Energy Transformation Associated with the Creation of an Electromagnetic Field

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The purpose of this project was to determine the maximum weight that could be suspended by three different electromagnet configurations, each having six (6) coils and having lengths of six (6), eight (8) and ten (10) inches. A constant voltage Switching DC power supply (BK Precision, Model 1692) was utilized for these experiments in orde to provide a constant voltage input and hence a constant current, power and energy input into each electromagnet. Three separate voltage settings consisting of 6, 11 and 15.3 volts were utilized. A separate set of experiments were also performed which consisted of measuring the temperature change that each electromagnet experienced with each voltage, current, power and energy input. Calculations were performed using the following equation to determine the energy loss due to the temperature increase of each electromagnet: The change in energy of an object associated with a change in temperature of an object is: Change in energy of object equals (mass of object)(specific heat capacity of object)(change in temperature of object The data showed that as the voltage input into each electromagnet was increased, so too did the final temperature increase for each electromagnet. Therefore, as the voltage/current/power/energy input was increased, the amount of energy lost as heat (transformed into thermal energy) also increased. The greater amount of electrical energy being transformed into thermal energy resulted in a corresponding decrease in efficiency in attractive force (lifting capacity) as a greater amount of electrical energy was input into each electromagnet. Therefore, the efficiency of each electromagnet decreased with an increase in electrical energy input. In the process of creating a magnetic field, entropy was also increased.

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