Review of PV Array and AC Supply based Induction Chula System

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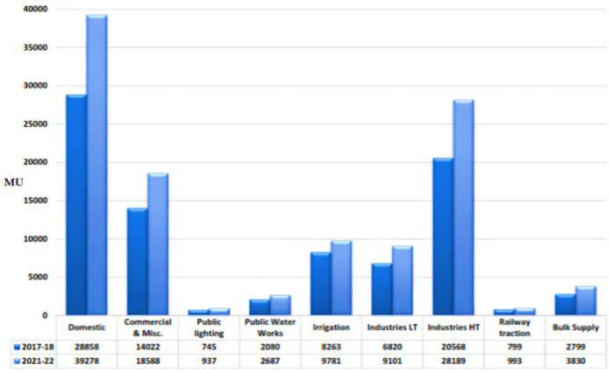
Abstract: - In the world specially in developing areas where people are fighting to cook with the help of stoves.But due to excessive use of it people are facing various issues as it emit dangerous fumes and helps greenhouse gas emissions but important problem to approve the use of these electric oven which brings notice is that lack of trustable electric power which make current commercial options unworkable. However, a stove with load of energy of 24V DC elegantly which helps in solving the problems of irregularity where the power by permitting car batteries to be used in place of a grid connection, while also as well as all taking all visible integration with small scale solar installations and solar-based micro-grids. This paper studies the model of a low voltage current-fed, full-bridge parallel resonant converter Chula. This Chula is presenting abenefit toeach of the field of solar power as well as major supply for the developing globe.

Keywords: - Induction Chula, PV Array, AC Supply, Energy.

I. INTRODUCTION

The world is changing very fast as evolution in the global economy as well as way of life people are living majorly depends on the energy as well as the electricity. If we see the energy market where it is related to changing due to the energy fluctuating on day to day basis, in the outlook 2015 where it has been described about work done in the Indian energy where it comprise of multiple factors which describe about the importance of energy. In India if wee there are many areas where there is no electricity and the percentage if we see is 18% entire globe and reason behind is not availability of appropriate base as in power grid to provide electricity as the growing demand for energy which involves the various uses ofrenewable sources and encourage decentralized in the different age group. Individually if we see photovoltaic energy which helps energy market to develop and raising the energy demand .in India if we see there multiple factors, wrong assumptions and mentality of people related to the energy that is electricity generated from various sources solar photovoltaic energy whereas survey has conducted in order to find out the depth of solar Photovoltaic energy system with many different perception. As well as itsSocio-Economic-Technical (SET) where it is related to the effect on energy rules and regulation of India.

Thus, the Research and Development (R&D) in energy engineering with an economics mentality is highly important.A lot of initiatives are in progress over all the globe to tackle solar energy and transform it into electricity with various form as in cooperation from governments, public and private firms.in the year 2017,May, the Government of India, Ministry of Power and Central Electricity Authority (CEA) issue details summary or a report related to thebroadening of electricity sectorin India from 1947 to 2017. As per the details summary, the Indian power sector may go through emergency in power generation due to scarcity of raw materials such as coal and natural gas. The expected electrical energy usage (in MU) of National Capital Region (NCR) for the years 2017-18 and 2021-22 is portrayed in Fig. 1.



(Source: Central Electricity Authority)

Fig. 1: Anticipated Electrical Energy Consumption (in MU) of National Capital Region (NCR) for the years 2017-18 and 2021-22

In 2012, the renewable energy field generated 15% of India‘s entire electricityand ifwesee the details analysis of International Energy Outlook (IEO) (2016), India‘s renewable energy electricity different age people isforecast to raise up to 28% by 2040. A rapid growth is experienced (3.7% per year) in commercial energy which is maximum used in Indian market. Thus, India‘s economic growth will be raised over all different nations by the year 2040. By 2028, it is forecast tomaximize the population by changing China as the biggest populated country. Same as, the IEO 2016 detail analysis presented the information on the subject connectedto International Energy Markets of 2040. In IEO 2016, the energy utilization is projected on one’sown forcorporation for EconomicCooperation and Development members (OECD) and nonmembers (non-OECD). From the huge data produced in this detail

analysis, few quotations which are related to the solar energy fields are as follows. By the end of 2012, the installed solar Photovoltaic dimensionswas 90 GW globe wide. Before the end of year 2020 there are more than 30+ countries where different governments has made different rules and regulations for national solar generation When such national target are focused, then the entire solar generation volume reaches 350 GW within 2020. By the year 2012, six countries inthe entireglobeshows 76% of the entire installed solar Photovoltaic capacity, considered 61% of the global achieve for the year, 2020. If we see for each year as photovoltaic manufacturing is increasing the volume of 60W for each year will be resulted in the year from 2013 to 2020 and as per that we can achieve national target can be attained.

It is crucial to recognize that there shall be no correlations between the national targets and the forecasted of solar Photovoltaicmarket volume and as per the initial exchange offering2016 forecasting, it is not important to attain all the listed purpose of installing solar Photovoltaicand other renewable energy sources. Thus, the targets are made alternated by countries majorly on different factors then and there.

Grid-connected solar power plants were started by government in the month of January 2008 and Feed-In-Tariff (Fit) for solar energy (a maximum of INR 15/kWh (kilowatt-hour)) was launch. However, at that time, due to multiplecauses, solar power generation cost was too overpriced (i.e., INR 18/kWh) due to which the tariff seems to be non-viable. Thus to handle, this circumstances was launched by Generation-Based Incentives (GBI) scheme in which the developers are prohibited from installing more than 5MW solar power services in India that effected the returns on large scale. There were multiple reasons why this GBI Scheme got break down and some of the causes of it werenon-incorporation of state utilities of governments in the project development, land acquisition hurdles anddeficiency of grids which is giving raise to inadequate widening of the zone only by 6MW for the year 2009.

In January 2010, Gujarat UreaVisas Nigam Limited (GUVNL) amended the solar tariff to INR 15 per kWh for first 12 years, and then after it related to which INR 5 per kWh for the next 13 years. During 2011, the solar space faced subsequent decline in the tariff charges in the span of INR 10.95-12.76 per kWh.

In 2012, the Central Electricity Regulatory Commission (CERC) has amended thepresent rule and regulations and started new rules and regulations in order to see the solar project tariff When the new rules and regulations has been launched and on 1 setApril 2012 it came into form to follow the rules, the solar power plants was got advantage as there was big reduction in capital value (up to 41 per cent in normative capital cost). The results of this advantage wasmainly in price for narrow -film and crystalline modules in India.

As this Photovoltaic module was launch costdepletion CERC has beendecreased the generic levelised tariff for solar projects to INR 10.39/kWh (without claiming Accelerated Depreciation) and INR 9.35/kWh (after claiming Accelerated Depreciation) for solar PV energy projects. This made such animportant effectsuch that the solar tariff in Gujarat was priced at INR 15/kWh (for the first 12 years) for solar power projects that were commissioned until 28 January 2012 while for the solar power projects commissioned between 1 April 2012 to 31 March 2013, the cost was set with the tariff of INR 9.28/kWh (for the first 12 years). Same as example was seen in Rajasthan as well, when Rajasthan Electricity Regulatory Commission amend the tariff downwards (i.e., INR 13.19/kWh (claiming Accelerated Depreciation) for solar Photovoltaicprojectsput on it. commissioned till 31st March 2012 while INR 8.85/kWh (claiming Accelerated Depreciation) was set as tariff for the projects commissioned up to 31st March 2014).

Now after the countries states are also focusing on it and taking more risk to make it work for example Tamiland signs an proposal on July 20 2015 in order to purchase power with the price of INR 7.01/kWh from the particular firm which has suggested solar plants for the durations of 25 years but the agreementwhich was made per unit price which was more as if we differentiate from Madhya Pradesh where the price was and it was the same firm.

On 20th January 2016, NTPC limited did contrasting bidding for its 420 MW solar power project to be set up at Bhadla Solar Park-II near Jodhpur in Rajasthan at the cheapest-ever price of INR 4.34/kWh. To the people's surprise, the solar power tariff hit to the all-time low of INR 2.97/unit on 13th February 2017 from Rewa Ultra Mega Power Ltd, globe's higesthetsolar power plant. This ignite the interests that raise to the development of a joint venture in the middle of Solar Energy Corporation of India Ltd (SECI) and Madhya Pradesh Urja Vikas Nigam Ltd (MPUVNL) to converge the energy requirements of India by setting up large solar power projects. It will be socking thatthe solar power tariff in India has the power to hit Indian rupee (INR) 2.97/kWh on 13th February 2017 collating to INR 18/kWh in 2008, if we do the comparison in India between the different states as in we will be able to see that India's solar power tariff hit every time lessRest 2.44 per unit on 12th May 2017 at the trading of 500 megawatt (MW) of power at the Beadle solar park in Rajasthan.

By the year 2022, India focusing tocreate 100 GW through solar energy with the help of mechanisms like Utility-scale, Rooftop solar, Off-grid, give out Generationand

Micro-grid. The total installed solar power volume in India as on 31 May 2017 is 12.50 GW.

II. INDUCTION CHULHA

In India if we see people loves cooking and while cooking the extensively used induction heating and the containers use are meetings, hardening and brazing etc. and the reason behind using of such heating induction is that as it is giving good result such as heating efficiency , people want things to be done in the good environment as health issue are also one of the concern afarhygiene issue people moves on to the cheapest as cost effective method while cooking that effective semiconductor devices, in the below diagram we can see that when the coil is collated alternative current flow which is in close lid which created magnetic field of the coil and generate and start circulating currents in the lid of the vessels in Fig 2.

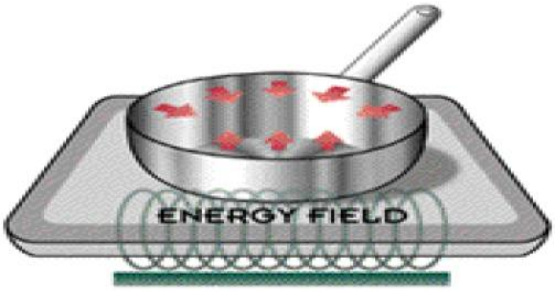


Fig. 2: Induction Cooker

Working principle of induction cooker:

Fig. 3 shows the fundamental element of an induction cooker. Its fundamental circuit structure is shown in Fig. 3. In an induction cooker, starting with analternative current supply of 50 Hz is thencorrected todirect current andgradually back to a scaling elevated frequency AC origin from aninverter. This high frequency current makes a scaling elevated frequency in place of magnetic field from an induction coil. Thus,putting a cooking pan / utensil near to the induction coil will induce eddy current in the pan. As a consequence of which, heat energy will be generated on the upper side of the pan. The internal resistance of the pan reflects heat to be dissipated according to Joules effect. Thus, it is the pan itself and not the heater that heats up and cooks the food.

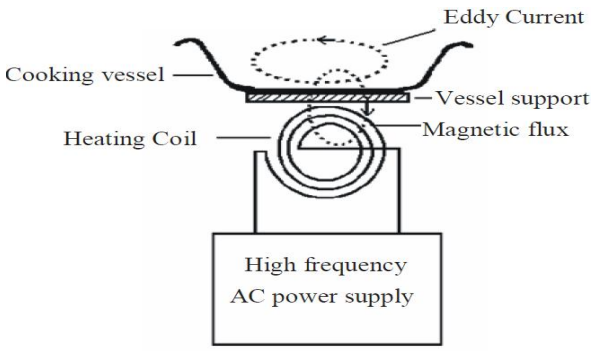


Fig. 3: Principle of Induction cooking

Advantages of induction cooker:

- Only radiation that comes from an induction cooker is heat radiation,
- The coil is safer as well as remains cool which is plays a crucial role
- Higher effectiveness and also. reducing and managing lesser electricity bills,
- Continuous result power,
- Nonattendance of shock hazard in the cooking pan,
- Adjustable temperature control,
- Inexpensive than readily accessible microwave-oven,
- Common kitchen-motive steel containers are enough for cooking,

Basic Requirement of an Induction Cooker

- Change in the radio-frequency range
- Power factor close to unity
- Broader power range
- Ethnicity

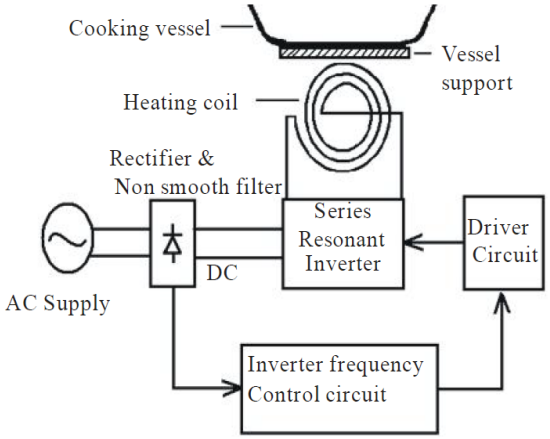


Fig.4: Basic circuit of a domestic purpose induction cooker

III. LITERATURE REVIEW

Bridge rectifier plays an important role as induction cookers basically energy from various sources that is from main voltages and the main voltage in case it does not or not support as much it is required to work then it has been corrected by the bridge rectifier.

The induction cooker takes the energy from the mains voltage and this voltage is thenrectified by an uncontrolled bridge rectifier. A bus filter is model which permitanelevated voltageripple and the resultant power factor close to one. Then an inverter provides elevated frequencyalternating current to the induction coil. But as

the times passes resonant inverter topologies are mostly used for induction cooker. There are mainly two types of invent ret topologies has been used that full bridge which has been launched by Hobson and Tabb in the year of 1985 and 2nd one is half bridge which was launched by Dawson and Jain in the year of 1991.

Various types of half bridges are also reported by Hobson et al., (1985); Kiersten in the year of 1995, Kami in the year of 1996,Wang et al in the year of 1998, Kwon et al in the year of 1999 and Sadhu et al in the year of 2004. By seeing this more upgraded versions of inverter has been launched such as cycle controlled half bridges which was launched by Hsieh and Wang in the year of 1997 for the purpose of reducing less conduction loss.

Two single transformation inverter topologies Zero Voltage Switching (ZVS) and Zero Current Switching (ZCS) are demonstrateby Omori et al., (1985); Listen and Hobson 1990); Cohen (1993). If we see both as infull bridge, half bridge has been made by Lorene et al., (2002). After making both the inventor the have decided on multiple factors that bride inverter is performing best as if we compare with the multiple function of full bridge inverter functions that are reliable as compare to full bridge inverter are tough, cost effective, and its sallied circuit layout makes it more versatile.

Achara et al., (2007) has done details analysis of the circuit of half bridge inverter using the principle of positive-negative phase shift control under ZVS and non-ZVS operation for small size and low voltage induction cooker.

Dawson and Jain (1990) also made a differentiation between two inverter power supply topologies such as current source parallel inverter and voltage source series inverter for induction heating and melting operation.

The differentiation is based on the basis such as input power factor, element ratings, maximum and minimum operating rate of occurrence, operation under varying load condition, inverter starting capacity and control simplicity. They have shown that voltage source series inverter supply better converter utilization over current source parallel inverter at the rate of occurrence more than 1 kHz. Below that rate of occurrence, current source parallelinverter plays crucialrole.

Missive et al., (2003) launched a circuit topology with add on advantage of active inductor snubbed for an edge resonant ZVS-PWM high rate of occurrence inverter using IGBT which can reached ZVS in all power regulation areas.

Various burner appliances which involves two or four inductors are made from and in multiple burner induction cookers, either one inverter per burner or one inverter for two or more burners is utilized. A single output inverter multiplexing the loads along the time periodically by means of electromechanical switches is developed by Rally (1988). A few details analysis such as Jung (1999) and Forest et al., (2000) as attempt toresolve the issues

Their proposed schemes have some restrictions such as low efficiency due to two solid state switches assuggested by Jung (1999) and reduction in power control when all loads are operated as proposed by Forest et al., (2000). Full bridge inverter with two results has been launched byBirdie et al., (2005).

IV. METHODOLOGY

In the below Fig 4new method has been applied for the solar cooking system and the capacity of the direct current

Powered Induction cooking system is unmoving comingout and its widening has not outreach to the top. In this system we are applying a 12V battery as DC source of supply.

The one main benefit of using the present time proposal isthat in the very less time other auxiliary circuit uses very less current and also saves time with full regulating of this topology and if we see the total energy consumed by the overall procedure is more than 100W of energy and also disadvantages of it model has the structure of coil which is quiet straight although it not so confused as this model with a control system falsify thatis so direct without any barrier.

The last systemthat used direct current oldapproach for cooking details of its progress is expressed in this details analysis. Where two direct current batteries of 12V 65AH is attached in series. In this system they have used an inverter with the rating of 2 KVA and the PV panels used is of 380 WP volume. With this system we can easily cook for four people within a time duration of 40 minutes, making use of only 0.7 kWh of energy. The main disadvantage with this model is the 2KVA inverter which decrease the effectiveness and causes over loss of power in this system.

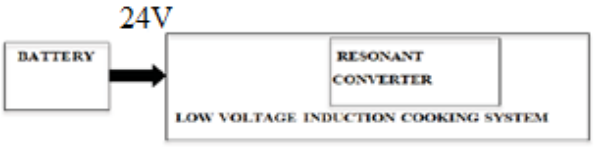


Fig 4: Modern Topology

Where as per the Induction principle when a high frequency. Alterative current passesthrough the coil it and creates oscillating magnetic field. This will pass through the plate that has contact over the coil wound. This in turn makes the eddy current passes through the coil and the heat is createdas per the topology. There are some other parts are the auxiliary elements that are consumed forspecific aim. The ZCD is make use inrecognizing the

capacitor terminal, when its crossing over zero. Here the transposition sensor used is LM 35 which is kept over the coil and under the heating plate to sense the temperature of the plate that is getting heated. The result is given to the micro controller. Here the program for the LCD represent is also feed and dipped into the pic micro controller to sense the voltage and current that is inputted through an PV system and the current and voltage that is production to the induction coil is also measured through the present sensor and a voltage divider circuit. This is attach atcorrect ends to sense the voltage and current flowing through the ends of the circuit. The LCD shows fourframework the input and output side voltage and current with the set temperature that users holds the power. Where the user can set the required temperature that is correct forcooking and also LCD displays the real temperature that is measured through the temperature sensor that is feed back to the micro controller and that is displayed in the display nearer to the set value. The main working happens in the micro controller where the dissimilarity between the set and the actual temperature is found this dissimilarity makes the PWM (Pulse Width Modulator) generate signal to the opt couplerwhich is utilize to turn up andalone signals and sends it to the Switching device that can be MOSFET or an IGBT.

V. CONCLUSION

The solar powered Induction cooking system willhas been designed withvarious hardware models and applied for getting the required result. The proportion of battery used is24V, 65AH, 2.5KV inverter required and only one panels of 380W is utilizing to create theshown result. If two 12V batteries is attached inseries and the 3 panels are attached in series and utilized to power this topology. Then the system can easily work more than 4 hours and the stored energy can supplement for 2hours and this system can easily put back the age old Chulasystem and also assist them leading a sustainable life style with an new age system that totally depends on the renewable source of energy. This system can be scaled up by raining the panels in number with a higher capacity battery system. That could make the system capable of constantly running for more than 6.5 hours as the energy required of the cooking top is full filled. These systems, when assimilate at a broader scale in the rural areas can put backthe Chula cooking system and hold up them in leading a feasible life.

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