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Electric Power Generation From Hybrid Parabolic Solar Cooker

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***Abstract*: The continuously increasing imbalance betweenthe energy demand and supply, together with escalating cost ofthe conventional energy resources as well as growingenvironmental pollution are forcing people to invent newermethods either to reduce energy demands or to find alternativeenergy resources for cooking. The main intension behind this project is to employ concept of hybrid parabolic solar cooker with sensible heat conversion unit. Solar energy is availableeverywhere for free of cost Sun's energy can be directly converted in to electrical energy, mechanical or even direct thermal energy. The project expects to reduce the consumption of timber as fuel used for cooking and electricity purpose to some extent, to encourage the use of renewable energy, to mitigate respiratory diseases caused by the inhalation of combustion smoke and help the family's economy. Currently we are working on generation of electricity or electrical energy as well as thermal energy from same system.The system consists of energy conversion unit i.e., Thermoelectric Generator from which solar thermal energy is converted into electrical energy and made to store in battery by converting DC to AC using inverter it can be used for domestic purpose. This arrangement will help to cook the food, and also to generate electrical energy even during deficiency of solar radiation.**

***Key Words* : Solar oven, Parabolic Concentrator, Thermoelectric Generator(TEG), Inverter, Batter**

I. INTRODUCTION

The use of conventional fuels (hydrocarbons), is to meet the daily various needs is inevitable in every home. The use of timber resources in rural areas, used for as cooking fuel, has caused large emissions of carbon dioxide and deforestation in the forest, which along with forest fires and illegal logging, is an environmental degradation in many cases irreversible. Therefore, alternatives are required to improve the quality of people's life, mitigate the use of conventional fuels, reduce carbon dioxide emissions and contribute to family and economic savings. Solar energy is one of the best ways of reducing the use of non-renewable resources. With solar energy, the sun's rays are used to generate electricity, heat water or other fluids, charge battery, heat homes through glass windows and cook food.The advantage of using solar cooker are, it emits no harmful gases, nor reason for global warming, it is very environmental friendly. Usually a solar oven is used for cooking food which is used instead of firewood and other fuels to cook meals. One of the most famous solar ovens is the parabolic solar oven.The only thing we need to do is to collect solarradiation in efficient way and convert in to required form. Solar Parabolic concentrator is one which collects radiations and concentrates at small area so all thermal energy is utilized uniformly over blackened hot plate which is specially designed for it. Thermoelectric generator is used as special unit in the current system to make use of thermal energy from hot plate in turn produce electricity. Thermoelectric devices offer a unique power generation solution becausethey convert thermal energy into electricity without requiringmoving components. Thermoelectric generators have been proposedforwaste-heat recovery applications, and advancements in thermoelectricmaterialsdevelopment have highlighted the technology's energy efficiencyand commercial potential.

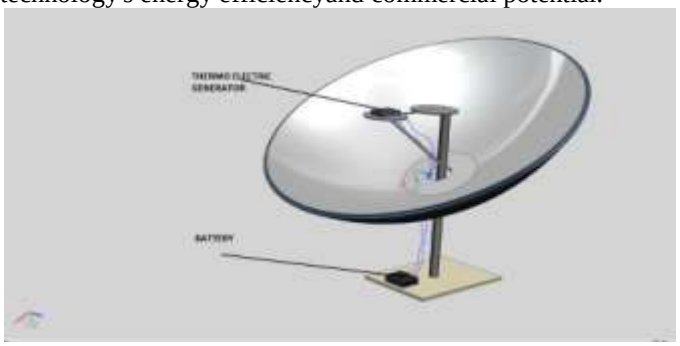

Fig 1.Hybrid Parabolic Solar Cooker (NX V.19)

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II. WORKING PRINCIPLE

In parabolic reflector type solar cooker, all the light falling on mirror will be reflected such a way that all light rays will concentrate at small area of cooker.The solar dish is a point focusin collector. At the focus of parabolic dish collector, a holding tray is provided upon which cooker is to be placed as shown in Fig 2. This is utilized for cooking,The tracking of parabolic dish collector is done manually after 30 minutes.

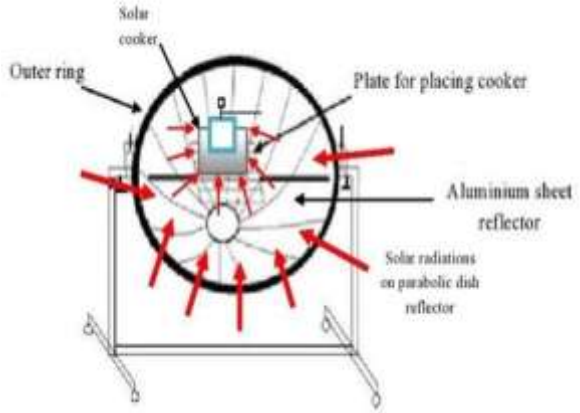

Fig 2. Schematic diagram of parabolic dish collector

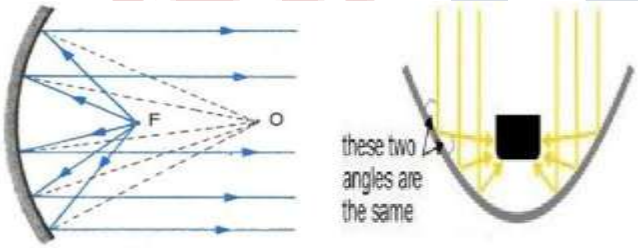

Fig 3.Angle of incidence of light ray on collector.

In addition to this another adjacent hot plate is used for recover excess thermal energy from main hot plate,And convert it into electrical energy by using thermoelectric generator. TEG is a direct power conversion device. A thermoelectric generator is a device that consists of a p-type and n-type semiconductors connected in series, shown in Figure 4. This structure can be used to convert heat energy to electricity by using a principle known as the Seebeck effect. When heat is applied to one surface of the thermoelectric generator, the electrons in the n-type semiconductor and the holes in the p-type semiconductor will move away from the heat source. This movement of electrons and holes gives rise to an electrical current.

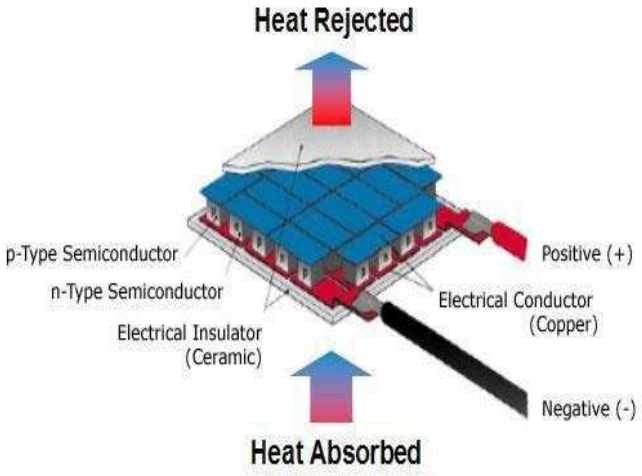

Fig 4. Schematic diagram of a thermoelectric device

Seebeck effect-It is a phenomenon in which temperature difference between two dissimilar electrical conductor and semi-conductor produces a voltage difference between two substances. When heat is applied to one of two conductor or semi- conductor heated electron flow towards the cooler one. Thus the generated electrical energy from TEG is stored in the battery. Stored energy is converted from DC to AC using invertor which can be further used for appliances.

III. CONCLUSION

Cooking with solar energy remains a fuel saving technique, which can provide definite help in situation of fuel scarcity. This can be used for applications like cooking and power (electricity) generation, where power availability is less or totally absence. As India is a developing country where energy management is big challenge for a huge population. By using this project we can drive both cooking and electricity generation according the intensity of solar radiation focusing on the hot plate.

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