back. A typical MAGLEV trains costs three cents per passenger (not including construction costs). This compares to 15 cents for passenger per miles for travel by plane and 30 cents for ton mile for traveling through intercity express. Maglev tracks have high longevity due to minimal friction and an even distribution of weight. Most last for atleast 50 years and requires little maintenance during this time. Maglev trains are promoted for their energy efficiency since they run on electricity which can be produced by coal , nuclear , hydro ,fusion , wind or solar power without requiring oil. On average most trains travel 483 km/hr(300mph) an use 0.4 mega joules per passenger mile. Using a mi/gallon car with 108 people as a comparison , travel by car is typically 97km/h (60 mph)and uses 4 megajoules per passenger mile.

## BASIC CONCEPTS ON ELECTROMAGNETISMS:

## MAGNETIC LEVITATION:

Magnetic levitation or magnetic suspension (mag-lev) is a method by which an object is suspended



with no support other than magnetic fields. Magnetic force is used to counteract the effects of the gravitational acceleration and any other accelerations.

The two primary issues involved in magnetic levitation are

lifting force: providing an upward force sufficient to counteract gravity.

Stability: ensuring that the system does not spontaneously slide or flip into a configuration where the lift is neutralized.

Why is Maglev important? There are four basic reasons.

**First**, Maglev is a much better way to move people and freight than by existing modes. It is cheaper, faster, not congested, and has a much longer service life. A Maglev guide way can transport tens of thousands of passengers per day along with thousands of piggyback trucks and automobiles. Maglev operating costs will be only 3 cents per passenger mile and 7 cents per ton mile, compared to 15 cents per passenger mile for airplanes, and 30 cents per ton mile for intercity trucks. Maglev guide ways will last for 50 years or more with minimal maintenance, because there is no mechanical contact and wear, and because the vehicle loads are uniformly distributed, rather than concentrated at wheels. Similarly, Maglev vehicles will have much longer lifetimes than autos, trucks, and airplanes.

**Second**, Maglev is very energy efficient. Unlike autos, trucks, and airplanes, Maglev does not burn oil, but instead consumes electricity, which can be produced by coal-fired, nuclear, hydro, fusion, wind, or solar power plants (the most efficient source now being nuclear). At 300 miles per hour in the open atmosphere, Maglev consumes only 0.4 mega joules per passenger mile, compared to 4 mega joules per passenger mile of oil fuel for a 20-miles-per-gallon auto that carries 1.8 people (the national average) at 60 miles per hour (mph). At 150 mph in the atmosphere, Maglev consumes only 0.1 of a mega joule per passenger mile, which is just 2 percent of the energy consumption of a typical 60-mph auto. In low-pressure tunnels or tubes, like those proposed for Switzerland's Metro system, energy consumption per passenger mile will shrink to the equivalent of 10,000 miles per gallon.

**Third**, Maglev vehicles emit no pollution. When they consume electricity, no carbon dioxide is emitted. Even if they use electricity from coal- or natural-gas-fired power plants, the resulting CO<sub>2</sub> emission is much less than that from autos, trucks, and airplanes, because of Maglev's very high energy efficiency.

Maglev has further environmental benefits. Maglev vehicles are much quieter than autos, trucks, and airplanes, which is particularly important for urban and suburban areas. Moreover, because Maglev uses unobtrusive narrow-beam elevated guideways, its footprint on the land is much smaller than that of highways, airports, and railroad tracks.

**Fourth**, Maglev has major safety advantages over highway vehicles, trains, and airplanes. The distance between Maglev vehicles on a guide way, and the speed of the vehicles, are automatically controlled and maintained by the frequency of the electric power fed to the guide way. There is no possibility of collisions between vehicles on the guideway. Moreover, since the guide ways are elevated, there is no possibility of collisions with autos or trucks at grade crossings.

Magnetic levitation is used for mag-lev trains, contactless melting, and for product display purposes.

#### **LIFT:**

Magnetic materials and systems are able to attract or press each other apart or together with a force dependent on the magnetic field and the area of the magnets, for simplest example for lift is a dipole magnet positioned in the magnetic field of another dipole magnet oriented with like poles facing each other, so that the force between magnets repels the two magnets.

Essentially all types of magnets have been used to generate lift for magnetic levitation; permanent magnets, electromagnets, diamagnetism, superconducting magnets and magnetism due to induced current in conductors.

To calculate the amount of lift, a magnetic pressure can be defined.



For example, the magnetic pressure of a magnetic field on a superconductor can be calculated by

$$P_{\text{mag}} = B^2/2\mu_0$$

Where  $P_{\text{mag}}$  is the force per unit area in pascals,  $B$  is the magnetic field just above the superconductors in teslas and  $\mu_0 = 4\pi \times 10^{-7} \text{ N.A}^{-2}$  is the permeability of the vacuum.

### MAGNETIC PRESSURE:

Magnetic pressure is an energy density associated with a magnetic field. Any magnetic field has an associated magnetic pressure contained by the boundary conditions on the field. It is identical to any other physical pressure except that it is carried by the magnetic field rather than (in the case of the gas) by the kinetic energy of gas molecules. A gradient in field strength causes a force due to the magnetic pressure force.

The magnetic pressure force is readily observed in an unsupported loop of wire. If an electric current passes through the loop, the wire serves as an electromagnet, such that the magnetic field strength inside the loop is greater than the field strength just outside the loop. This gradient field strength gives rise to a magnetic pressure force that tends to stretch the wire uniformly outward. If enough current travels through the wire, causing to fracture, or even explosively fragment. Thus management of magnetic pressure is a significant challenge in the design of ultra-strong electromagnets.

The force (in cgs)  $F$  exerted on a coil by its own current is

$$F = I^2/c^2 R [\ln(8R/a) - 1 + Y]$$

Where  $Y$  is the internal inductance of the coil, defined by distribution of current.  $Y$  is 0 for high frequency currents carried mostly by the outer surface of the conductor, and 0.25 for D.C currents distributed evenly throughout the conductor.

Interplay between magnetic pressure and organic gas pressure is important to magneto hydro-dynamics and plasma physics. Magnetic pressures also be used to

propel projectiles; this is the operating principle of the rail gun.

If any currents present are parallel to a magnetic field, then field line follows the shapes in which the magnetic pressure gradient is balanced by the magnetic tension force. Such a field configuration is called force-free because there is no Lorentz force ( $\mathbf{j} \times \mathbf{B} = 0$ ). The familiar potential magnetic field is a special case of a force free field: Potential field configuration occupy space that contains no electric current at all.

The magnetic pressure  $P_B$  is given in S.I units ( $P$  in Pa,  $B$  in T,  $\mu_0$  in H/m) by

$$P_B = (B^2/2\mu_0)$$

And in cgs units ( $P$  in dyn/cm<sup>2</sup>,  $B$  in G) by

$$P_B = (B^2/8\pi)$$

In practical units,

$$P_B[\text{bar}] = (B[\text{T}]/0.501)^2.$$

### WORK DESCRIPTION FOR MAGTION BIKE:

Mag-lev trains have 2 circuits, the first one is called primary electromagnetic circuit that is enabled with the rail. And the second circuit is called secondary electromagnetic (or) superconductive circuits with passing current. Thus this circuit acts as same pole permanent magnet which repels each other to create a levitation. Thus this electromagnetism in the coil causes forward propulsion. Similarly, the mag-lev bikes are designed in same way to have a same propulsion system and also this can suspend the mostly vibration causing machine part (the wheels of the bike) to suspend at a shorter distance with high suspension. Thus this system can help us achieve electromag suspension in bikes. And to help us to go in a speed more than 100 Km/hr. In this system we achieve very much speed in an average cost due to zero resistance between wheels and vehicle as well as have less friction contact between the wheels. Also this magtione bike have a self-propulsion due to electromagnetic propulsion.

### How to design for the magnetic levitation in bikes:



First of all, we need to know about the problems faced by us in design such magnetic levitation bike. To claim a such new idea on road on all suddenly basis is that we are depleting our fossil fuel reserves and are trying to change the mode of fueling fully into electric charger module so that we could use the electrical energy in spite burning and depleting the fossil fuels. But we are still in developing vehicles that could run in electrical energy with high speed nearer to gasoline fueled vehicles. And this scope of idea can be reached only if we are able to design and develop a vehicle in a less cost and also have a speciality nearer to fossil fuel automobiles. Here we are going to reach this by electromagnetic force.

There are numerous design problems. We had to face in this magtion bike but since we are in the startling stage we have the ideas and hopes to create them. the main idea and concept is based on the magnetic wheels and mudguards.

### Designing of wheel section:

The wheel is designed for having magnetic levitation and also this should give us a less friction on speed to get the maximum we were trying to adopt these with an innovation. for such design of wheels as shown and the markings describe the poles of each magnet showing for propulsion system. The rim is to hold a space for permanent magnet, which is to levitate. And the electromagnets at the rim position to levitate at correct position and to hold against the ground.

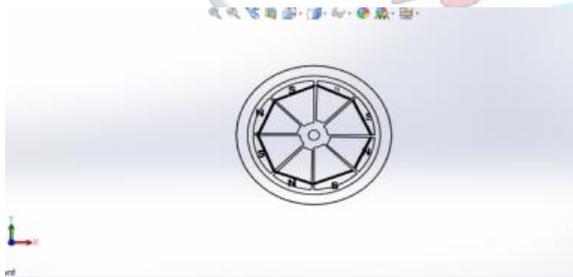


Fig. 1. Design in 2d view

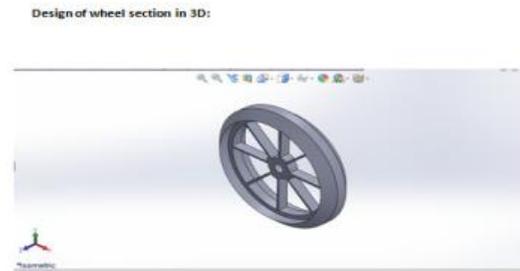


Fig.2. shows the side view wheel section diagram in using solidworks.

### DESIGN OF MUD-GUARD:

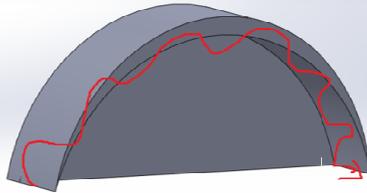
Mud guard in normal vehicle is to have the slots pretending to have electromagnetic slots. And the battery is connected to the middle of the vehicle in near the middle. and this mudguard is covered to the maximum area of the wheel and the coverings are made of sheet metal to avoid magnetic field. The 3D diagram shows just the simple cross section of a mudguard region.



Fig.3. shows the clear cross section of a mud guard region.

And also the mud guard acts such as an engine in this system. In the proposed way the propulsion of wheels are the main system that are going to be attracted by the mud guard magnet.

The alternating current will increase the magnets power in the order to increase in one direction.



**Fig.4.** shows the magnetic field of attraction in a increased following manner for propulsion in the magtion bike.

### SUSPENSION:

As the magtion bike is having levitation on the wheels and driven by same power source through levitation and we can adjust the levitation through magnetic coil adjustment in changing coils magnetic inductance.

### Braking:

The most important part in a vehicle is braking and the wheel braking can have a disc attached to the sudden disc types of brake for sudden engagement of brake. And another brake is like electromagnetic pole reversal.

### CONCLUSION:

The magtion bike is a new and innovative idea and we are in trying to develop this idea further. And the design of this magtion bike is going to be getting harder and can also help us in developing some smart thoughts enduring new way of physics.

### REFERENCE:

1. Lecture 19 MIT 8.02 Electricity and Magnetism, spring 2002
2. J.Bransky, phys.Teach.28,392(1990).
3. A.M.Wolsky, R.F. Giese and E.J.Daniels, scientific American, 260,60(Feb 1989).

4. Michael , GEBICKI (27 Nov 2014). "What's the world's fastest passenger train". Stuff.co.nz. Retrieved 24 Dec 2014.

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