Comprehensive Analysis and Specifications of Energy Efficient Portable Heater (EEPH)

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ABSTRACT *Energy Efficient Portable Heater also abbreviated as EEPH, focuses on heating up an object with maximum energy efficiency. The project is expected to cut the electric power supply by approximately 75% and hence making it very efficient. Solar energy which remains to be abundant source of energy is the source for starting up the project. The Peltier device is controlled utilizing the Solar Panel. The device incorporates warm sink and Peltier plates and thus bringing about the suction of warmth from one end and discharge of warmth from the other. Because of this, there is a temperature contrast on the two closures. The venture will center on the more sizzling end of the device. Once the task module has accomplished the expected temperature, to keep up the temperature, One Therm(R) is utilized. The material is created utilizing aluminum thwart with nanoparticles sandwiched between it. The nanoparticles don't enable the warmth to escape and subsequently keeping up the temperature for 3 to 4 hours. The warmer will be secured with the material enabling the radiator to keep up a consistent high temperature. The radiator discovers its application in the provincial regions where power is rare. The corporate workplaces additionally discover the radiator valuable as it helps in vitality sparing. Further to keep sustenance and other consumable substances at a kept up temperature the module can be utilized. Auxiliary preferred standpoint to the undertaking is that it doesn't permit development of any microorganisms and other microscopic organisms and henceforth maintaining a strategic distance from the rot of the nourishment inside the radiator.*

Keywords: *EEPH, nanoparticles, portable, heater, energy.*

INTRODUCTION

Efficiency as an energy resource capable of yielding energy and demand savings that can displace electricity generation from coal, natural gas, nuclear power, wind power, and other supply-side resources. Interests in vitality proficiency and the subsequent asset benefits are considered straightforwardly into utility vitality asset basic leadership about putting resources into new assets and working existing frameworks.

The world is confronting vitality emergency. The non-sustainable assets are exhausting at an exponential rate. Because of such unfavorable circumstance, we are constrained to move our concentration towards sustainable and proficient power supply. This venture will center on utilization of sun powered vitality with boosted productivity.

The module will consolidate sun based vitality with the Peltier impact for increase in the temperature. Peltier impact is a wonders in which temperature contrast can be estimated between two unique metals or semiconductors associated at one intersection when the electric current is gone through the other intersection.

Peltier radiators or thermoelectric warmers are exceptionally proficient warming devices which deal with the standard of Peltier impact. At the point when the current is gone through the terminal one side of the module retains the warmth result in diminish in temperature produces refrigerating impact while opposite side radiates the warmth which give warming impact then the warmth can be disseminated to the climate through constrained or common convection.

This venture centers around the warming end of the device and subsequently making it the wellspring of temperature increase. To keep up the temperature One Therm is being utilized. The creation is an aluminum thwart with sandwiched nanoparticles which don't enable warmth to escape and thus keeping up the temperature of a given region.

With the given materials and devices, the undertaking has a tendency to accomplish the thought process of vitality proficient warming and keeping up the temperature for 3 to 4 hours(without control supply) and henceforth satisfying the planned utilization of keeping the protest warm with Minimum power supply.

Briefing about EEPH

The module will combine solar energy with the Peltier effect for increment in the temperature. Peltier effect is a phenomena in which temperature difference can be measured between two different metals or semiconductors connected at one junction when the electric current is passed through the other junction.
Peltier heaters or thermoelectric heaters are very efficient heating devices which work on the principle of Peltier effect. At the point when the current is gone through the terminal one side of the module ingests the warmth result in diminish in temperature produces refrigerating impact while opposite side transmits the warmth which give warming impact then the warmth can be disseminated to the climate through constrained or common convection.

This undertaking centers around the warming end of the device and henceforth making it the wellspring of temperature increase. To keep up the temperature One Therm is being utilized. The innovation is an aluminum thwart with sandwiched nanoparticles which don't enable warmth to escape and subsequently keeping up the temperature of a given zone.

With the given materials and devices, the task has a tendency to accomplish the thought process of vitality proficient warming and keeping up the temperature for 3 to 4 hours(without control supply) and subsequently satisfying the planned use of keeping the protest warm with least power supply.

Mechanical broilers are generally utilized as a part of the assembling business for curing, drying or heating. A stove's execution, contrasted with the best accessible practice, can diminish after some time because of basic/mechanical corruption, innovation progressions or changing procedure prerequisites. There is potential for usefulness change, as far as vitality and process execution, in numerous current modern broilers. Warming applications expend just about 1/5 of all mechanical vitality (OEERE 2001), and this examination has ascertained that run of the mill ozone depleting substance emanation from an immediate gas terminated modern stove is 0.2– 0.4 tCO2e per ton of item throughput for a 1 MW broiler. Albeit conceivably advantageous, far reaching process change by means of retrofitting is regularly unfeasible because of confinements in existing advancements, space accessibility, design limitations, warm misfortunes, disturbance to creation, budgetary reasonability, and so on. Diminishing vitality utilization of stove units offers an engaged and plausible way to deal with vitality sparing. The point of enhancing mechanical broiler ought to be to expand item quality, generation effectiveness and laborer wellbeing, and also to diminish vitality utilization and waste. Process variety of working conditions significantly affects item quality, execution, cost, wellbeing and operational productivity. The cost lessening related with lean assembling is vital for organizations in progressively aggressive markets.

LITERATURE REVIEW

One of the research paper proposes that power consumption is one of the major issues in today's general life. Maybe semiconductor is a great solution of this power consumption. If we success to use semiconductors in well manner then we can reduce power consumption. But peltier module is one of the best solutions for this. At the point when the current is gone through the terminal one side of the module ingests the warmth result in diminish in temperature produces refrigerating impact while opposite side transmits the warmth which give warming impact then the warmth can be disseminated to the climate through constrained or common convection.

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SPECIFICATIONS

Peltier Device

A Peltier cooler, heater, or thermoelectric heat pump is a solid-state active heat pump which transfers heat from one side of the device to the other, with consumption of electrical energy, depending on the direction of the current. Such an instrument is also called a Peltier device, Peltier heat pump, solid state refrigerator, or thermoelectric cooler (TEC). It can be used either for heating or for cooling, [1] although in practice the main application is cooling. It can also be used as a temperature controller that either heats or cools.[2]

This technology is far less commonly applied to refrigeration than vapor-compression refrigeration is. The primary advantages of a Peltier cooler compared to a vapor-compression refrigerator are its lack of moving parts or circulating liquid, very long life, invulnerability to leaks, small size, and flexible shape. Its main disadvantages are high cost and poor power efficiency. Many researchers and companies are trying to develop Peltier coolers that are cheap and efficient. (See Thermoelectric materials.)

A Peltier cooler can also be used as a thermoelectric generator. When operated as a cooler, a voltage is applied across the device, and as a result, a difference in temperature will build up between the two sides.[3] When operated as a generator, one side of the device is heated to a temperature greater than the other side, and as a result, a difference in voltage will build up between the two sides (the Seebeck effect). However, a well-designed Peltier cooler will be a mediocre thermoelectric generator and vice versa, due to different design and packaging requirements.

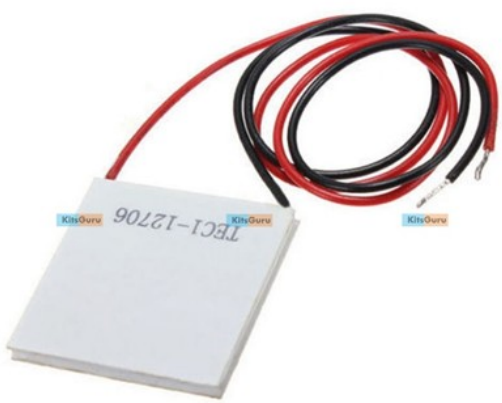

Figure 1: Peltier device

- Model: TEC1-12706, TEC-12712
- Size: 40mm x 40mm x 4mm
- Operates from 0~15.2V DC and 0~6A for 12706, in a good condition with heat sink, current will rise to 4A.
- up to 12A for 12712
- Operates Temperature: -55°C ~ 83°C
- Max power consumption: 60 Watts for 12706, 114W for 12712
- These devices must be used together with a heat sink to avoid burned in 2 seconds after powered up
- Each device is full inspected and tested
- Fitted with 6-inch insulated leads
- 1x Backside Heatsink, 1x frontside heatsink
- 12V fan and fan protective shield

- Assembly screws
- 40×40 pelter side fixture
- 2x 10cm the heat thrinkable tube
- DC 2.1mm to cable connector.

Heat Sink

A heat sink (also commonly spelled heatsink[1]) is a passive heat exchanger that transfers the heat generated by an electronic or a mechanical device to a fluid medium, often air or a liquid coolant, where it is dissipated away from the device, thereby allowing regulation of the device's temperature at optimal levels. In computers, heat sinks are used to cool central processing units or graphics processors. Heat sinks are used with high-power semiconductor devices such as power transistors and optoelectronics such as lasers and light emitting diodes (LEDs), where the heat dissipation ability of the component itself is insufficient to moderate its temperature.

A heat sink is designed to maximize its surface area in contact with the cooling medium surrounding it, such as the air. Air velocity, choice of material, protrusion design and surface treatment are factors that affect the performance of a heat sink. Heat sink attachment methods and thermal interface materials also affect the die temperature of the integrated circuit. Thermal adhesive or thermal grease improve the heat sink's performance by filling air gaps between the heat sink and the heat spreader on the device. A heat sink is usually made out of copper or aluminium. Copper is used because it has many desirable properties for thermally efficient and durable heat exchangers. First and foremost, copper is an excellent conductor of heat. This means that copper's high thermal conductivity allows heat to pass through it quickly. Aluminium heat sinks are used as a low-cost, lightweight alternative to copper heat sinks, and have a lower thermal conductivity than copper.

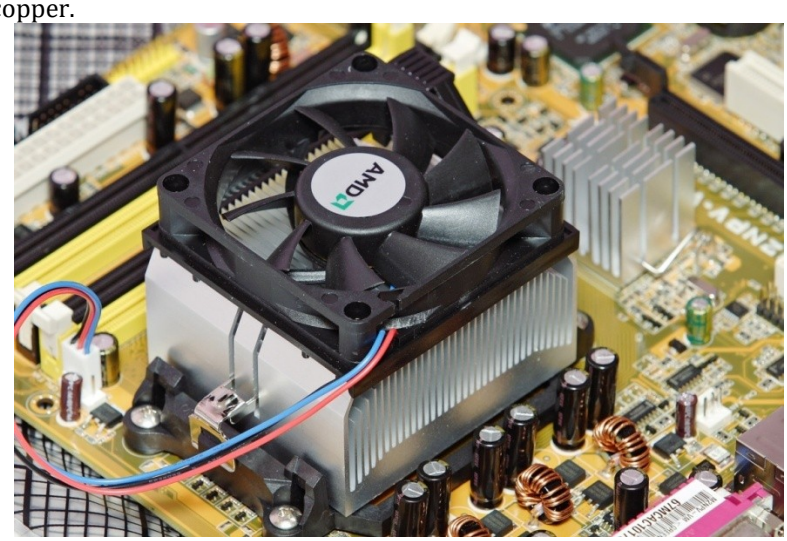

Fig. 2: A fan-cooled heat sink on the processor of a personal computer

Solar Panel

Solar panels absorb sunlight as a source of energy to generate electricity or heat. A photovoltaic (PV) module is a packaged, connect assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 365 Watts (W). The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 W module will have twice the area of a 16% efficient 230 W module. There are a few commercially available solar modules that exceed efficiency of 22% [1] and reportedly also exceeding 24%.[2][3]

A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes an array of photovoltaic modules, an inverter, a battery pack for storage, interconnection wiring, and optionally a solar tracking mechanism. The most common

application of solar panels is solar water heating systems. The price of solar power has continued to fall so that in many countries it is cheaper than ordinary fossil fuel electricity from the grid (there is "grid parity").

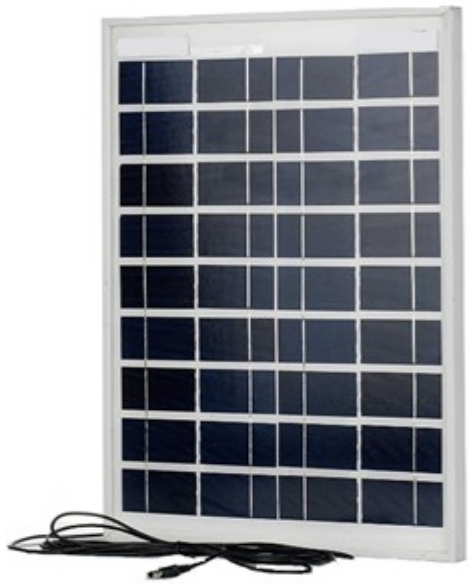

Fig. 3: Solar PV modules (top) solar hot water panels (bottom) mounted on rooftops

- Material: Silicon; Colour: Grey
- Item Dimensions (L x B x H): 84 cm x 54 cm x 5 cm
- Wattage: 50 Watts
- Package Contents: 50 Watt Solar Panel
- Warranty: 25 Years

Battery

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smartphones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected to an external circuit, electrolytes are able to move as ions within, allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work

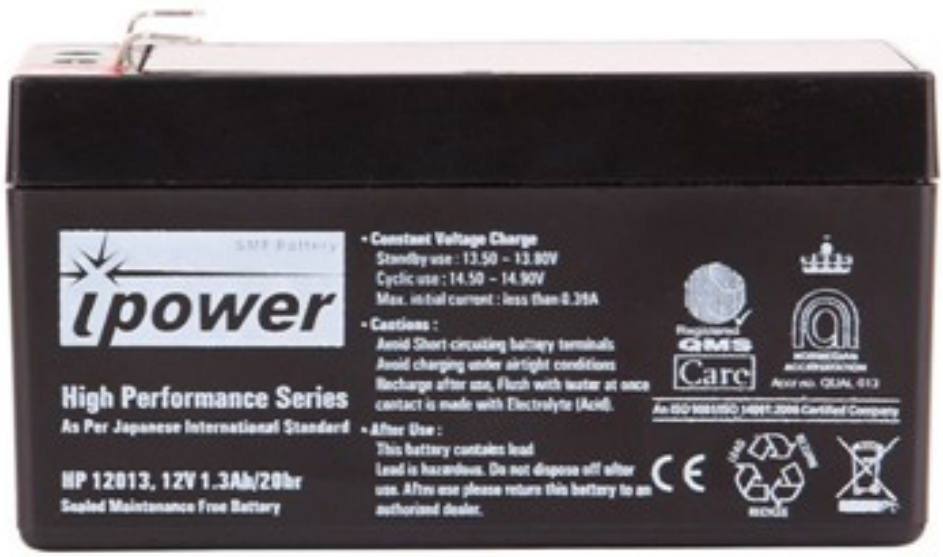

Fig. 4: High performance series battery

CONCLUSION

Electrically Efficient Portable Heater (EEPH) is a reliable alternative to other portable heaters. It is cost efficient and ecofriendly which is the most wanted requirement of today's era. By controlling the temperature range of the heating unit, it can be used in various sectors like in the rural areas where there's no electricity to heat the food or no electrical heating devices available, near the coasts from where the marine edibles need to be transported to the market area, medical area for storing pharmaceuticals and keeping products bacteria free. The efficiency of the heater can be increased by increasing the number of peltier plate module which will eventually help in increasing the temperature in less time. Number of peltier plate modules used can be calculated using the heat transfer formula. The biggest advantage of this device is that it can keep the food hot for 3-4 hours and hence can be used for commercial and corporate sectors in order to keep the food hot and also save the electricity.

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Great thoughts speak only to the thoughtful mind, but great actions speak to all mankind.

~ Theodore Roosevelt