Implementation of Induction Water Heating System for Domestic Application

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***Abstract*- The effective use of solar energy is frustrated by the discontinuous idea of its accessibility, restricting its utilization and adequacy in household and modern applications particularly in water warming. Right now, sun powered force is profited at the most elevated level; the ideal room temperature can be accomplished effectively through the boiler having low obstruction power. However, because of disappointment of resistance at short interims and the need of difficult exertion during the evolving procedure, diminish the intrigue of opposition boilers. Now, the heater having a low breakdown likelihood and warming the water with induction warming standard offer a very appealing arrangement. The aim of this study is to research induction water heating technique for electrical boiler applications. To this end, an exceptional induction water-warming framework was planned and delivered. The structured framework was controlled by single and two-stage electrical association and acceptable outcomes were gotten. It is normal that an effective warming framework having ease activity and support can be created by improving this procedure material for showcase.**

***Index terms*- Solar panel, Renewable Energy, Water heater, Charge controller, Battery and Inverter**

INTRODUCTION

Boiling water is fundamental both in enterprises and homes. It is required for cleaning up, washing garments and utensils, and other local purposes in both the urban and provincial zones. Heated water is additionally required in enormous amounts in lodgings, clinics, inns, and enterprises, for example, material, paper, and nourishment preparing, dairy, and eatable oil. Truth be told, high temp water is required fundamentally for reasons for cleanliness and washing in homes. Heated water requests have all the earmarks of being most elevated inside the times of the day when electric vitality interest for different objects is high.

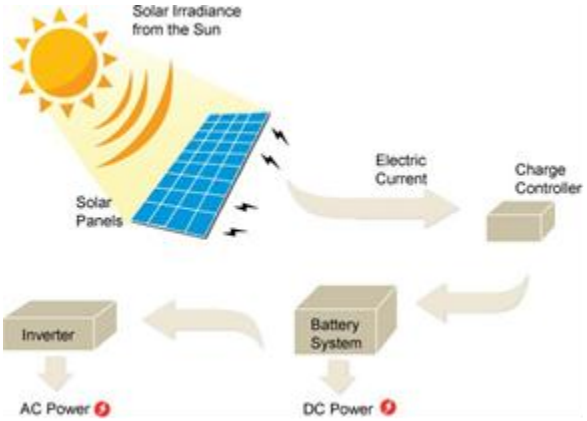

Fig 1: System Architecture Diagram

The sun has been an incredible nearness and power since the commencement of human presence on earth. It has been viewed by numerous societies as a divine force of some structure, and comprehended by most to be a definitive wellspring of life on this planet. It has likewise been purposefully abused by numerous smart methods throughout the hundreds of years, so as to all the more likely use this nurturing vitality. To the extent sustainable power sources go, the sun speaks to the best and most stable we have. It is limitless as for all viable timescales, monstrously amazing, comprehended and unsurprising in its general patterns and designs, and for a long time to come past anthropogenic impacts. To put it plainly, the ideal vitality source; yet it isn't without troubles. Sun based radiator is a gadget which is utilized for warming the water, for creating the steam for residential and mechanical purposes by using solar energy. At present, high temperature water requests are met fundamentally by the utilization of electric

radiators. Shockingly, rising vitality cost, ecological concerns, and the draining idea of the flow essential vitality sources being used have made electric heaters less attractive.

In addition, the interest for power is developing quickly; subsequently inside those periods when heated water request is most elevated the electric vitality offices are regularly overstretched, bringing about certain cases to control concealing particularly in developing countries.

These issues can be taken care of by removing the energy demand for high temp water purposes from power.

Fortunately, the specialized and financial possibilities of solar hot water system SHWSs are entrenched and they have discovered household and business applications. These frameworks utilize solar energy to create high temp water.

PROPOSED SYSTEM

In Solar water heater system possess have numerous focal points incorporates it doesn't require any expense of power. It has extremely low running expense just as upkeep cost. All the sun based water warmer frameworks are extensively named Active sunlight based water radiator and latent sun powered water radiator. In latent sun powered water radiator, just sun oriented vitality is utilized to expand temperature of water yet in Active sunlight based water warmer, sun oriented vitality as well as some mechanical power is required to build temperature of water.

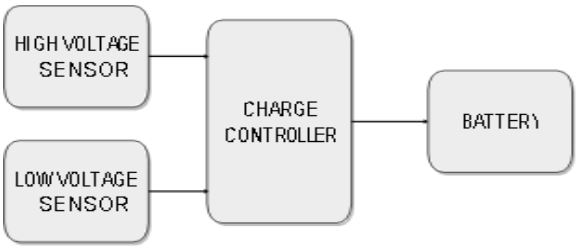

Fig 2: Block Diagram

SOLAR PANEL

A solar panel is a lot of sun oriented photovoltaic modules electrically associated and mounted on a supporting structure. A photovoltaic module is a bundled, associated get together of sun based cells. The sun based board can be utilized as a part of a bigger photovoltaic framework to create and supply power in business and private applications.

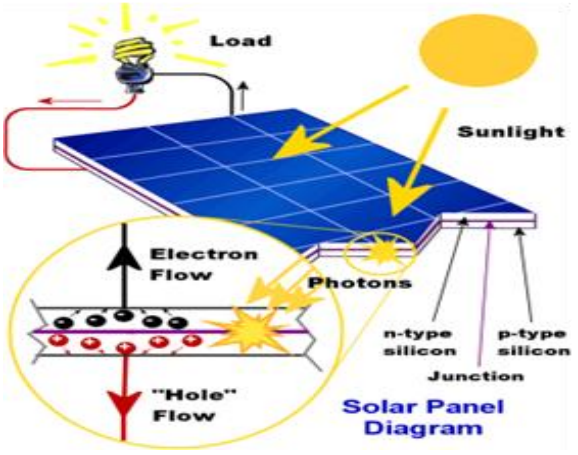

Fig 3: Solar Panel Block Diagram

The working guideline of all today sunlight based cells is basically the equivalent. It depends on the photovoltaic impact. By and large, the photovoltaic impact implies the age of a potential distinction at the intersection of two unique materials in light of unmistakable or other radiation.

CHARGE CONTROLLERS

Most stand-alone solar power systems will require a charge controller. The motivation behind this is to guarantee that the battery is never cheated, by occupying power away from it once it is completely energized. Just if an extremely little sunlight based board, for example, a battery saver is utilized to charge a huge battery is it conceivable to manage without a controller. Most charge controllers likewise join a low-voltage disengage work, which keeps the battery from being harmed by being totally released. It does this by turning off any DC machines when the battery voltage falls hazardously low.

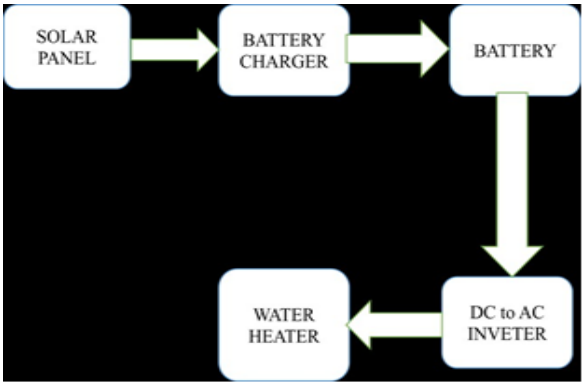

Fig 4: Charge Controller

The principle behind a solar charge controller is simple. There is a circuit to gauge the battery voltage, which works a change to occupy power away from the battery when it is completely energized. Since sun oriented cells are not harmed by being short or open-circuits, both of these techniques can be utilized to stop power arriving at the battery.

BATTERY

An electric battery is an assortment of at least one electrochemical cells in which put away substance vitality is changed over into electrical vitality. The standards of activity haven't changed much since the hour of Volta. Every cell comprises of two half cells associated in arrangement through an electrolytic arrangement. One half cell houses the Anode to which the positive particle0s move from the Electrolyte and different houses the Cathode to which the negative ones float. The two cells are might be associated by means of a semi penetrable membranous structure permitting particles to stream yet not the blending of electrolytes as on account of most essential cells or in a similar arrangement as in auxiliary cells.

Fig 5: Battery

The energy released during tolerating an electron by an impartial molecule is known as electron proclivity. As the nuclear structure for various materials are extraordinary, the electron fondness of various materials will vary. On the off chance that two various types of metals or metallic mixes are drenched in a similar electrolyte arrangement, one of them will pick up electrons and the other will discharge electrons. Which metal (or metallic compound) will pick up electrons and which will lose them relies on the electron affinities of these metals or metallic mixes. The metal with low electron liking will pick up electrons from the negative particles of the electrolyte arrangement. Then again, the metal with high electron liking will discharge electrons and these electrons turn out into the electrolyte arrangement and are added to the positive particles of the arrangement. Right now, of these metals or mixes gains electrons and another lose electrons. Subsequently, there will be a distinction in electron focus between these two metals. This distinction of electron fixation makes an electrical potential contrast create between the metals. This electrical potential distinction or emf can be used as a wellspring of voltage in any gadgets or electrical circuit. This is a general and fundamental guideline of battery.

INVERTER

A power inverter, or inverter, is an electronic gadget or hardware that changes direct current (DC) to alternating current (AC).The input voltage, yield voltage and recurrence, and by and large force dealing with relies upon the structure of the particular gadget or hardware. The inverter doesn't create any force; the force is given by the DC source. A force inverter can be completely electronic or might be a mix of mechanical impacts, (for example, a turning contraption) and electronic hardware. Static inverters don't utilize moving parts in the transformation procedure.

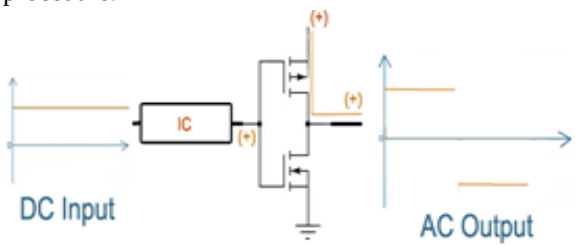

Fig 6: DC to AC Inverter

The PWM inverter corrects the output voltage according to the value of the load connected at the output. This is accomplished by changing the width of the switching frequency generated by the oscillator section. The AC voltage at the output depends on the width of the switching pulse. The process is achieved by feed backing a part of the inverter output to the PWM controller section (PWM controller IC).Based on this feedback voltage the PWM controller will make necessary corrections in the pulse width of the switching pulse generated at oscillator section. This change in the pulse width of the switching pulse will

cancel the changes in the output voltage and the inverter output will stay constant irrespective of the load variations.

SOLAR POWER SUPPLY BOARD MODULE

Fig 7: Solar Power Supply Board

CONCLUSION

Renewable energy research has become progressively significant since the marking of the Kyoto Protocol. Solar water heating (SWH) or water purifier is one of the best advances to change over solar energy into thermal energy and is viewed as a created and popularized innovation. However, there exist chances to additionally improve the framework execution to build its dependability and proficiency. A compact survey essentially on the structure includes and related specialized progressions of the SWH frameworks regarding both vitality proficiency and cost viability has been introduced. A few sunlight based water warming structures have been presented in the market and are all the more usually used in the tropical areas of developing countries. Late improvements in heat pipe based sunlight based gatherer innovation display a promising plan to use sun oriented vitality as a dependable warming hotspot for water warming applications in sun powered unfriendly locales. Heat pipe based sun powered water warming is impacted by numerous components including the idea of the refrigerant, because of the natural concerns.

REFERENCES

[1] Vishal G. Shelke, Chinmay V. Patil, Kishor R. Sontakke, "Solar Water Heating Systems: A Review" International Journal of Scientific Engineering and Research (IJSER) Volume 3 Issue 4, April 2015.

[2] Prakash Kumar Sen, Nishita Kispotta, Shailendra Kumar Bohidar, "study on solar water heater and its system performance" International Journal of Advance Research in Science and Engineering Vol. No.4, Special Issue (01), April 2015.

[3] Sudhir Chaudhari, Nimesh Parmar, Hitesh N Panchal, "A Critical Review on Solar Water Heater" International journal of advanced engineering technology Issue II/April-June, 2017.

[4] K. S. Ong and W. L. Tong, "System Performance of U-Tube and Heat Pipe Solar Water Heaters" Journal of Applied Science and Engineering, Vol. 15, No. 2, pp. 105-110 (2012).

[5] G. Tsilingiridis,Martinopoulos And N. Kyriakis (2004). "Life Cycle Environmental Impact Of A Thermosyphonic Domestic Solar Hot Water System In Comparison With Electrical And Gas Water Heating". Renewable Energy 29 (8): 1277.

[6] Del Chiaro, Bernadette and Telleen-Lawton, Timothy (April 2007). "Solar Water Heating (How Can Reduce Its Dependence on Natural Gas)" (Pdf). Environment California Research and Policy Center. Retrieved 29 September 2007.

[7] C.H.Papadimitriou and K. Steiglitz, "Combinatorial Optimization: Algorithms and Complexity",vol.1,no.2, pp. 1104– 1108,1982.

[8] M. Grotschel, L. Lovasz, and A. Schrijver, "Geometric Algorithms and Combinatorial Optimization", vol.10,no.1, pp. 201–206, 2009.

[9] Bhattacharyya, B., Malapati, M., Munda, J., and Sarkar, A. (2007). Influence of tool vibration on machining performance in electrochemical micro-machining of copper. International Journal of Machine Tools and Manufacture, 47(2), 335-342.

[10] V.Dhinesh, T.Premkumar, S.Saravanan and G.Vijayakumar," Online Grid Integrated Photovoltaic System with New Level Inverter System" International Research Journal of Engineering and Technology, Vol.5, Issue 12, pp.1544-1547, 2018.

[11] J.Vinoth, T.Muthukumar, M.Murugagndam and S.Saravanan," Efficiency Improvement of Partially Shaded PV System, International Journal of Innovative Research in Science,

Engineering and Technology, Vol.4, Special issue 6, pp.1502-1510, 2015.

[12] M.B.Malayandi, Dr.S.Saravanan, Dr. M.Muruganandam, "A Single Phase Bridgeless Boost Converter for Power Factor Correction on Three State Switching Cells", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1560-1566, May 2015.

[13] A.Sasipriya, T.Malathi, and S.Saravanan, "Analysis of Peak to Average Power Ratio Reduction Techniques in SFBC OFDM System" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Vol. 7, No.5, 2013.

[14] P.Ranjitha, V.Dhinesh, M.Muruganandam, S.Saravanan, "Implementation of Soft Switching with Cascaded Transformers to drive the PMDC Motor", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1411-1418, May 2015.

[15] C.Sowmiya, N.Mohanandhini, S.Saravanan and M.Ranjitha,"Inverter Power Control Based On DC-Link Voltage Regulation for IPMSM Drives using ANN" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 11, pp.1442-1448, 2018.

[16] N.Yuvaraj, B.Deepan, M.Muruganandam, S.Saravanan, "STATCOM Based of Adaptive Control Technique to Enhance Voltage Stability on Power Grid", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1454-1461, May 2015.

[17] P.Manikandan, S.Karthick, S.Saravanan and T.Divya," Role of Solar Powered Automatic Traffic Light Controller for Energy Conservation" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.989-992, 2018.

[18] R.Satheesh Kumar, D. Kanimozhi, S. Saravanan, "An Efficient Control Scheme for Wind Farm Using Back to Back Converter," International Journal of Engineering Research & Technology (IJERT), Vol. 2, No.9, pp.3282-3289, 2013.

[19] K.Prakashraj, G.Vijayakumar, S.Saravanan and S.Saranraj, "IoT Based Energy Monitoring and Management System for Smart Home Using Renewable Energy Resources," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1790-1797, 2020.

[20] J Mohammed siddi, A. Senthil kumar, S.Saravanan, M. Swathisriranjani, "Hybrid Renewable Energy Sources for Power Quality Improvement with Intelligent Controller," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1782-1789, 2020.

[21] S. Raveendar, P.M. Manikandan, S. Saravanan, V. Dhinesh, M. Swathisriranjani, "Flyback Converter Based BLDC Motor Drives for Power Device Applications," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.

[22] K. Manikanth, P. Manikandan, V. Dhinesh, Dr. N. Mohananthini, Dr. S. Saravanan, "Optimal Scheduling of Solar Wind Bio-Mass Systems and Evaluating the Demand Response Impacts on Effective Load Carrying Capability," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.

[23] T.R. Vignesh, M.Swathisriranjani, R.Sundar, S.Saravanan, T.Thenmozhi," Controller for Charging Electric Vehicles Using Solar Energy", Journal of Engineering Research and Application, vol.10, Issue.01, pp.49-53, 2020.

[24] V.Dhinesh, Dr.G.Vijayakumar, Dr.S.Saravanan," A Photovoltaic Modeling module with different Converters for Grid Operations", International Journal of Innovative Research in Technology, vol.6, Issue 8, pp.89-95, 2020.

[25] V. Dhinesh, R. Raja, S. Karthick, Dr. S. Saravanan," A Dual Stage Flyback Converter using VC Method", International Research Journal of Engineering and Technology, Vol.7, Issue 1, pp.1057-1062, 2020.

[26] G. Poovarasan, S. Susikumar, S. Naveen, N. Mohananthini, S. Saravanan," Study of Poultry Fodder Passing Through Trolley in Feeder Box," International Journal of Engineering Technology Research & Management, vol.4, Issue.1, pp.76-83, 2020.

[27] C. Sowmya, N. Mohananthini, S. Saravanan, and A. Senthil kumar," Using artificial intelligence inverter power control which is based on DC link voltage regulation for IPMSM drives with electrolytic capacitor," AIP Conference

Proceedings 2207, 050001 (2020); https://doi.org/10.1063/5.0000390, Published Online: 28 February 2020.

[28] M.Revathi, S.Saravanan, R.Raja, P.Manikandan," A Multiport System for A Battery Storage System Based on Modified Converter with MANFIS Algorithm," International Journal of Engineering Technology Research & Management, vol.4, issue 2, pp.217-222, 2020.

[29] Dr.S.Saravanan, S.Karthick, K.Rajeshkumar, S.Sriramachandran, P.Surjeethkumar," Fishermen Border Alert System," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.9, Issue, 03, pp.236-241, 2020.

[30] A.Yuvaraj, S.Vijay, M.Saran, V.Dhinesh, S.Saravanan," Agriculture Fire Monitoring Robot Using IOT," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.9, Issue, 03, pp.257-262, 2020.

[31] A.Ananthan, A.M.Dhanesh, J.Gowtham, R.Dhinesh, G.Jeevitha, Dr.S.Saravanan," IoT Based Clean Water Supply", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.154-162, 2020.

[32] S.Karthikeyan, A.Krishnaraj, P.Magendran, T.Divya, Dr.S.Saravanan," The Dairy Data Acquisition System", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.163-169, 2020.

[33] A.Arulkumar, S.Balaji, M.Balakrishnan, G.Dineshkumar, S.Saravanan," Design and Implementation of Low Cost Automatic Wall Painting Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.170-176, 2020.

[34] N.Harish, R.Jayakumar, P.Kalaiyarasan, G.Vijayakumar, S.Saravanan," IoT Based Smart Home Energy Meter", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.177-183, 2020.

[35] M.Amaran, S.Mannar Mannan, M.Madhu, Dr.R.Sagayaraj, Dr.S.Saravanan," Design and Implementation of Low Cost Solar Based Meat Cutting Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.184-190, 2020.

[36] R.Anbarsan, A.Arsathparvez, K.S.Arunachalam, M.Swathisriranjani, Dr.S.Saravanan," Automatic Class Room Light Controlling Using Arduino", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.192-201, 2020.

[37] S.Monika, M.Priyadharshini, R.Rajalakshmi, T.Rajeshwari, C.Ramkumar, Dr.S.Saravanan," Design and Implementation of Electrochemical Etching Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.37-44, 2020.

[38] V.Periyasamy, S.Surya, K. Vasanth, Dr.G.Vijayakumar, Dr.S.Saravanan," Design and Implementation of IoT Based Modern Weaving Loom Monitoring System", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.11-18, 2020.

[39] M.Yogheshwaran, D.Praveenkumar, S.Pravin, P.M.Manikandan, Dr.S.Saravanan," IoT Based Intelligent Traffic Control System", International Journal of Engineering Technology Research & Management", Vol.4, Issue.4, Pp.59-63, 2020.

[40] S.Shenbagavalli, T.Priyadharshini, S.Sowntharya, P.Manikandan, Dr.S.Saravanan," Design and Implementation of Smart Traffic Controlling System", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.28-36, 2020.

[41] R.Pradhap, R.Radhakrishnan, P.Vijayakumar, R.Raja, Dr.S.Saravanan," Solar Powered Hybrid Charging Station For Electrical Vehicle", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.19-27, 2020.

[42] M.Pavithra, S.Pavithra, R.Rama Priya, M.Vaishnavee, M.Ranjitha, Dr.S.Saravanan" Fingerprint Based Medical Information System Using IoT", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.45-51, 2020.

[43] K.Subashchandrabose, G.Moulieshwaran, M.Raghul, V.Dhinesh, Dr.S.Saravanan" Design of Portable Sanitary Napkin Vending Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.52-58, 2020.