



CALIFORNIA STATE SCIENCE FAIR 2007 PROJECT SUMMARY

Name(s) Shyamal Buch	Project Number J0806
Project Title Got Motor? Got Generator! Can a Motor Act Like a Generator, and How Efficiently?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to determine if a motor could act like a generator, and its efficiency. Also, I wanted to find out how the efficiency is affected by the rotation speed. My hypothesis was that if I turned the shaft of a DC motor, it would produce voltage, just like a generator. I could then use this voltage to drive another motor. I expected the efficiency to be in the 60-75% range.</p> <p>Methods/Materials I decided to use DC motors from my robotics kit, because they had built-in rotation sensors with 1 degree accuracy. Also, the microcomputer in the kit could be programmed to vary motor speed and rotations using LabView software. I rotated the shaft of a DC motor so that it would generate voltage. This voltage was used to power a 2nd motor. The aim was to measure "rotations in" at the 1st motor (generator) and "rotations out" at the 2nd motor, to determine the efficiency. Two motors were then added: a 3rd motor to act as a rotation sensor, and a 4th motor to control generator speed. "Rotations in" were varied from 1 to 10, and speed was varied from 10% to 100%. "Rotations out" were measured for each step, and then efficiency was calculated. As a further study, the generator voltage was measured to see how it changed with rotation speed. I did research to see which wires in the motor cable powered the motor. Then I stripped the cable and soldered those wires so that I could measure generator voltage with a multimeter.</p> <p>Results My experiments showed that a motor could act like a generator. The measured average efficiency was 67.4%. For the initial rotation, however, efficiency was lower. Efficiency did increase with speed, but below 50% speed, the generator voltage was not enough to drive the motor. Voltage increased linearly with speed.</p> <p>Conclusions/Discussion My results supported my hypothesis, since average efficiency was in the 60-75% range as expected. Efficiency is less than 100% because of mechanical, electrical, and magnetic losses. Using a microcomputer helped me take measurements which were accurate and repeatable. I learned that it is very important to research ways to improve generator efficiency. My report describes many practical uses for "motor-acting-like-generator". I plan to do more experiments to identify other characteristics of my generator.</p>	
Summary Statement This project investigates whether a motor can act like a generator, determines its efficiency, and evaluates how the efficiency and voltage depend on generator speed.	
Help Received Ms. Bruins, my teacher, motivated and guided me. Mr. Reinking introduced me to the robotics kit. Mr. Balasubramanian/Mr. Martin gave me a tour of Cal ISO to view the power grid. Dad clarified concepts and assisted with soldering. Mom proofread my report and helped with board layout.	