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Generation of Three Phase Power from Single Phase by Indent of Converter Using Automatic Solar Tracking

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ABSTRACT: The main aim of this project is to build a single phase to three phase converter with the intent of converting single phase electric power to three phase power and to develop an automatic solar tracking system which will keep the solar panels aligned with the Sun in order to maximize in reaping solar power. The mainstream of the suburban area does not have the embrace right of entry to three phase electric power on a rational cost. Generating three phase power commissioning solar module leads to hike in cost when compared to generating single phase power. The main objective of our project is to shrink cost and three-phase power from single-phase power by dint of converter besides exploit the maximum solar energy through solar panel via automatic rotation of solar panel depends upon maximum intensity of light.

KEYWORDS: Solar panel, LDR, Inverter, Three phase Induction motor

I. INTRODUCTION

Conversion of single phase to three phases is an interesting task in the ac-ac converters. Having a converter that takes a single-phase source as an input and produces three phases balanced as output helps to run three phases load. Electric utilities does not establish three-phase power as a concern of itinerary since it outlay extensively other than single-phase mechanism. These are principally used for decades in the direction of generate three-phase power from a single-phase source. Implementation of three-phase power transmission lines cost as much as Rs 20,000 per mile and preserve contain a quantity of undesirable ecological impacts, even as if three-phase lines are nearby, the cost of mechanism is major. Based on predictable electricity demand for the three-phase application, the effectiveness could charge the patron designed for the expenditure of installation. In suburban areas only 4 to 6 hours of 3-phase supply which survive not satisfactory to reduce the meadow suitably and Phase converters are used where three-phase service is not available from the utility, or is too costly to install due to a remote location. Solar energy systems have emerged as a viable source of renewable energy over the past two or three decades, and are now widely used for a variety of industrial and domestic applications. Solar energy is a very large, inexhaustible source of energy. The power from the sun intercepted by the earth is approximately 1.8×10^{11} MW, which is many thousands of times larger than the present consumption rate on the earth of all commercial energy sources. So many solar panels have been installed all over the world and most of them are stable. They are installed in the direction of maximum radiation of sunlight. Now the problem arises that the sun is moving. So we cannot use maximum radiation of sun all the time. The position of maximum radiation receiving position only comes once in 24 hours. The amount of solar energy captured by a tilted collector could be increased by more than 40% by adjusting the tilt angle on a seasonal basis. By rotating the solar panel according to the movement of sun we can always receive the maximum radiation. So converting the single phase power to three phase power using automatic solar tracking by means of converter vigorously reduce the cost.

II.SYSTEM MODEL

The proposed Solar system tracks the extreme intensity of light. When the intensity of light is diminishing, this system automatically changes its direction to get maximum intensity of light. LDR (Light Dependent Resistor) light detector is used to track the coordinate of the Sun. While to rotate the appropriate position of the panel, a DC geared motor is used. The system is controlled by two relays as a driver and a microcontroller as a main processor. This project is covered for a single axis and is designed for residential usage. This project is able to track and follow the Sun intensity in order to get maximum power at the output for the purpose of battery charging. Battery power presents a simple converter topology

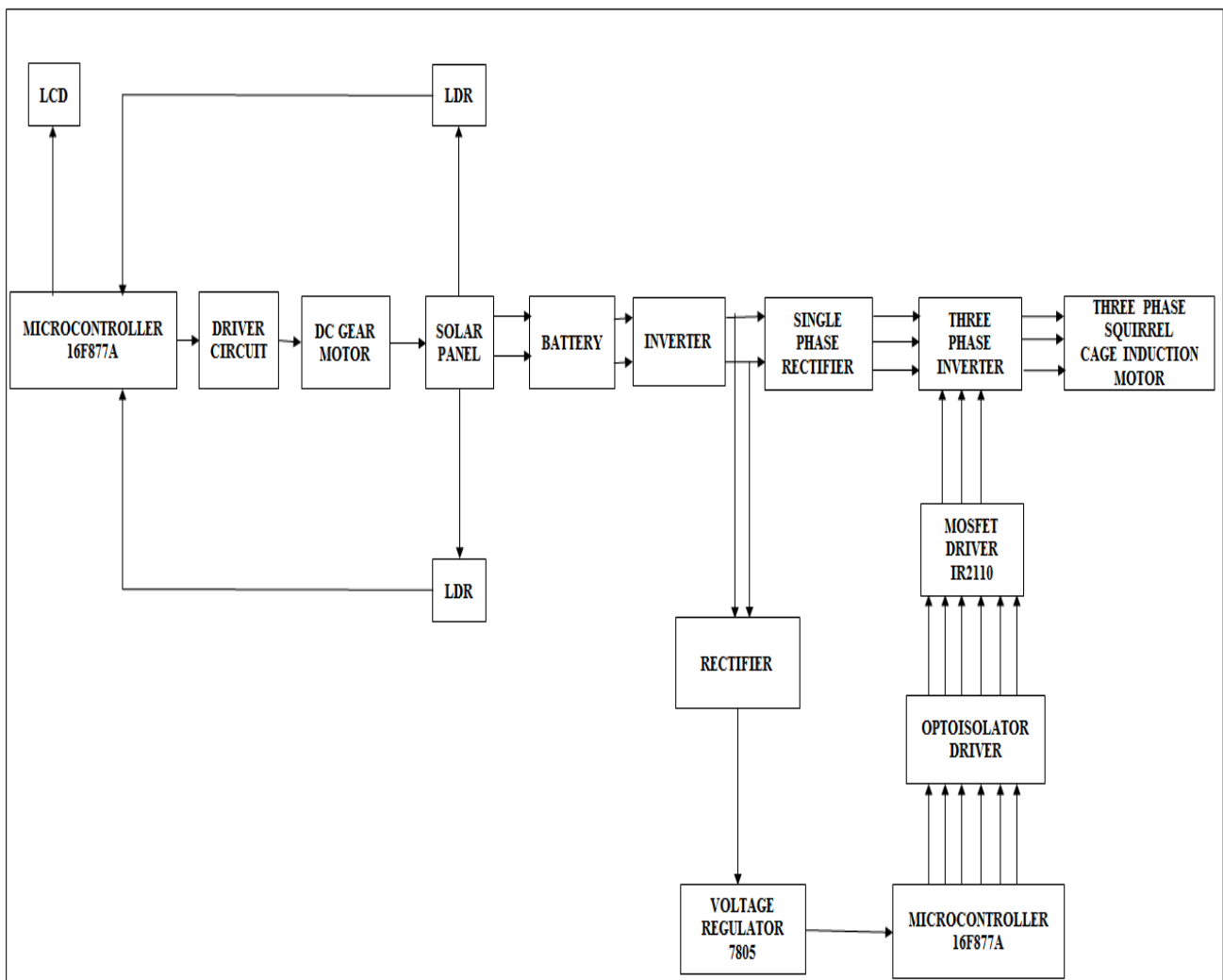


Figure 1: Overall Block Diagram

for driving a load with a single-phase ac supply. Using only six active switch MOSFETS. The converter supplies balanced output voltages at rated frequency, the proposed topology permits to reduce the rectifier switch currents, the harmonic distortion at the input converter side, and presents improvements on the fault and control approaches are supported by test results. The converter takes single phase supply and converts it into three phase supply with the help of MOSFETS. The single phase supply is first converted into dc supply by using rectifier again dc supply of rectifier is given to inverter where MOSFETS are used and converts the dc supply again into three phase ac supply.

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III.OVERALL HARDWARE SETUP

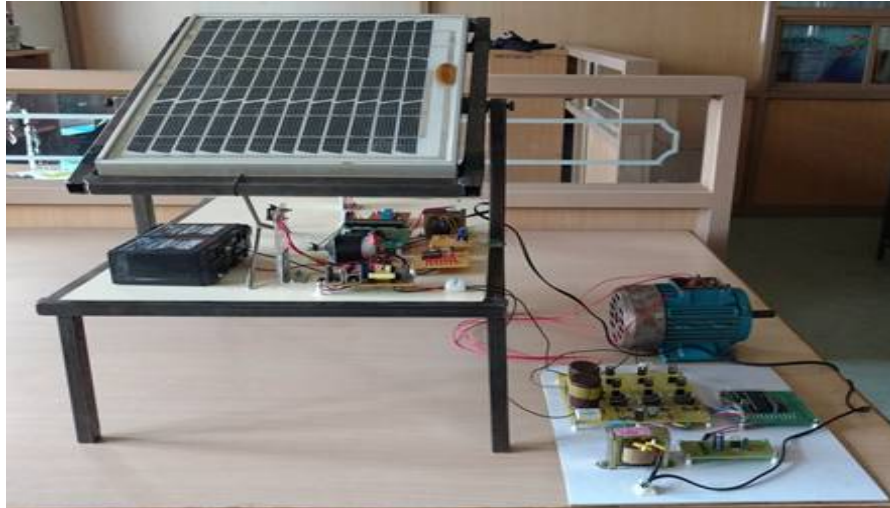


Fig 2: Overall hardware arrangement for generation of 30 power from 10 by means of converter using automatic solar tracking

IV. SIMULATION AND HARDWARE ANALYSIS

The simulation circuit was designed using proteus professional software version 7.0. The components were picked from the library and connected appropriately as represented in fig 4.1. The outputs from pins 5 and 6 are connected to input port, pins 15 and 16 of motor driver which controls the direction of motor movement through the output ports. The compiled program was transferred to the microcontroller after the design completion by right clicking and selecting the program file. Closing and opening the switches cause the motor to change direction while increasing and decreasing the voltage assumed from the panel give different values of power and voltage on the LCD.

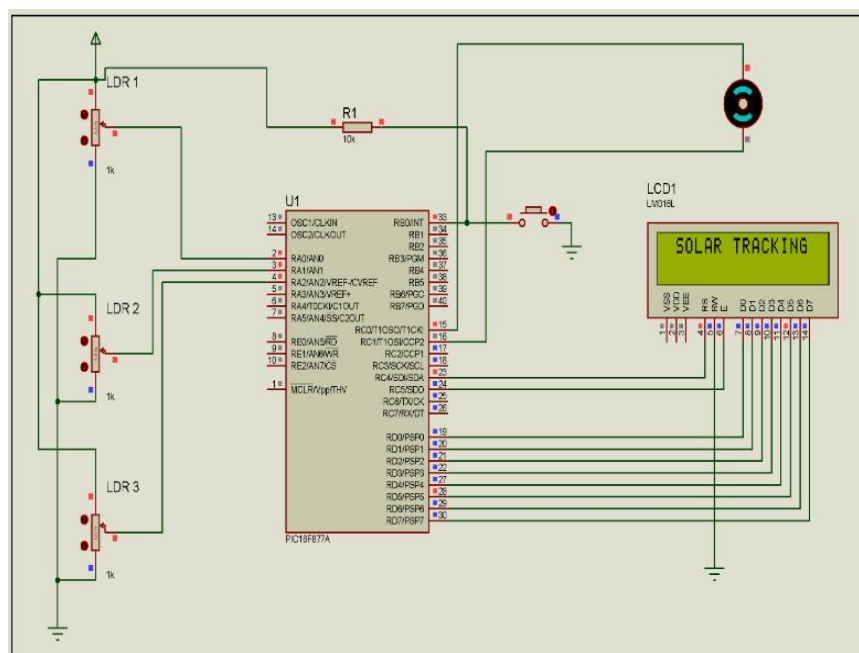


Fig 3: Simulation diagram of automatic rotation of solar panel

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The hardware setup of the automatic rotation of solar panel is shown in below figure. Which consists of Solar panel, LDR's, Microprocessor (16F877A), Driver circuit, DC gear motor, Inverter, LCD.

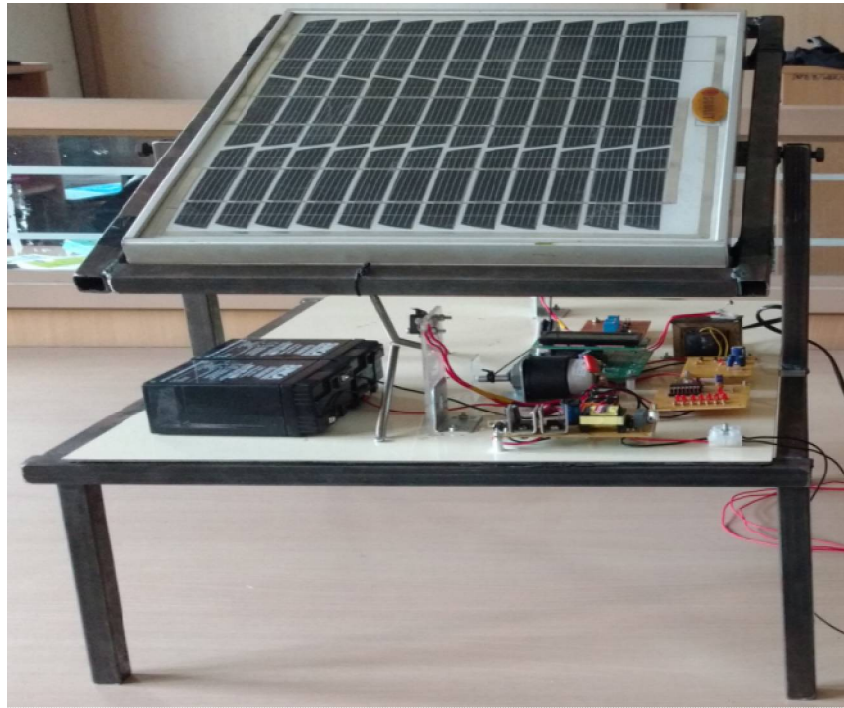


Fig 4: Hardware arrangement for automatic rotation of solar panel

LDR (Light Dependent Resistor) light detector is used to track the maximum intensity of the Sunlight. A DC geared motor is used to rotate the solar panel depends upon extreme intensity of sunlight. . The system is controlled by two relays as a driver and a microcontroller (16F877A) as a main processor.

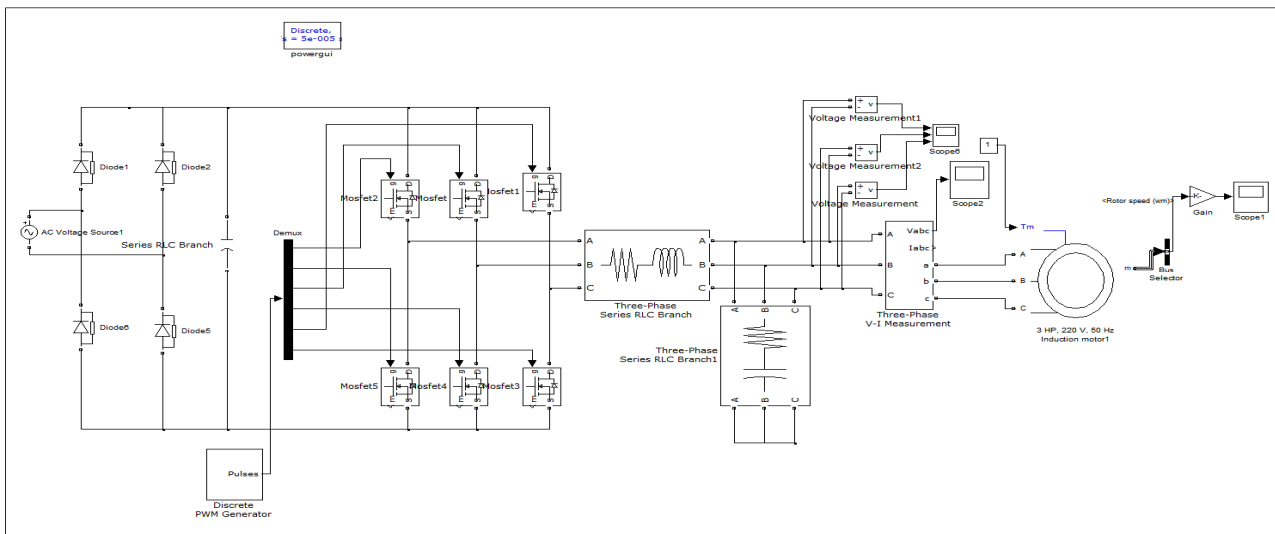


Fig 5: Simulation diagram of single phase to three phase converter

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Single phase ac voltage (230V, 50Hz) with peak amplitude of $V_m=325.27V$ is converted into dc voltage by diode bridge rectifier. The output voltage of the rectifier circuit is 205V. This output voltage is given as input to the inverter circuit. DC voltage is converted into three phase ac voltage by the inverter. The output line voltage of the inverter is 415V. This voltage is used to drive the three phase induction motor load.

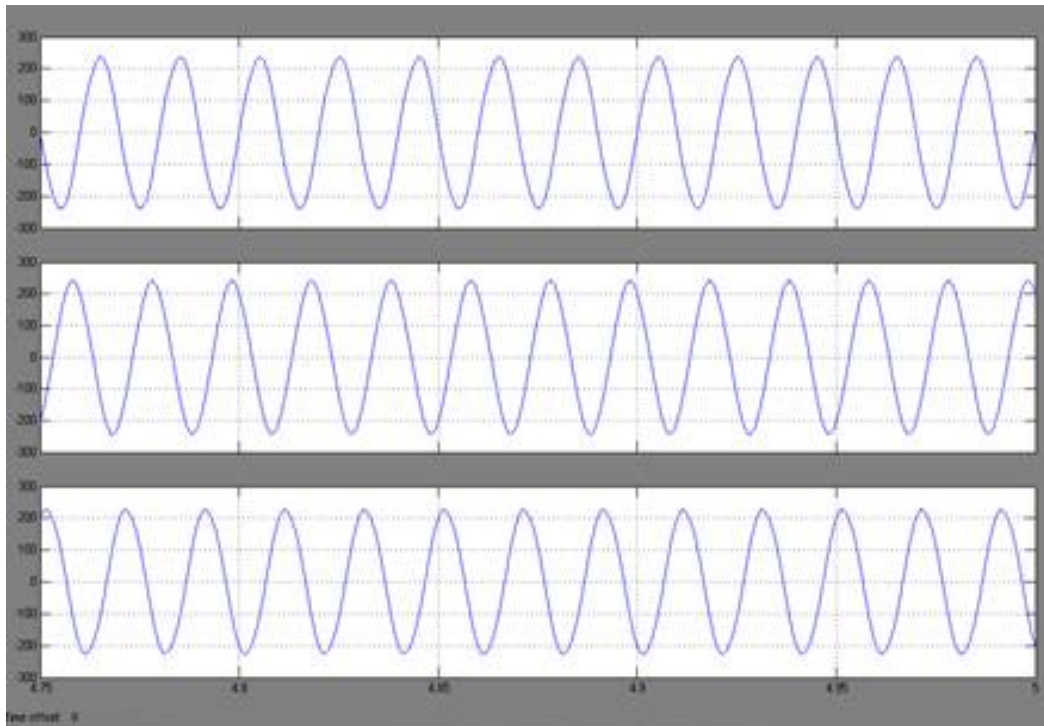


Fig 5: Simulated output waveform of single phase to three phase converter

The hardware setup of Single phase to three phase converter is shown in below figure. Which consists of Power supply, Transformer, MOSFET, Microprocessor (16F877A), Three phase Induction motor.

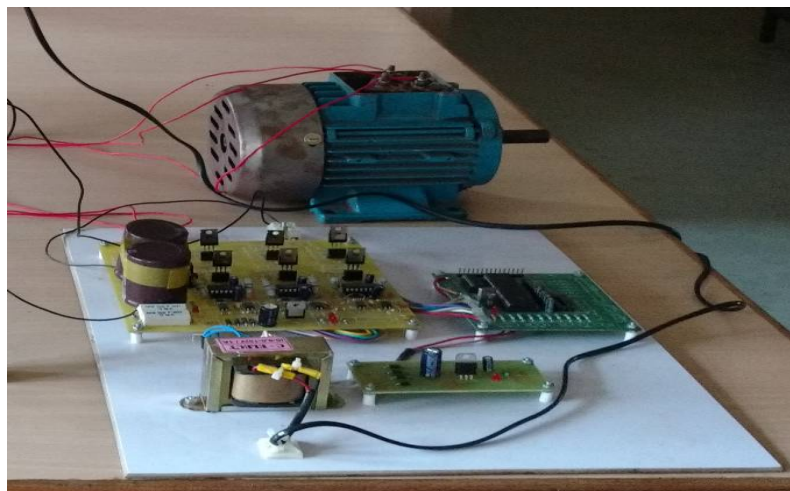


Fig 6: Hardware arrangement for Single phase to three phase converter

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Converter consists of six MOSFET's. This converter takes single phase supply and converts it into three phase supply with the help of MOSFETS. Microprocessor powered by power supply circuit which consists of bridge rectifier, capacitor, voltage regulator. The PWM (Pulse width modulation) given to the MOSFET's gate from microprocessor. The single phase supply is first converted into dc supply by using rectifier again dc supply of rectifier is given to inverter where MOSFETS are used and converts the dc supply again into three phase ac supply. Which is used to drive the Induction motor. Thus we converted three phase supply from single phase using converter. The hardware output for the Single phase to three phase converter is shown in below figure. The result has been seen through the Digital Storage oscilloscope. From which we can know the source voltage.

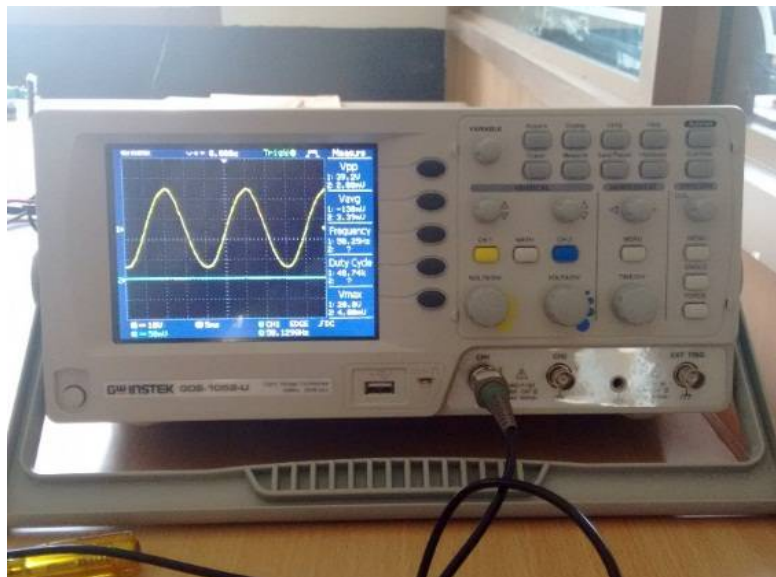


Fig 7: Output waveform of one phase observed through DSO

V.CONCLUSION

Three-phase systems are not available in every location particularly in remote rural areas, hill stations, low voltage distribution homes and so forth. Single phase to three phase converter reduce a higher tariff for a three phase service because of the spare apparatuses for transformers, metering and the extra transmission wire. This converter efficiently operate for any three phase equipment. Solar trackers gain more power than their stationary counterparts due to an increased direct disclosure to solar rays, however this trackers are slightly more costly than their stationary counterparts, due to moving parts in the proposed system. Applications such as compressors, pumps, welders, computer controlled machines.

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