



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Arjan S. Puniani	Project Number S0715
Project Title Energy Conversion in the Internal Combustible Engine via Thermopiles: Waste Heat to Electrical Energy	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Automobiles are notorious for their fuel inefficiency, utilizing only 13% of the total amount of fuel for locomotion, while 62% is lost as the engine itself is incapable of harnessing the tremendous force released from igniting gasoline and compressed oxygen. The remaining 25% is consumed for the coolant and alternator. My project utilizes thermocouples, which are devices for measuring temperatures, consisting of two dissimilar metals that are electrically joined at one end. When one junction is hotter than the other, a thermal electromotive force is produced that is roughly proportional to the difference in temperature between the hot and cold junctions. I used these thermocouples to convert that waste heat emission into useable, electrical energy. My hypothesis states that this may very well be a possibility to the improvement of fuel efficiency in automobiles.</p> <p>Methods/Materials After wiring the thermocouples in a series to achieve an accumulative voltage output, also known as a thermopile, I secured the conversion tool with fiberglass insulation on the muffler. I then extended the range of the thermopile from underneath the Pontiac Firebird (model automobile) with copper wiring to keep track of the engine temperature from the dashboard. A voltmeter measured the voltage output and a thermo-gun was used to determine the temperature of the muffler. I then recorded both numerical values.</p> <p>Results The initial results were quite straightforward: the higher the temperature, the higher the voltage output, indicating a positive correlation. However, as the experimentation progressed, high muffler readings were paired with lower voltage output in comparison to other trials. As the difference between the reference and measuring junctions decreased, the voltage negatively correlated.</p> <p>Conclusions/Discussion The plausible mechanism explaining this inconsistency is the lack of ambient air to create a high enough difference for maximum voltage output. However, the purpose of the experiment--to determine the possibility of harvesting electrical energy from waste heat of the automobile--was suggested true. Future application of these results includes actual, calculated fuel efficiency and multiple thermopiles in critical heat locations.</p>	
Summary Statement The purpose of my experiment is to propose a possible solution of automobile fuel inefficiency by converting the waste heat emitted from the internal combustible engine into useable electrical energy.	
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