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Review Paper on Magnetic Levitation Train

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ABSTRACT

This paper includes the design, equipment, innovation, application and future employments of "Magnetic levitation trains." The maglev transportation framework is steadier, quicker, financial, and proficient. Maglev frameworks are as of now being used for applications, for example, course, rapid prepares, and assembling. Maglev is a strategy for drive that utilizations attractive levitation to push vehicles with magnets instead of with wheels, axles and course. With maglev, a vehicle is suspended a short separation far from a guide way utilizing magnets to make both lift and push (levitation would not surpass over 10 centimetre's). In future these High-speed maglev trains would give an enormous rivalry to the aeronautics business.

Keywords: Electromagnetic suspension, stability, Guidance, Inductrack, magnetic induction, Electro-dynamic suspension

1. INTRODUCTION

Maglev trains move more easily and to somewhat more quietly than other ordinary trains. And they don't depend on traction or friction, their increasing speed and deceleration are quicker than other trains, they are unaffected of weather. The control required for levitation isn't at all the vast measure of the general vitality utilization; the majority of the power in these trains is used to conquer air protection (drag), as with each rapid type of transport. These trains can move consistently high speeds than the customary trains, they hold **Shwethasingh (1)** clarifies about the Magnetic levitation has an extremely progressed and productive innovation. We can utilization of it in modern reason and additionally in office and home like as the fan in structures, transportation, and atomic reactor, utilization of lift in structural building, toys, and pen. So it has numerous applications which are utilizing as a part of the entire world. It gives the spotless vitality and its all application gives the absence of contact and subsequently no erosion. Attractive levitation enhances proficiency and life of the framework. It reduces the maintenance costs of the system.

2. MAGLEV TECHNOLOGY

This innovation utilizes monorail track with linear motors, these trains move on special tracks rather than the mainstream conventional train tracks. They utilize capable electromagnets to reach at higher velocities, they float around 1-10 cm over the guide way on an attractive field. These trains are impelled by the guide ways. Once the prepare is pulled into the next section the attraction switches with the goal that

the prepare is pulled on again. The electro-magnets run the length of the guide way.

TYPES OF MAGLEV TECHNOLOGY:

2.1. ELECTROMAGNETIC SUSPENSION
2.2. ELECTRODYNAMIC SUSPENSION
2.3. INDUCTRACK SYSTEM

2.1 ELECTROMAGNETIC SUSPENSION:

Electromagnetic suspension (EMS) is the magnetic levitation of a question accomplished by continually adjusting the quality of a magnetic field created by electromagnets utilizing a criticism circle. Much of the time the levitation impact is generally because of perpetual magnets as they don't have any power dissemination, with electromagnets just used to settle the impact.

Numerous frameworks utilize magnetic attraction pulling upwards against gravity for these sorts of frameworks as this gives some inalienable sidelong dependability, yet some utilization a blend of magnetic attraction and magnetic shock to push upwards.

Magnetic levitation innovation is essential since it lessens vitality utilization, to a great extent hindering grating. It likewise maintains a strategic distance from wear and has low upkeep prerequisites. The utilization of magnetic levitation is most ordinarily known for its part in maglev trains.

2.2. ELECTRODYNAMIC SUSPENSION:

Electro-dynamic suspension (EDS) is a type of attractive levitation in which there are conductors which are presented to time-fluctuating attractive fields. This initiates whirlpool streams in the conductors that make a horrible attractive field which holds the two protests separated.

These time shifting attractive fields can be caused by relative movement between two items. Much of the time, one attractive field is a perpetual field, for example, a lasting magnet or a superconducting magnet, and the other attractive field is incited from the progressions of the field that happen as the magnet moves with respect to a conductor in the other protest.

Electro-dynamic suspension can likewise happen when an electromagnet driven by an AC electrical source creates the changing attractive field, at times; a straight enlistment engine produces the field.

2.3. INDUCTRACK SYSTEM:

Inductrack is a latent, safeguard electro-dynamic attractive levitation framework, utilizing just unpowered circles of wire in the track and lasting magnets on the vehicle to accomplish attractive levitation. The track can be in one of two arrangements, a "stepping stool track" and a "covered track". The step track is made of unpowered Litz wire links, and the overlaid track is made out of stacked copper or aluminum sheets.

There are three plans: Inductrack I, which is improved for fast activity, Inductrack II, which is more effective at bring down paces, and Inductrack III, which is expected for overwhelming burdens at low speed.

Inductrack was imagined by a group of researchers at Lawrence Livermore National Laboratory in California, headed by physicist Richard F. Post, for use in maglev trains, in light of innovation used to suspend flywheels.[2][3] At steady speed, control is required just to drive the prepare forward against air and electromagnetic drag. Over a base speed, as the speed of the prepare expands, the levitation hole, lift power and power utilized are to a great extent steady. The framework can lift 50 times the magnet weight.

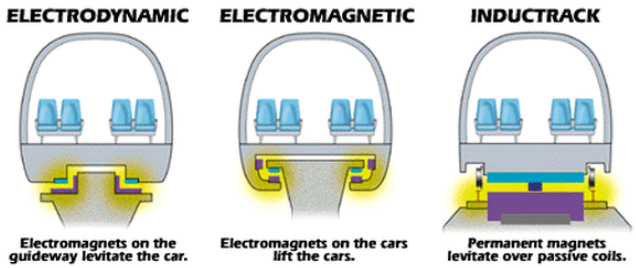

Figure 1. Levitation Techniques.

3. COMPARISION OF MAGLEV AND CONVECTIONAL TRAINS

The more effective railroad is convection rail path at bring down speed. The maglev prepare have low air protection, the absence of moving protection, the keep running on attractive suspend track so it is enhance control proficiency. The heaviness of the electromagnets in numerous EMS and EDS plans appear like a noteworthy outline issue. A solid attractive field is required to suspend a maglev vehicle. For the Transrapid (German maglev), this is between 1 and 2 kilowatts per ton. Another way for levitation is the utilization of superconductor magnets to decrease the vitality utilization of the electromagnets, and the cost of keeping up the field. Most vitality use for the TRS is for impetus and conquering the grating of air protection at speeds more than 100 mph. Convectional trains would weigh not as much as maglev. Since the significant wellspring of commotion of a maglev prepare originates from uprooted air, maglev trains create less clamor than a regular prepare at identical velocities. In any case, an examination presumed that maglev commotion ought to be appraised like street movement while regular trains have a 5– 10 dB "reward" as they are discovered less irritating at a similar din level. Maglev configuration takes out the utilization of braking and overhead wire dissimilar to the convectional one's, they get their electrical supply from ground, their plan is so Aero-dynamical that they reach around 300 mph quick than the convectional rapid trains.

4. CONTROL SYSTEMS

There are no flagging frameworks for high or low speed maglev frameworks. There is no need since every one of these frameworks is PC controlled. Also, at the to a great degree high speeds of these frameworks, no human administrator could respond sufficiently quickly to back off or stop in time. This is likewise why these frameworks require devoted privileges of way and are normally proposed to be lifted a few meters over the ground level.

Two maglev framework microwave towers are in contact with an EMS vehicle constantly for two-route correspondence between the vehicle and the headquarters focus' principle activities PC. There is no requirement for prepare shrieks or horns.

5. DEVELOPMENT OF MAGLEV TRAINS:

There are different factors which are used in the development of maglev trains , these help in movement , stability , guidance etc of a train.

5.1 PROPULSION:

Some EMS systems such as HSST/Linimo can provide both levitation and propulsion using an onboard linear motor. But some EDS systems and some EMS systems are like they can levitate the train using the magnets on board butcannot propel it forward. As such, vehicles need some other technology for propulsion. A linear motor (propulsion coils) mounted in the track is one solution

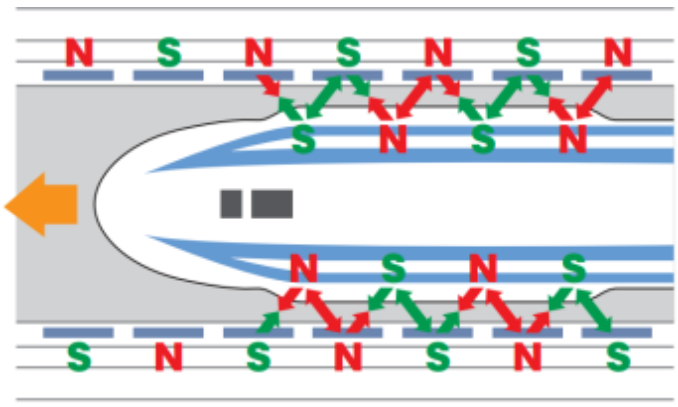

Figure 2. Propulsion

5.2 STABILITY:

As per Earnshaw's theorem, any combination of static magnets cannot be in a stable equilibrium. Therefore a dynamic magnetic field is required to achieve stabilization. EMS systems rely on active electronic stabilization which constantly measure the bearing distance and adjust the electromagnet current accordingly. All EDS systems rely on changing magnetic fields creating electrical currents, and these can give passive stability. Because maglev vehicles essentially fly, stabilisation of pitch, roll and yaw is required by magnetic technology. In addition to rotation, move forward and backward, sway (sideways motion) or heave (up and down motions) can be problematic with some technologies.

5.3 GUIDANCE:

Some systems use Null Current systems (also sometimes called Null Flux systems); they use a coil which is wound so that it enters two opposing, alternating fields, so that the average flux in the loop is zero. When the vehicle is in the straight ahead position, no current flows, but if it moves off-line this creates a changing flux that generates a field that naturally pushes and pulls it back into line. This is the guidance system of maglev trains

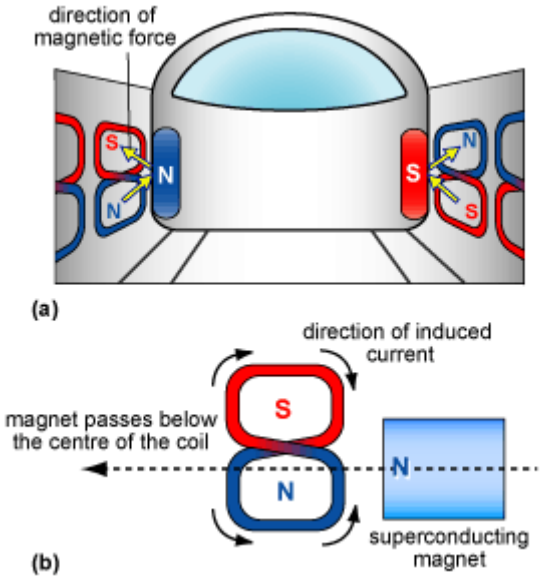

Figure 3. Guidance

6. EVACUATED TUBES:

Evacuated (Airless) tubes are used in maglev train technology, evacuated tubes provide low drag or remove the drag on track, evacuated tube has potential to increase speed and efficiency and also its performance greatly, most of the energy will lost due to aerodynamic drag, there is a risk of exposing of evacuated tube, which could be exposed to the risk of cabin depressurization unless tunnel safety monitoring system can repressing the tube in the event of an abnormal condition or accident.

7. RESULTS AND DISCUSSION

Maglev train has own advantage to reaches the high speed, this advantage enough to compare other conventional trains, maglev train has 500kmph exciting very high speed, tit has no fuel consumption, cost is lower than the flights, it is very faster, effective, require less maintenance use for both transport and public travel.

8. CONCLUSION

Maglev trains consume very less amount of energy compare to other trains, they do not require large engine, motors, etc. in maglev train there is no any ground friction due to that, train reaches its very high speed compare to other trains, in maglev trains only air resistance and drag resistance play its role only, maglev trains require separate track for levitate, initial cost of the maglev train is very high and it may be decrease in near future.

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