

Solar Energy Used for Induction Cooktop

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ABSTRACT

Non-renewable energy sources, such as coal, petrol, diesel and LPG gas, are disappearing quickly these days. LPG gas is primarily utilized for cooking in our nation, but its cost is rising daily. Due to the scarcity and high explosiveness of LPG gas, cooking has become increasingly expensive and risky. Another energy source for cooking is electricity. Additionally, the price of electrical energy per unit rises. There is no guarantee that electrical energy will be available continuously because of a shortage of it. Thus, we propose a proposal here that uses renewable energy sources, such as solar energy, in place of non-renewable ones. When compared to alternative cooking methods, solar energy is simpler, safer, more affordable, and faster.

Keywords : - Non-Renewable Energy, Renewable Energy, LPG Gas, Solar Energy.

I. INTRODUCTION

Our way of life is ever-changing. Although it gets easier, safer, faster, and more pleasant, our cooking habits remain the same. There are still only two fundamental options available to me for cooking: electrical energy and LPG gas. It's time to move away from traditional energy sources and towards non-traditional ones, like solar energy instead of LPG gas. A free energy source that is accessible 365 days a year, 24 hours a day, is solar energy. We are able to transform solar energy into electrical energy by means of solar cells. In the future, cooking—one of the most

significant tasks performed by humans—may be done with solar energy.

II. Description of Components

Installing the entire system is quite simple. Figure 1 depicts the fundamental block diagram for solar-powered cooking using an induction hob. A solar panel, battery, inverter, control circuit, and induction hob are some examples of the various blocks. Let's examine each block more closely.

A. Solar Panel

There are other names for solar panels, including solar thermal energy panels, photovoltaic modules, and sets of solar photovoltaic modules. Through the process of photovoltaic effect, solar modules harness light energy from the sun to generate electricity. These days, LP-CVD zinc oxide-coated amorphous silicon photovoltaic cells are incredibly efficient [4]. To give the desired current capability, electrical connections are formed in parallel, and to provide the desired output voltage, they are made in series. Every panel is rated based on its DC output power under typical operating conditions; typically, this falls within the range of 100 to 500 watts. Assume you use a 600-watt panel; three panels are needed for an induction cooker that uses 2000 watts. The output current of each 200 W panel is 16 A, and the voltage is 12 V. Since every panel is connected in series and parallel, 16 A of current is flowing through them altogether. 800 W is the wattage since the efficiency is 80%. In that case, the current is $800/12$, or 66A. A solar panel costs 32 rupees per watt.

B. Battery

Many electrochemical cells coupled in parallel or series make up an electric battery. One way to think of a cell—the fundamental building block of a battery—is as a power-generating apparatus. It has the ability to transform chemical energy stored in the body into electrical energy. Rechargeable or secondary batteries are employed in this method. Lead-acid and nickel-zinc cells are two types of secondary cells. The load levelling system uses stationary batteries to store energy during periods of low demand and use it during periods of peak demand. Use two batteries for this project, each with a capacity of 36 V and 180 Ah and measuring 12 V x 3 and 180 Ah. About three hours' worth of output are produced by this [5].

C. Power converter

Inverters are the name for the dc-to-ac power converters. A circuit that transforms DC electricity into AC power at the required output voltage and

frequency is known as an inverter. Either a fixed or variable ac output voltage is possible. One way to do this conversion is by carefully turning on or off the devices (such as BJTs, MOSFETs, IGBTs, MCTs, SITs, GTOs, and SITHs). This system uses a half bridge topology with voltage source inverters that are pulse width modulated (PWM) inverters. [1] a 2.5 kVA inverter that meets our needs with a typical output specification of 230V at 50 Hz Series resonance topology is applied here. [2].

D. Solar MPPT Controller

"Maximum power point tracking," or MPPT, is a term used to describe systems that maximise the power output of one or more photovoltaic devices, usually solar panels, such as grid-connected inverters and solar battery chargers. There are solar panels in the atmosphere. Solar panels are illuminated by the sun's rays; occasionally, shadows form, which causes an imbalance in the voltage and current produced, potentially leading to damage to the panel. Solar panels may burn out from time to time. The solar MPPT controller safeguards the solar panel and battery charging unit by managing overvoltage and undervoltage situations that arise in solar panels. It increases voltage when production of voltage is low and decreases voltage when production of voltage is large.

E. Induction Cooker

Induction heating is employed in induction cookers. via creating eddy currents inside the metal and increasing resistance, induction heating is the technique of heating an electrically conducting metal via electromagnetic induction. This results in the metal heating up to joules. A multi winding coil that conducts a high-frequency alternating current is found in an induction cooker [3]. In materials with a high relative permeability, magnetic hysteresis losses can also produce heat. The size, kind of material, coupling, and penetration depth of the object all affect the AC frequency that is used.

III. Comparative Study

Cost and safety are LPG's two main drawbacks. It takes incredibly solid metal tanks to keep a pressurized tank in 274 times less space than it would typically take up, hence it's not unexpected that LPG containers occasionally blow up. Because LPG burns so easily, it should be far riskier to move it by car and store it in big tanks in populous places. The unreliable supply of electricity brought on by load shunting is a drawback. Overloading occasionally causes a malfunction in the system. The combustion of coal contributes to atmospheric pollution as well.

Radiant light and heat from the sun are captured utilizing a variety of constantly developing technologies, including solar photovoltaics. A photovoltaic cell is becoming cheaper and cheaper these days. value of KCAL per square meter.

A 1 sq. mm area may produce 1200 kcal/hrm² of solar energy. 860 kcal is equal to 1 kilowatt. In one-hour, solar energy produces $1200/860 = 1.3$ kw. Now imagine a 15 Ah battery at 36 V. Now multiply 36V by 15 Ah to get about 600 W of energy, then compute how many watts the battery generates in 30 minutes.

Table 1 Cost Estimation

Particulars	Specifications	Cost
Solar panel	600W	21,600
Battery	1 Kw	10,000
Battery charger	1, 12V	1,500
Total cost		33,100

Table 2 Cost Comparison Between Traditional and Induction System

Sr. No.	Year	Cooking Gas Cost per cylinder	Electricity Avg. Cost per unit
1.	2002-03	395.50	1.2
2.	2003-04	400.95	1.5
3.	2004-05	425.35	1.7
4.	2005-06	475.25	2.2
5.	2006-07	650.75	2.5
6.	2011-12	921.50	3.2

IV. Concluding Remarks

This study presents an induction cooking device that runs on solar electricity. Efficiency appears to decrease with increasing cooking degree. With solar powered induction heating energy can be saved and it can be work during off shine period also.

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