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A REVIEW ON THE DEVELOPMENT AND ANALYSIS OF MAGLEV TRAIN

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Abstract- The term "Levitation" refers to a class of technologies that uses magnetic levitation to propel vehicles with magnets rather than with wheels, axles and bearings. Maglev (derived from magnetic levitation) uses magnetic levitation to propel vehicles. Maglev has became the fastest growing technology in the field of railways infrastructure. Maglev trains which are based on the principle of maglev have been compared with high speed transportations such as air transport. High-speed maglev trains promise dramatic improvements for human travel widespread adoption occurs. Maglev trains move more smoothly and somewhat more quietly than wheeled mass transit systems. This paper briefly examines some commercial applications of rare earth magnets and magnetic levitation and summarizes the state of the technology.

Keywords- Levitation, Maglev train, Magnet, Guide-way

I. INTRODUCTION

MAGLEV (derived from magnetic levitation) uses magnetic levitation to propel vehicles with magnets rather than with wheels, axles and bearings. With maglev, a vehicle is levitated a short distance away from a guide way using magnets to create both lift and thrust. Maglev trains move more smoothly and somewhat more quietly than wheeled mass transit systems. Their non-reliance on friction means that acceleration and deceleration can surpass that of wheeled transports, and they are unaffected by weather. The purpose of this article is to analyze a proposed new mode of guided high speed ground transportation (HSGT), Maglev, and evaluate its technical, economic, social and other aspects. The need for high speed ground transportation modes is discussed in the following section. To provide the relevant background and needed understanding of issues involved in introducing a new mode of transportation, the developments in high speed ground transportation are presented. Two sections focus on present status of high speed rail networks and speeds, and Maglev transportation system development weather. The purpose of this article is to analyze a proposed new mode of guided high speed ground transportation (HSGT), Maglev, and evaluate its technical, economic, social and other aspects. The need for high speed ground transportation modes is discussed in the following section. To provide the relevant background and needed understanding of issues involved in introducing a new mode of transportation, the developments in high speed ground transportation are presented. Two sections focus on present status of high speed rail networks and speeds, and Maglev transportation system development.



Fig 1- Maglev High Speed Train

1.1 MAGLEV HIGH SPEED TRAIN

The Magnetic levitation (MAGLEV) technology was first tested in the 1970s, but it has never been in commercial operation on long-distance routes. The technology relies on electromagnetic forces to cause the vehicle to hover above the track and move forward at theoretically unlimited speeds. In practice, the aim is for an operation speed of 500 kph (Taniguchi, 1993). In 2003, a MAGLEV test train achieved a world record speed of 581 kph (Takagi, 2005 [5]. The special infrastructure required for MAGLEV trains means high construction costs and

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no compatibility with the railway network. The MAGLEV is mostly associated with countries like Japan and Germany where MAGLEV test lines are in operation. In Japan, the test line will eventually be part of the Chuo Shinkansen8572 between Tokyo and Osaka connecting the cities in about 1 hour compared with the present 2.5 hours. In China, a short MAGLEV line was opened in December 2003 connecting Shanghai Airport and the city's Pudong financial district with trains running at maximum speed of 430 kph . However, plans to adopt MAGLEV technology for the planned Beijing–Shanghai route were abandoned in favour of a conventional steel wheel-on-steel rail HST . The future of the MAGLEV, it seems, depends on its success in Japan, in the same way the development of the HST depended largely on the success of the first Shinkansen line.

1.2 PRINCIPLE OF MAGLEV TRAIN

Maglev is a system in which the vehicle runs levitated from the guide way (corresponding to the rail tracks of conventional railways) by using electromagnetic forces between superconducting magnets on board the vehicle and coils on the ground. The following is a general explanation of the principle of Maglev. The levitation coils are installed on the sidewalls of the guide way. When the on-board superconducting magnets pass at a high speed about several centimeters below the Centre of these coils, an electric current is induced within the coils, which then acts as electromagnet temporarily. As a result, there are forces which push the superconducting magnet upwards and ones which pull them upwards simultaneously, thereby levitating the Maglev vehicle [3]. EMS systems such as HSST/Linimo can provide both levitation and propulsion using an onboard linear motor. But EDS systems and some EMS systems such as Transrapid levitate but do not propel. Such systems need some other technology for propulsion. A linear motor (propulsion coils) mounted in the track is one solution. Over long distances coil costs could be prohibitive.

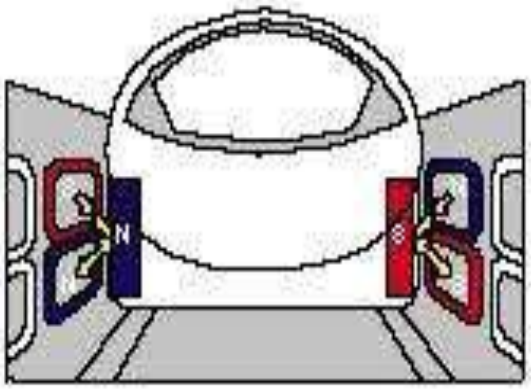


Fig 2- Principle of Magnetic Levitation Train

II. EDS ELECTRO DYNAMIC SUSPENSION

In electro dynamic suspension (EDS), both the guideway and the train exert a magnetic field, and the train is levitated by the repulsive and attractive force between these magnetic fields. In some configurations, the train can be levitated only by repulsive force. In the early stages of maglev development at the Miyazaki test track, a purely repulsive system was used instead of the later repulsive and attractive EDS system. The magnetic field is produced either by superconducting magnets (as in JR–Maglev) or by an array of permanent magnets.

The repulsive and attractive force in the track is created by an in wires or other conducting strips in the track. A major advantage of EDS maglev systems is that they are dynamically stable – changes in distance between the track and the magnets creates strong forces to return the system to its original position. In addition, the attractive force varies in the opposite manner, providing the same adjustment effects. No active feedback control is needed.

III. MAGLEV TRACK

The magnetized coil running along the track, called a guideway, repels the large magnets on the train's undercarriage, allowing the train to levitate between 0.39 and 3.93 inches (1 to 10 centimetres) above the guideway. Once the train is levitated, power is supplied to the coil within the guideway walls to create a unique system of magnetic fields that pull and push the train along the guidway. The electric current supplied to the coil in guidway walls is constantly alternating to change the polarity of the magnetized coils. this change in polarity causes the magnetic field in front of the train to pull the vehicle forward, while the magnetic field behind the train adds more forward thrust.

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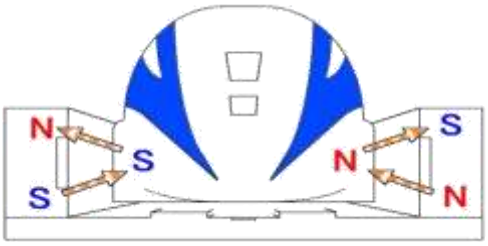


Figure 3. EDS

IV. ANALYSIS OF MAGLEV TRAIN

The Maglev train analysis focuses on three system aspects: cost, speed, and reliability. These performance metrics were chosen because they are the basic characteristics of a train system. Speed is the most common standard used to compare transportation systems and is directly related to the time needed to travel. For the Maglev, speed is an extremely appealing attribute since it can travel over a hundred miles per hour faster than the current high speed rail in the Northeast Corridor. The measure for speed is in miles per hour. Lastly, reliability is the most crucial parameter because knowledge of a transportation system's safety is the determining factor whether or not the system is viable. Passenger safety requires transportation reliability, which is paramount to all other system aspects. But testing and measuring how reliable a transportation system can become highly complex.

V. CONCLUSION

The present review paper is concluded that the train is best levitated in canter position. The modern HST was developed mainly to substantially increase railway capacity on the route. This was achieved, in part, through high-speed operation. Travel time: Maglev, despite higher top speeds and greater acceleration, has little travel time advantage in real-world applications. The conclusion of this comparison is that. the advantages of Maglev over high speed rail are few and they are very small. They are far outweighed by the advantages of HSR, particularly in system network and compatibility characteristics and investment cost the limitation on networking and incompatibility with other transportation systems makes Maglev extremely inconvenient for integration in intermodal systems, which actually represent the "transportation system of the future."

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EMS systems such as HSST Taking from Wikipedia using internet site.

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