CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
S0712

Project Title
The Effect of Load Resistance on the Amount of Power Delivery

Abstract

Objectives/Goals
The objective of this study is to determine the optimum load resistance in a circuit that yields the most power delivery possible to an electrical component. Research suggests that if the load resistance is decreased, then the amount of power delivery will increase proportionately.

Methods/Materials
A condensed electrical circuit consisting of a 10 volt regulated DC power source, a 1000 ohm internal resistor, and a variable load resistor was constructed. An ammeter was used to measure the current (in milliamps) in the entire circuit, and a voltmeter was used to measure the potential difference across the load resistor. These two values were multiplied in order to calculate the amount of power delivery (in milliwatts) to an electrical component that would be placed in series with the load resistor.

Results
Power delivery peaked at a load resistance of 1000 ohms, which, incidentally, was also the value of the internal resistance. When the load resistance was set to 0 ohms, no power delivery occurred. Between load resistances of 0 ohms and 1000 ohms, power delivery increased very rapidly. Then, after peaking at a load resistance equal to the internal resistance, power delivery dropped off considerably. Eventually, the rate of decrease tapered off and power delivery did not reach 0 milliwatts within the range of testing.

Conclusions/Discussion
The results of this study were not fully consistent with the hypothesis. In fact, the relation between load resistance and power delivery was not even linear. However, these data do show that power delivery to an electrical component peaks when the load resistance of the circuit is 1000 ohms. This was also the value of the internal resistance in this investigation. Therefore, further study is needed to determine whether maximum power delivery is always achieved at a load resistance of 1000 ohms, or if the load resistance needs to be equal to the internal resistance to attain that goal.

Summary Statement
This project focuses on varying the load resistance in a circuit to maximize the amount of power delivered to a given component, thereby increasing its performance.

Help Received
Over the course of this study, I received education and assistance from my dad. He helped set up the electrical circuit and position the meters properly.