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MAGLEV TRAIN : A New Revolution in Magnetic Levitation

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ABSTRACT

This paper reviews and summarizes maglev train technologies from engineering point of views and work over the different part of the world upto last three decades. The purpose of this paper included general understanding, technologies, and worldwide practical projects.

Keywords: Magnetic Levitation , Propulsion, Guidance, Superconductor, Electromagnets.

I. INTRODUCTION

Along with the increase in population and expansion in living zones, transportation services cannot offered cannot offered mass transit anymore. In order to increase in demand of transportation it is necessary to a system must have certain requirements such as rapidity, reliability, and safety with environment friendly, low maintainance, compact and light in weight. “Maglev” or “Magnetic levitation”, is a technology used for high speed surface transportation using maglev train.In which vehicles is lifted from roadway or guideway by using a magnetic field. This paper discusses the development of magnetic levitation, propulsion and guidance.

II. METHODS AND MATERIAL

2.1 Liturature Survey

MAGLEV means magnetic levitation. Magnetic levitation is a way of using electromagnetic fields to leviatate objects without any noise.Maglev is means of floating one magnet over another.this maglev system is divided into two types attractive systems and repulsive systems,which is reffered to as electromagnetic suspension and electrodynamic suspension. Maglev train represents a promising evolution in the high speed graond transportation,offering speeds oin excess of 500 mph.The electromagnets and supercounducting magnets have allowed us to create a magnetic levitation train.A high speed maglev train non contact magnetic levitation,guidance and propulsion system has no wheels and axles . this system is replacement over mechanical system by using electronic applications.

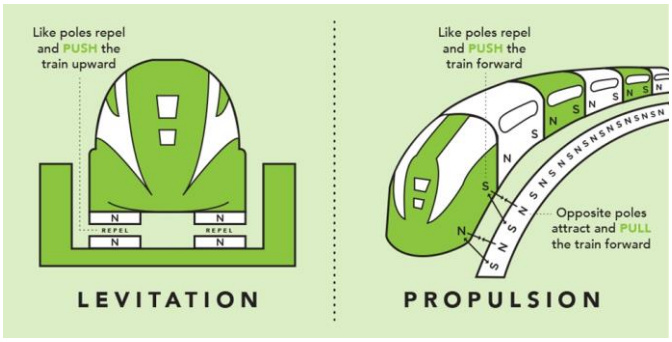

Figure 1: Levitation and Propulsion System

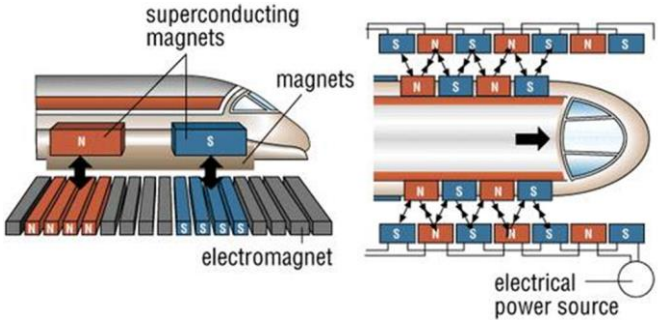

Figure 2: Arrangment of magnets and supercoductors for levitation and propulsion

2.2 World survey

The first patent for magnetically levitated vehicle was granted in 1968 to U.S. scientists Gordon Danby and James Powell [1].The two countries allowing Japan and Germany to take the lead in maglev development. U.S. interest was received in the 1980 but funding was lost around 1992.Based on these studies,the Department of

Transportation will designate one project eligible for $950 million in funding [2].

In 1979,the Germen Ministry of Research & Technology the first maglev vehicle licenced to carry passengers using model TR05. In 1988, the model TR06 set a speed record of 257 mph. In 1989 a prototype commercial service service vehicle TR07, speed record of 271 mph. The Transrapid vehicle frame wraps around the guideway and the car is levitated by magnetic attraction to the underside of guideway.

2.3 India Survey

List of maglev train proposals in india Mumbai-Delhi : A maglev line project was presented to the Indian railway minister Mamata Banerjee by an American company.A line was proposed to serve between cities of Mumbai and Delhi.

Mumbai-Nagpur : The state of Maharashtra also approved a feasibility study for a maglev train between Mumbai and Nagpur about 10,000 km away.It plans to connecting the regions of Mumbai and Pune with Nagpur via less developed hinterland (via Ahemednagar,Beed,Latur,Nanded and Yavatmal).

Chennai-Banglore-Mysore : As per large and medium scale industries Minister of Karnataka Mr.Murugesh Nirani,a report will be prepared by December 2012 and project expected to cost $30 million per km railway track.The speed of maglev will be 350 Km/hr between Banglore and Mysore within 30 minutes.

Pune(Pimple saudagar/Hinjawadi)-Mumbai(Panvel) : The indian ministry was in the process of reviewing the proposal to starting a MAGLEV Train system in india.The complete cost for the project is over $30 billion and a proposal sent by United States to Lalu Prasad, Rail Minister in which advantages of maglev train presented .The planning to have running the first maglev between Mumbai-Pune,which will takes only 30 minutes to travel along the 200Km distance.Pune-Mumbai is expressway where approximately 14000 vehicles travel daily,with fuel consumption of 2 million liters per day.The business proposal reduces the fuel consumption.

III. RESULTS AND DISCUSSION

3.1 Advantages

- **Safe:** Due to the interlocking system with guideway there is no risk of derailment.
- **Accelrates and deaccelrates quickly :** Accelration and deaccelration of vehicle can be rapid and fairly steep grades can be climbed easily.
- **Low maintenance :** There are few moving and rolling parts so wear and tear is less,this ensures easy maintenance of vehicles and guideways.
- **Economical :** There is no axle load on small spans of track so guideway construction costs are quite low.
- **Reduced noise and vibrations :** When the vehicle is running there is no physical contact between the guideway and carriages which minimizes rolling noise and vibration.

3.2 Disadvantages

- **Cost** : Travelling cost is reduced to a great extent but cost of installation is too high

IV. CONCLUSION

The replacement of mechanical components by wear free electronics overcomes the technical restrictions on conventional wheel rail technology that means with traditional railways,maglev systems have features that could constitute an attractive transportation alternative

1) High speed
2) High safety
3) Less pollution
4) Low energy consumption

We have yet to see any maglev system in continuous maglev operation. Obstacles to commercial use of the magnetic levitated train include.

- Expense,especially in guideway construction
- Existence of conventional high speed rail systems
- Possibility of selecting a guideway design that will be incompatible with systems in future

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