Electromagnetic Braking: Efficiency Relative to Position

Goettle, Bryce (School: Ashley Public School)

The purpose of this experiment was to determine how the efficiency of an electromagnetic braking system changes as the electromagnet is moved farther from the wheel's center. I hypothesized that the electromagnet would be more effective the closer it was to the wheel's center. My reasoning for this hypothesis was that the velocity of the wheel (at any given point) would decrease as that point neared the wheel's center, allowing the electromagnet to stop the wheel's movement sooner. Prior to the testing, I built an apparatus in which I could adjust an electromagnet's distance from a ferromagnetic wheel and its position relative to the wheel's center. With this apparatus, I conducted tests with four electromagnets of different strengths at twelve one-centimeter intervals (from the wheel's center) and at five two-tenths-centimeter intervals (from the wheel's surface). To diminish the effects on any outliers, I averaged the deviations from the control from each of the twelve intervals relative to the wheel's center. The compiled data's correlation coefficient was –0.9117, meaning that there was a 91.17% correlation between the efficiency of the electromagnetic braking system and the electromagnet's distance from the wheel's center. From the results, I concluded that my hypothesis was indeed correct. Overall, aside from a few outliers, the compiled data showed a relatively consistent negative slope, giving a correlation of 91.17%. Therefore, given the high correlation, it is safe to say that the efficiency of an electromagnetic braking system does indeed increase as the electromagnet is moved toward a wheel's center.