

GK Tech. (Green Kitchen Technology)

A Power Lid

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Abstract

This study is focused on developing a device that will trap the waste heat from kitchen (cooking pot) and will convert it into electrical power, this technology is called GK Tech. (Green Kitchen Technology), & power harvesting device is called "Power Lid". Millions of people all over the world doesn't have the supply of electricity but they all do one common thing, they all cook their foods, this power crisis problem can be figure out with Power lid at the expense of waste cooking heat.

INTRODUCTION

You might have seen in your kitchen when you cook something you feel warm in kitchen this is because of the heat which being rejected from the cooking pots (utensil) during cooking. The heat is rejected in the form of water vapors convention with surrounding air and by means of radiation, this heat is nothing but waste heat. we are using fuel for cooking, that fuel provides heat which cooks the food but after cooking the remaining heat is flushed out in the surrounding and treated as a waste heat until now a days but from now on we would be able to trap that waste heat and will be able to manipulate it for conversion of electrical power by means of Power lid.

Basically we are trying to directly convert the heat into electricity ,usually what we see in various power plants e.g. Thermal power plant that they use heat to form

steam which will be used to run the turbine and then turbine is coupled to the shaft of the generator which will then converts the mechanical energy into electricity so you see there is no direct conversion of heat into electric power so to avoid such a long energy conversion process we were interested in designing such a generator that directly converts the heat into electric power that generator is called Thermo-electric Generator (TEG) .This TEG is used in Power Lid for direct conversion of waste heat from the cooking pot to the useful electric power.

Our main focus is to design power lid and review energy conversion process.

Power Lid

We all are familiar with lids, we use lids to cover our cooking pots (utensil) so that the

cooking would be better and fast, lids reduces the cooking time.



Figure (1).

Power Lid is also a kind of Lid but it is capable of producing electric power, that power is generated when the Power Lid is placed over the cooking pot. It is especially designed for this purpose, it consists of series of TEG which traps the waste heat (encountered through watervapors, radiation, conduction etc.) and convert it into electric power.

Construction of Power Lid

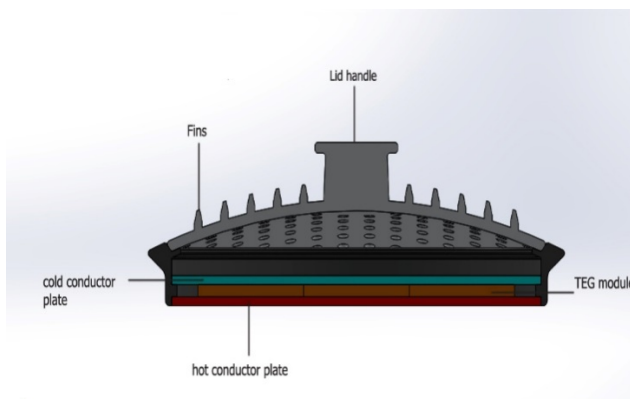


Figure (2).

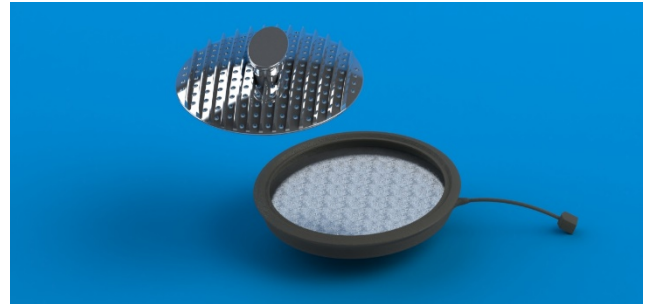


Figure (3).

It consists of following two parts

a) Bottom part.

1. Hot conductor plate – it's a high thermal conductive metal i.e. copper which will absorb the heat (i.e. heat sinker produces high temperature for TEG)
2. Cold plate conductor – it's a plate of aluminum because it rejects the heat at high rate (i.e. produces low temperature)
3. TEG module – in between cold plate and hot plate a TEG module is placed which will produce electric power.
4. It also have a cavity(space) which is filled with some volatile liquid for better efficiency (i.e. water etc.)

b) Top part.

The top part of power lid is having a cavity cover made up of aluminum with some pores and fins on it for better heat rejection so that the temperature of cold plate is maintained low.

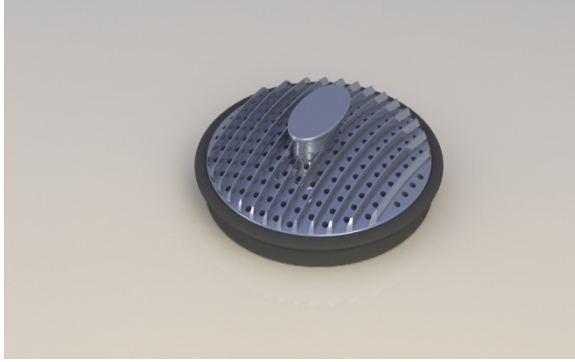


Figure (4).

Thermo-electric generator (TEG)

Thermo-electric Generator is a concept of harvesting electrical energy by trapping heat energy, it consists of thermo-electric panel which further is made up of thermo-electric module by connecting them in series. The basic unit of thermoelectric generator is thermoelectric module and thermoelectric module is made up of thermoelectric cells

Thermo-electric Cells

They are made up of two kinds of metals called p-type and n-type and they are attached to two heat sinkers, one for heat addition and one for heat rejection (i.e. hot plate & cold plate). They complete the circuit and a potential difference is generated which results in flow of current.

1. **P-type metals** – These are those metals in which electron density is less (i.e. positive potential) when heat is conducted through it e.g. Mercury, Aluminum, and cobalt etc.

2. N-type metals

These are those metals in which electron density is high (i.e. negative potential) when heat is conducted through it, e.g. Tantalum etc.

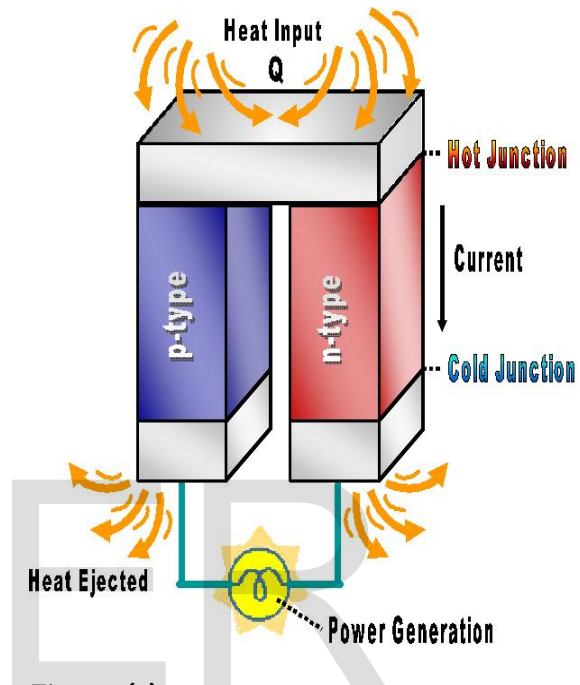


Figure (5).

Experimental Analysis

When we will cook in kitchen on stove the cooking pot is covered with power lid .the bottom plate temperature of power lid may vary according to the heat supply from the stove to the cooking pot (e.g.100-150 °C) but outer temperature would be at room temperature (i.e. 25-40 °C) so we will get a temperature difference of about (75-100 °C) if such a temperature difference is maintained in a power lid of base diameter 4.5' inches we will get a power supply of (5-10 Volts).which is enough to charge a mobile phone in about (60-90) minutes. Moreover we can use a battery which will

store the power and we would be able to use it whenever we want. Power generated is directly proportional to the temperature difference at the power lid so more the heat stove will provide more electric power will be generated.

Material required

Material used in Power lid is highly thermal conductive metals i.e. Aluminum, Copper, and Duralumin for the fabrication. Thermal insulated covered wires (heat proof and fire proof).

Discussion and Conclusion

Millions of people in India as well as in other countries doesn't have power supply but they all cook their foods, places in India like Ladakh, Leh, Chhattisgarh, North East etc. they have limited power supply. Power lid is a best way to overcome from this problem. By ignoring exhaust heat (either coming from kitchen, automobile or various industries) which is treated as waste heat, we are rising our global temperature continuously which is resulting in global warming and if it continues to happen at current rate we would very soon lose our life supporting system on earth and many other valuable things will vanish as a result. So steps should be taken against such an issue. Power lid is an initial step to support such kind of technology which is eco-friendly and to bring a new vision among people about energy which they treat as a waste is not actually a waste they can reutilize it and store it for their needs.

Advantages

1. It will provide an option for power generation when we needed.
2. It will be pollution free.
3. Waste heat will be utilized (every year our planet earth radiates about 100 million Giga watts of heat into the space).
4. Solar panels cannot work in cloudy day and at night but such a technology will work every time
5. Best for camp firing and places where power supply is limited.

Limitations

1. Cannot be used as empty something has to be cook in pot.
2. Heat is taken from the stove.

[A view of power lid]



Figure (6)

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