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ENHANCED THERMO ELECTRIC COOLER AND GENERATOR

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Abstract

Peltier plates could be used to connect engine fins to heat and cool air. The idea is to connect a Peltier plate to engine fins in a way that heats and cools the air in the same way as the engine fins. When an engine runs, it will dissipate heat and various toxic gases into the atmosphere. These gases cause global warming and contribute to climate change in the first place. The emissions are released into the atmosphere and create toxic gases and heat in the atmosphere. Overheating of the engine will also affect its performance when it's too hot. the engine can be too hot to run properly if it is too hot in the engine compartment. To reduce the toxicity level of exhaust gases and ensure smooth engine operation, we tested Peltier elements to cool the engine to a certain temperature. Peltier are used to reduce the number of toxic exhaust gases in the engine. Peltier will absorb the flue gas from the engine to dissipate the cooled air into the atmosphere. It will increase the performance of the engine and reduce the global warming caused by that warming. The Peltier can be implemented on an engine to reduce emissions.

Keywords— Peltier plates, engine fins, toxic gases, Overheating.

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I. INTRODUCTION

Thermoelectric cooling is a technique of cooling that is used in a variety of uses. It has a positive effect on a traditional refrigeration system. The transition between chilling and heating devices is simple to regulate. Thermoelectric coolers are used in a variety of uses, including cooling electrical devices, thermoelectric refrigeration, space conditioning with PCM, portable active solar stills, and so on. The Peltier phenomenon is used in TEC heat exchangers. According to research, an electric current passing through two conductors causes a heating or chilling impact. When a voltage is given to two ends of a different substance, a difference is produced. According to the Peltier effect, the temperature differential causes heat to move.

The layer of components is soldered between two clay slabs, which are electronically in series and thermally in parallel.

The temperature at the junction decreases when a direct current passes through one or more sets of elements from 'n' to 'p,' causing heat to be absorbed from the area around it. Heat is taken out by electron transport, and it moves from a high to a low condition. A cooler's pumping capability is directly proportional to the number of combinations of 'n' and 'p' kinds. (couples). Because they carry out the heat, n-type and p-type semiconductors, typically Bismuth Telluride, are the most frequently used materials to accomplish the Peltier effect.

II. LITERATURE REVIEW

2.1 In this study, Gang Tan used phase change materials to reate a thermoelectric space cooling system. Thermoelectric cooling systems integrated with PCMs are used for space-cooling purposes. There are two kinds of work in thermoelectric space cooling system models that use PCM and numerical computations. Using phase change materials increases the efficiency of the system. Experimental values claim that the values of the system's coefficient of performance increase significantly.

2.2 In This research paper Michael Gasik introduces functionally graded materials used

for thermoelectric cooling of energy systems in solar space. The system was designed to take advantage of natural resources such as the intense solar radiation approaching Earth. This system is often used in space systems. The system is compact in structure and performs the noiseless operation. Results and Discussion From the above article, two types of materials are used in power systems for solar spaces: homogeneous FGM and semiconducting FGM. The system has a very low coefficient of performance of 0.85. This system runs a quiet process, which is why it is used in many solar space stations.

2.3 Andrew B. Kustas suggested providing each firefighter with an external thermoelectric cooler. This makes the outside temperature less susceptible in hot environments and keeps the body's internal temperature normal. Many firefighters die because the heat flows from high to low and the external environment raises the internal temperature. Succeeded in heat dissipation performance of COP 0.6 at 160w. The presence of a hot environment during physical activity creates a certain load. This will cool you down and keep you warm.

2.4 The research paper by Nandy Putra represents the Coolant reduces the thermal resistance between the wall and the coolant. RESULTS AND DISCUSSION To maintain the temperature of the central unit, heat pipe liquid blocks with alumina water and titania water as coolants are used together with thermoelectric coolers. A heat pipe fluid block and TEC containing coolants such as alumina water and titania water are used to lower the temperature of the CPU. This study demonstrates thermoelectric cooling of electrical equipment using nanofluids with heat pipe liquid blocks. As the CPU load increases, so does the heat dissipation rate.

2.5 Javad Abolfazli Esfahani's experiment shows that the intensity of solar radiation has a significant impact on the productivity of portable solar stills. Portability features have a big impact on solar stills compared to other

traditional types of solar stills. Temperature and solar radiation intensity were higher in summer than in winter. It consists of solar collectors and the walls of the solar still are fitted with black wool covers. The efficiency of portable solar systems was higher in summer than in winter. This region has the highest productivity of portable active solar distillers. If the experiment was carried out for nine days, from 2:00 pm to 3:00 pm, the researcher received a constant intensity of radiation as the ambient temperature increased and the airspeed decreased. Thus, atmospheric conditions affect the productivity of portable solar distillers.

2.6 Karan Singh Viraj Instead of using this solar energy to create electricity, the goal of my work is to use the Peltier effect to change the solar heat transferred from one side of the surface of the thermoelectric element to the cooler side on the opposite side. It is intended to have an immediate impact. and thermoelectric cooling. A solar refrigerator's primary concept is to create a positive and negative temperature effect at the two joints by adding a voltage with the extra heat available from the solar heat on the screen to create a cooling effect. In this paper, we investigate and present the operation of solar refrigerators based on thermoelectric cooling and the Peltier effect.

2.7 G Rohit claims in this article that a variety of machines, including vehicles, stoves, ovens, boilers, kilns, and heaters, emit a lot of excess heat. The findings indicate that as the heated surface's temperature rises, the production power increases considerably. The thermoelectric generator (TEG) is one of the most widely used techniques in waste heat recovery studies. Most of this excess heat is not used, which significantly lowers the effectiveness of these devices.

2.8 According to R.S. Fayazahamed's study, water can be boiled by heating it from the thermoelectric module's hot side. This is caused by the heat being absorbed and released using a Peltier element. The method that will provide simultaneous cooling and heating impacts

without utilizing movable mechanical parts is the objective of this piece. There is no need for an operating fluid in thermoelectric ventilation and heating devices.

2.9 According to Adama Coulibaly's trial, a typical thermoelectric generator can produce at least 4 W of electrical energy, which represents about 0.3% of the total thermal energy required for braking. This is enough to power onboard sensors and car gadgets, enhancing their functionality. energy efficiency in vehicles the potential energy in the shape of heat generated by friction during deceleration was calculated using a thermal analysis of brake pads and discs. Research in the global car business is heavily focused on the problem of lowering vehicle energy usage and greenhouse gas pollution.

2.10 According to X. Liu's experiment, the highest output power rises approximately proportionally to the increase in exhaust gas temperature but does not affect the ideal module area. We use a mathematical model of a thermoelectric generator to examine the impact of exhaust gas parameters on system performance to explore the impact of exhaust gas parameters on the performance of the novel generator. The medium is gasified and condensed by a thermoelectric generator, which then transmits surplus heat. This boosts power density considerably, decreases the optimum module size, and optimizes power output. Novel thermoelectric generators with reduced waste heat transmission coefficients have advantages over traditional thermoelectric generators.

III. EXPERIMENTAL SETUP

When electrical current travels through two wires with different properties, the Peltier effect occurs. Depending on which way the current flows, these conductor-conductor junctions will either receive or discharge heat. Semiconductors are used in thermoelectric technology to create the Peltier effect because they can be more readily optimized for moving heat. The simplest Peltier device can typically be built around a single semiconductor pellet and attached to the electrically conductive substance (typically

plated copper) on both ends. The second different material necessary for the Peltier effect to occur in this arrangement is copper connection pathways to the power source. Heat will circulate through the circuit in the path of charge carrier movement. (Charge carriers transfer the heat). Electronics from outside the container regulate the temperature and prevent it from overheating.



FIGURE 1. experimental setup

Up until a point where the internal heating exceeds the heat pump's capability, temperature (T) rises with rising current (I). Beyond that point, increasing I will cause the gadget to heat up and potentially break. The actuator should receive input from a thermistor. circuitry in the power source that controls incoming power and upholds the proper setpoint temperature.

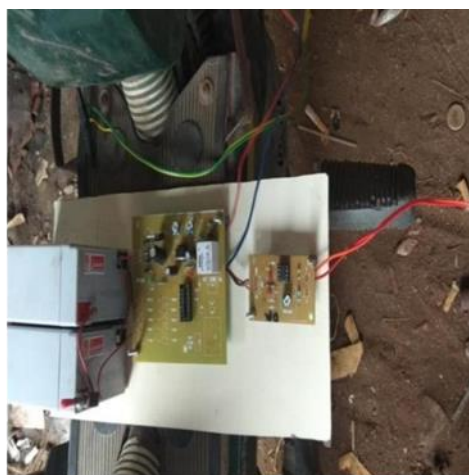


FIGURE 2. Experimental setup

The cooler power source must have a current limit that is less than I_{max} and avoids overheating for the cooler being used.

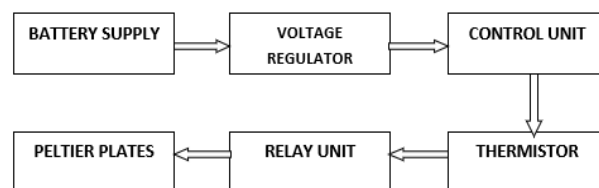


FIGURE 3. Block diagram

IV. RESULTS

By pointing out that the atmospheric temperature and the thermal impedance of the atmosphere directly affect when a cooler overheats, the temperature drop and fin cooling both with and without Peltier require different quantities of time, as shown by the two plots above. in case an engine's lifespan is greatly shortened and its components are damaged by burning without a Peltier.

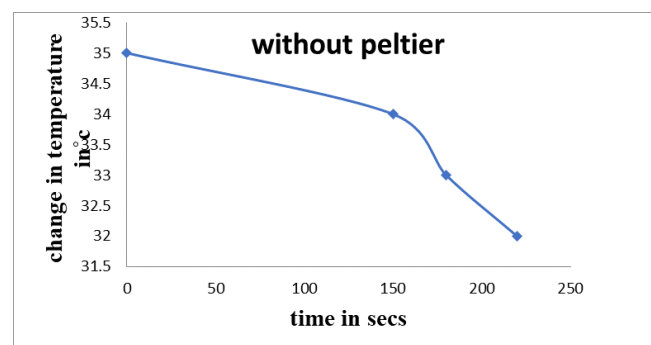


FIGURE 4. change in temperature without Peltier.

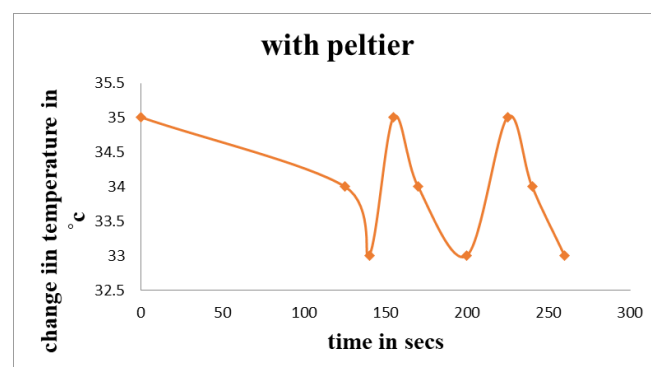


FIGURE 5. change in temperature with Peltier.

However, Peltier plates could extend component life by keeping them from overheating and improving gasoline economy if they were used to cool motor fins. The above graph shows the difference in temperature with and without Peltier at certain intervals of time.

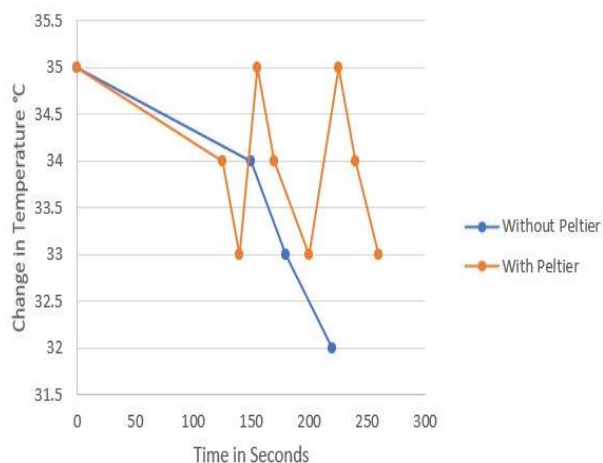


FIGURE 6. comparison of change in temperature with and without Peltier

V. CONCLUSION

For use in personal cooling and heating, a thermoelectric cooling and heating device was created and constructed. To accomplish the cooling, ten TECs were powered by a DC feed through an external power source. By hitting the goal, the project's progress is determined. All the project's separate components passed the tests with favorable outcomes. By choosing a single TEC with a greater capacity, the prototype can be made smaller. To move the air for an extended period, select a cold-side heat sink with superior twisted channels. We cannot install any TEC cooling, even as it is depicted in the attached picture. If only one high-power TEC is picked for the cooling system, well-known TEC brand names must be chosen. Larger hot-side heat sinks (fins) must be carefully chosen based on their estimated thermal resistances for optimal cooling effectiveness. Changing the airflow and some mechanical or electrical components can result in a more portable, comfortable personal tek cooler that can be mounted on a roof. It has a single heat sink with a heated side and a cold side. There are heating uses for the tec air cooling device for automobiles.

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