

## Abstract

The design of Professor Robert Dell's Thermoelectric Generator is redesigned for greater efficiency in weight, space and cost while maintaining a similar output of power from the generator. The new design incorporates a novel heat exchanger design, building from Professor Robert Dell's Chimney heat exchanger. Professor Dell's initial design is modified by adding a heat pipe to create a greater temperature difference across 3 thermoelectric modules, connected in series, which generates a voltage within the plates. The design is modelled in one dimension by utilizing principles of heat transfer, fluid dynamics and thermodynamics and is then tested using MatLab. The design is then modeled in 3D using the SolidWorks. The efficiency of this new design is then verified using computational fluid dynamics software simulations and the results are compared with the efficiency of previous TEG designs. A prototype of this new heat exchanger is manufactured, and tested experimentally using a steam generator. The temperatures, voltage, amperage and power output are recorded and compared to the existing designs.

The experiments show that the new design produces 42% more power per square meter of convection surface than generated by the Chimney heat exchanger design and 550% more than generated by the original design. The new design is also shown to be 20% less cost effective than the cost of the Chimney heat exchanger design and 28% more cost effective than the cost of the original design.