

Abstract

Project Title: Voltage vs. Capacitance: Determining which has a Greater Effect on the Magnetic Energy of a Coil Gun

Project ID: 181

This project was done to answer the following questions: Does a change in the voltage or capacitance used in a coil gun circuit change the magnetic energy produced by the gun? If so, is there a difference in the amount of change caused by each one?

My hypotheses were: A. A change in the voltage or capacitance in the circuit of a coil gun circuit will affect the magnetic energy produced by the gun. B. An increase in the voltage in the circuit will have a greater effect than an increase in capacitance on the magnetic energy produced.

A coil gun was constructed using plans from the book *15 Dangerously Mad Projects for the Evil Genius* by Simon Monk. The coil gun was used to shoot a metal projectile at a paper target, which measured how far the projectile fell as it traveled. This information was used to determine the speed of the projectile, and using that information, the magnetic energy was calculated.

A control test was run using full voltage and full capacitance with ten shots from the coil gun. The voltage of the coil gun was then dropped to 75% voltage and the gun was shot ten times. The voltage was then raised to 100% and the capacitance of the coil gun was lowered to 75% voltage and the gun was shot ten times. Each of these three tests were repeated an additional three times resulting in a total of twelve tests or one hundred-twenty shots.

The data I collected supported both of my hypotheses, as the 75% voltage tests and the 75% capacitance tests indicated lower energy results than the control tests and the 75% voltage tests resulted in the lowest amounts of kinetic energy in the projectile which corresponded to the lowest magnetic energy of the coil gun.