CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J0812

Project Title
Which Linear Motor Technology Is Most Effective at Propelling a Roller Coaster Ride: Synchronous or Induction?

Abstract

Objectives/Goals
To determine which of the two linear motor propulsion technologies is most effective at propelling a roller coaster vechicle down a track.

Methods/Materials
In order to prove my hypothesis, I constructed two roller coasters each launched by a separate electromagnetic propulsion system. Each of the roller coaster layouts is identical with a launch section, a vertical loop followed by a vertical section of track (where the car will go up and go back through the loop backwards). I measured the time it took for the car to travel sixteen inches (measured from the axel of the front wheel). Before each run, the car will be placed at the beginning of the straight track. Positioning is important#the car has to be placed so the fixed magnet below the car is just over the first coil in the LIM; for the LSM the hall-effect sensor has to be placed over the first fixed magnet which has the #N# pole up, and the coil has be lined up just before a fixed magnet with the S pole up. After making sure the capacitors are charged up, I press the red button on top of the power supply to launch the #LIM# car. The #LSM# car launches as soon as the car is placed on the track as described above (and the two 9-volt batteries are connected) Despite their differences, each of the motors use the same principle, using electromagnets to propel a projectile at a high speed.

Results
Because the LIM used the most energy, I hypothesized that I would launch the car the fastest and the results of my test appeared to prove that true. My design of the #cars# seemed to play a big role in the result. The weight of the two 9-volt batteries and the amount of current they produced #slowed# down the LSM car; the original circuit called for + and - 12-volt from a DC power supply.

Conclusions/Discussion
Because the LIM used the most energy, I hypothesized that I would launch the car the fastest and the results of my test appeared to prove that true. My design of the #cars# seemed to play a big role in the result. The weight of the two 9-volt batteries and the amount of current they produced #slowed# down the LSM car; the original circuit called for + and - 12-volt from a DC power supply.

Summary Statement
With my project I build working prototypes of a linear induction and synchronous electromagnetic motors and compare which is more efficient in terms of power usage and performance.

Help Received
Father purchased some of my material for me online; Father supervised me when I was soldering; Father helped me test my project with a multimeter to make sure it was safe.