Electromagnetic Braking System: A Rotary Design Which Applies Electromagnetism To Achieve Reduced-Friction/Frictionless Braking

St. Onge, Jesse (School: Lewiston Senior High School)

Some large modes of transportation, such as trains and roller coasters, do not use traditional hydraulic-friction brakes because of the wear that they experience. Therefore, electromagnetic brakes have been the alternative for these vehicles. This project aims to apply the same concept by utilizing electromagnets to smaller vehicles such as a bike or automobiles so that a significant amount of friction is reduced or eliminated. Basic construction consisted of one or two electromagnets suspended on either side of a partially ferromagnetic steel rotor rotating within the proximity of their magnetic field. Different stages of testing began with specific settings for the prototype to determine the most productive mechanisms and amount of force needed to stop the rotor efficiently. Prototype testing measured the braking time of the rotor while turning at 1,200, 1,400, and 1,500 RPM, where the amount of voltage applied to the magnets and the distance from the rotor, measured in millimeters, determined the magnetic flux, directly affecting braking time. The most efficient mechanism used two magnets with an opposite polarity which was 40% more efficient than two with the same polarity and 307% more efficient than using a single magnet. Therefore, two magnets with opposite polarity were tested to pursue the effectiveness of frictionless braking. Theoretically, the electromagnets could be used as an emergency brake when brought in direct contact with the rotor or as a traditional brake that reduces or eliminates the amount of friction needed to apply braking force.