(Levitation Trains)
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Abstract-The report begin by giving a brief background of definition and historical information about magnetic or maglev train. This is followed by discussing the technology used in the train and its purpose.


Figure1.(a demo of magnetic levitation train in museum in Chinghai)

I. Introduction(Background)

A. Definition

Magnetic levitation is a system uses superconducting magnets of transportation that suspends, guides and propels trains using magnetic forces. Maglev stands for Magnetically Levitated which means that these trains won't have to touch the track in order to move. This Maglev train has the potential to be faster quieter and smother than wheeled train.

B. Levitation trains history

Maglev has been a long standing dream of railway engineers for the past century. In 1904, Robert Goddard wrote a paper proposing a form of frictionless travel by raising train cars off the rails by using electromagnetic repulsion roadbeds. In 1910, Emile Bochelet applied for the same idea but, his dream could not be realized because his concept used too much power to get magnets. Move over in the early 1920s, a German scientist named Hermann Kemper worked in attractive-mode Maglev and in 1953 he established the basic design for practical. In 1969, two Americans, Gorden Danby and James Powell were granted a patent of the Maglev trains and this was the first patent of this kind of trains. Also, at 1970 both Japan and Germany start investing money into Maglev researching.

II. Technology

A. Mechanism of work

There are three primary types of Maglev technology first electromagnetic suspension (EMS) uses the attractive magnetic force of a magnet beneath a rail to lift the train up, second electrodynamic suspension (EDS) uses repulsive force between two magnetic fields to push the train away from the rail. The third one is the stabilized permanent magnet suspension (SPM)

which uses opposing arrays of permanent magnet to levitate the train above the rail. Engineers have devised the Maglev train using electromagnets and superconducting magnets. Elemagnets are metals with electric current running through them giving the metals a magnetic field similar to that at the bar magnets and superconducting magnets are able to induce charge to cause the repulsion forces. What both systems do through is centered of Maglev train's lateral guidance, levitation system and its propulsion.

1. Lateral Guidance System

The lateral guidance systems control the trains ability to actually stay on the track by using the system of electromagnets found in the undercarriage of Maglev train. A computer control system ensures that the train does not deviate more than 10mm from the actual train tracks. A simplified drawing of the (EDS) train and the transpaid suspension train are shown in the figure below.

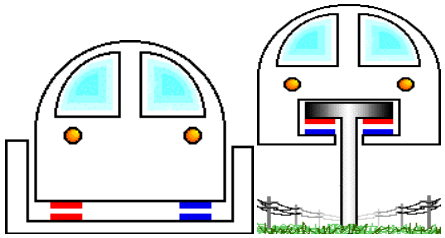

FIGURE 2.(PICTURES OF THE GUIDWAY DESIGN OF THE EDS (LEFT) AND THE TRANSRAPID (RIGHT))

2. Levitation System

The levitation systems used in the design of the Maglev railway allow it to glide above the actual track for about 80mm while the transpaid suspension system allows it to go less than 12mm above the track. The attraction of magnetic forces occur because the current found in both the train and the guideway both flow in the same direction.

3. Propulsion System

Propulsion occurring in the linear induction Motor which gives voltage to the four motors. The speed of Maglev trains in linear Synchronous motors are determined by the frequency of the alternating current and the magnetic field directions. In order for the train car to brake and slow down, the field simply has to be reversed allowing the train to brake without the use of friction.

B. The purpose of the technology

Scientist realized that this technology will be necessary for the growth of the cities in the future because of the absent of fuel the cost is reducing and air pollution disappears. Also normal train does not go further 400km/h where Maglev exceed 500km/h with no maintenance for 50 years.

References:

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(2)Maglev (transport)-Wikipedia, http://en.wikipedia.org/wiki/Maglev_train, 12/6/2008.