

# Improvement in Efficiency of Induction Chulha System with Solar Power and Grid Connection

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**Abstract:** - In olden days chula was used in rural areas of India as firewood and dung based fuel, Due to which a lot of indoor pollution was created which lead to damage to human health. In India if we see there are more than 50 million which are using this Chula module and its effect are very pernicious. For upgrading the cooking module Solar power cooking module was launched. This induction has quality of heating being a noncontact heating method can easily reach high temperature in small span of time. In the cooking system it has better efficiency, security, and exact output has been measured, while preparing this cooking system keen research has been done where we have taken advantage of solar energy as the basic source to give power to the Induction.

The main aim of this paper is to create a model that is an induction cooking system which obtain solar system with quasi resonant topology and take care of production using pulse width modulation.

**Keywords:-** Chulha System, Solar Power, Grid Connection

## I. INTRODUCTION

As we see cooking is an essential activity in our regular routine where it will not be any socking that more 70% people are using essentially cooking applications, In those time especially in rural areas people are not able to buy and also there was not proper supply of LPG which was the one of the biggest obstacle for the people who are living in rural areas. In rural areas of India people are mainly using this Chula system for firewood and dung based fuel due to which it created lot of home inside pollution and health disease as in this pollutants are involved like particulates, carbon monoxide, nitrogen oxides, benzene, and formaldehyde.

If we check the records over 3.8 million death due to this inside home pollution disease as in stroke, heart disease, tuberculosis ,lung cancer and many more and all this most effected people are women's and children, as in more than 50 million people are badly affected by this cooking system ,Now coming to urban areas of Indian population here the situation is completely reverse as people are aware of all these new invention, up gradations of solar induction cooking system due to which number of LPG users has been increased whereas there was shortage of LGP which leads to energy emergency due to which there was repeatedly power cut was going which are making situation miserable and cause of which this stove options are also becoming valueless .where our objective was to replacing these cooking ideology with new upgraded solar powered induction cooking system .this system was plan by the Quasi resonant topology with the aim which give higher efficiency as compare to the resonant inverter topology which contains Incremental Conductance, while preparing the solar power induction algorithm has been used for the purpose of MPPT in order to increase the authenticity of this cooking system as the discontinuous obstacle issue has been resolved.

When this solar power induction was launched at larger scale main aim was to provide and the stable lifestyle as we

as to decrease the environmental bad effects which was produced while using the Chula cooking system and thus, to reduce the inside home pollution, several disease this upgraded as well as efficient solar powered induction has been invented . This upgraded induction of heating helps in heating a non-contact method which helps in producing very high temperature in a very small of time , for preparing this upgraded system and doing the research the main aim was use solar energy as the base which helps in giving the power supply to the solar power induction stove where we have used maximum power point to follow how it can utilized maximum energy from the sun and this can be used for charging the battery where this battery is very useful as it stores the solar energy which can be later on used for night hours also we can resolve the problem of irregularity issue which was seen in mostly cooking system.

## II. NEED FOR SOLAR POWERED SYSTEM

In India need has been generated as more than 100 million people especially people of rural areas are completely dependent on this the Chula cooking system. This cooking system is the conservative system of cooking which is highly influences inside home pollution as it is indoor cooking .This Chula is made up of mud where it is U shaped and prepared from the clay , Chula primarily gets power from the wood and animal dung as animal dung cake has been prepared which include dung of cow, buffalo, goat etc. and many more plants some of them are sarkanda and tuhari ,for cooking the food on this Chula person has to sit near it ,as fumes which rise to the Chula is bit higher and due to high flames it causes many health disease , damage to respiration system and many more , as we have already defined the main aim to replace to old cooking system was due to as it is inside home pollution, lot of smoke , many more disease which are effecting women's and children .This cooking system as it home inside cooking system casing respiration problems , many mire disease like chest pain, headaches and tuberculosis. In India more than 2 million population is dying from this cooking system especially in rural areas. The mail aim of this paper writing is to search a renewable and solution to the problem which can reduce minimal pollution as compare to the Chula cooking system taking care of the things which lead a safety life ,highly sustainable method

## III. DESIGN SYSTEM

Solar power induction is a process of heating electrically ferromagnetic substance which is called electromagnetic induction, below is the diagram where block diagram system has been described in Fig 1, in this diagram which contains induction coil which is connected with the solar panel and which boost and connected by the half bridge inverter topology. In order to control the production battery charging and power control unit which helps in cooking setup.

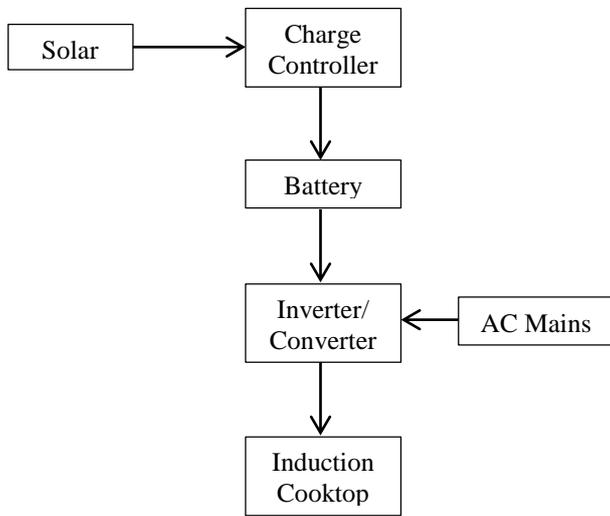


Fig. 1: Block Diagram of System

**Main Power Supply**

In this solar power induction power gets from the grid which is optional for getting the power and the voltage of it is transform into direct current supply through Alternative current to direct current 230V 30A these two are used in reflection as well as showing as a standard voltage 2.2 AC TO DC which is the main input to convertor which used for charging the battery and this replica of it is shown in Fig 2.

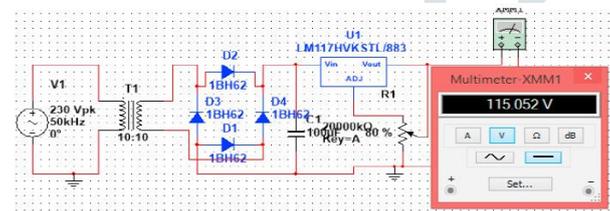


Fig. 2: AC to DC converter

The main purpose of this convertor is it makes easy to get batteries charge as well the half bridge convertor helps in working efficiently as it is require only direct current supply. 230V mains AC Voltage it is transform to 115v Direct current at 1200 capacity level. Some of the other aspects to make it workable in the scope of frequencies for dissimilar power levels in the area of inverter segment.

**Solar**

As it is named as solar power induction as the base is solar system thus it solar is main chief to provide the cooker. Solar is basically done up with photovoltaic cells that transform solar energy into electrical energy which is in the formation of direct current. Photovoltaic module creates electricity from the sun as the Photovoltaic is having features of nonlinear due to which production is not constant every time or we can say throughout the day. In this model, in order to control the voltage of Photovoltaic model has made in such a manner that Direct current to direct current preform simultaneously along with the Photovoltaic where as in the research for heating up the induction coil solar plays a crucial role and a 350 W in this solar transmission to provide energy panel has been used. The units used in this based on the sun.

**DC to DC Converter**

The change control the unregulated direct current contributes of the solar panel. The smooth direct current supply is important for the charging unit to be adjusted direct current for imposing the purposes and to contribute the inverter with smooth supply. 24VDC to 115VDC

converter is used in the reflection while the practical power ratings for the 3 power levels were taken as 24VDC to 65VDC. The hands on results shown were just a demo to explore the probability of the execution of the project. In the second stage simulation ratings has been used.

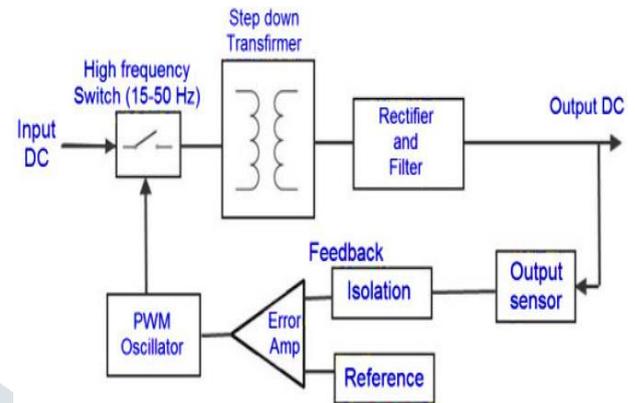


Fig. 3: DC converter

**Battery charging circuit**

To store the energy accumulation batteries has been used which contains electrochemical cells .For maintaining load levelling small size or moveable batteries has been used . The charger controller circuit regulates the charging and the discharging of the battery stage to increase the existence of the battery.

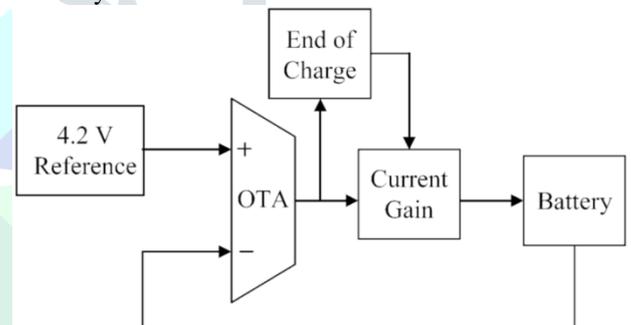


Fig. 4: Battery charger

**Auto Switching**

Here we are covering how it actually works what we are using which switch and connection and all the auto switch helps in selecting the auto switch which is accessible supply in the middle of solar and the grid helps in choosing whichever is adequate for doing power demand research. For the survey power solar is the prime concern which is economical selection and consumption, this auto switch is handled by the microcontroller program, whereas the battery power size is compare to the change state selected , in this if the battery magnitude is enough the coil has sufficient power which it will take from the battery , in this model this auto switch is made in such a way from the power that is source selection is ready in the very starting of the every cooking phase and in case if battery is not enough to supply sufficient power for the cooking phase which is chosen also the time span has been calculated and the actual power as well the battery will be charged from the solar or from the mains .

**Half bridge inverter**

The half bridge circuit is made in a way to convert the direct current from Photovoltaic and mains to alternating current. The main benefit making use of half bridge is that the elevated frequency harmonics can be make use to assemble heat in the coil. The simulation model of half -bridge circuit with cooking coil is shown in fig. 5.

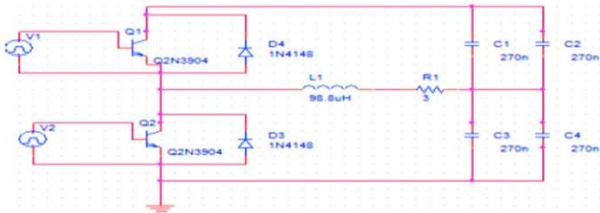


Fig. 5: Half bridge inverter with the cooker coil

The half bridge circuit shown in fig. 5 is model has been made in such a way that is two IGBTs to transform direct current too into alternative current. A 115VDC source is provide to the two IGBTs which is transform to an alternating current by transmitting opposite PWM indicators to the switches. The volume of voltage generate on the coil depends on the convert frequency and the pot material used. In the diagram the power span varies from 200W to 1200W. L1 and R1 represent the cooker coil and the pot individually. The four electrical condenser shown in fig. 5 is the deep tank which is used so that it can continue in ups and downs of supply in case of sine wave. These backup even are ready and useful in cases when the supply is required at the stage of 5 % dead time in case of state change

Voltage and rate of occurrence is monitored by quivering width modulation by changing duty ratio. The inverter simples and workable in the rate of occurrence, the rate of occurrences from 10 KHz to 65 KHz for all dissimilar power stages.

**Control circuit**

The model of control circuit is plan in such a way that it contains atmega-328 to process controls as in charging, observing, presenting and automatic switching, in the Fig 6 it is completely shown The programming algorithm and flow chart for the control unit The circuit manages the power magnitude as per the buyer chosen the input. The LCDs are cable of presenting characters [14]. The Liquid crystal presents the power consumption and the magnitude chosen by the buyer. It also designate if something is wrong or if there is proper supply of the sources Voltage as well as and current recognizes uses voltage divider and shunt resistor individually. In case of switching control circuit really helps in all this stuff

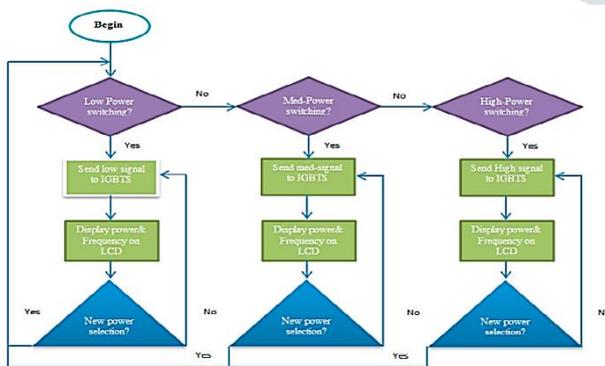


Fig. 6: Power Control Flow chart

**Induction coil**

In this it has been described how this induction coil has been used as it works with the concept of electromagnetic induction by using or we can say warming up the cooking containers straight away, as cooking container are made up of ferromagnetic material which helps in in flowing of the Eddy currents and generate heat on the material. Oscillating magnetic field produce current in the vessel and due to which vessel or containers, cooker perform more 80% better than before and accurately while preparing or cooking.

**IV. PRACTICAL COOKING LEVELS**

Induction cooker, pot, cooling fan and the whole setup has been described in the Fig. 7. The solar input has been connected to the boost converter which helps in increasing the level that is 65V, 4A to the level of half bridge circuit. Where ever we can see the highest level of the power of panel is 300W and also there is concern that it is impractical to raise the highest power from the panel as there is concern is and unpredictable movements of the sun which is not constant and moving very frequently.



Fig. 7: Induction cooker, Pot, cooling fan and the whole setup

The induction cooker was efficient of heating a pot holding about 600ml of water to through 90°C. It has been noticed that these consumptions process that how much it energy it takes to warm-up the water from 90°C to 100°C is increased than that used up to 90°C and all this is happening due to raising in temperature which is quiet faster the molecules which are present in the water However, the speed raising is not directly to temperature is rising as proof by the physical reflection of the molecule gestures when water outreach boiling thusly to reach 100°C the input power which is directly raised to sufficient level of water. This is due to the unused heat need to transform a liquid to gas. The transformation shows eight different cooking magnitude in the form of load voltage, load current and pulse midsize the variations waveform with a dead time of 5 % to permit easy switching. The variation of frequencies permits the cooker to have abundance of cooking volume.

**V. CONCLUSION**

In this research as well as in paper solar powered induction system has been described where how this model has been prepared, its working, functions , characteristics in detail where it has been described how can we use batteries which can be charged using solar as well as grid where it has its own different uses as grid can be use when the solar power is not accessible whereas the choosing options is derived from by using auto switch .as it also helps in making our environment friendly, less pollution as this system is taking power or energy from the sun. Also we have make backups as in cooker has powered by the main power other than the sun energy in case of any uncertain situations .flexibility of the system as well as the derived results for multiple cooking levels due to which cooking level has been raised, also many other backup has been plan such as to upgrade the system and to reduce the risk two half bridge inverter contains of a class D and class DE half bridges can be used to work at high power and low power output ranges.

**VI. FUTURE SCOPE**

The present task can be increased in many techniques; some of them are introduced below.

**Model of an induction heater for saving of organic coating:** Induction heating is used to cure organic coating

such as paints on metallic substrates, create heat within the substrate and reduce the propensity for creating of coating limitations. A usual method is the drying of paint on sheet metal.

bridge series resonant inverter for induction heating applications with load adaptive PFM control strategy, IEEE Applied Power Electronics Conf. (APEC) Rec., 575-581.

### Model of an induction heater for sintering of carbides:

Induction heating is extensively used in sintering of carbide carry out because it can supply the required high temperature (2550°C) in a graphite retort or subsector with atmosphere control. Other performs of ferrous and nonferrous metals can be sintered in a same as manner with or without environment shielding.

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