

PHASE CONVERSION USING MOSFET TECHNOLOGY WITH AN EMBEDDED SYSTEM

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ABSTRACT

The majority of the suburban area does not have the encompass right of entry to three phase electric power on a rational cost. It designed for this development is in the direction of construct a single phase to three phase converter with the intention of single phase electric power to three phase power. Phase renovation machinery provisions three phase power commencing a single phase foundation to power inductive, resistive and capacitive heaps through separate compensation in excess of whichever alive converter equipment. The intention of embryonic this venture is to formulate three phase power obtainable cost-effectively. There comprise not been every major scientific advancements creature completed in farming region while compare on the way to former sector. The three- Phase supply structure is at present accessible universal, apart from possibly in various bucolic areas where barely a single or two phase supply is obtainable.

KEYWORDS: Single Phase, Three Phase, Inductive Load, Resistive Load, Power Rating

INTRODUCTION

A spacious mixture of mercantile in addition to manufacturing electrical equipments requires three-phase power. Electric utilities do not establish three-phase power as a concern of itinerary since it outlay extensively other than single-phase mechanism. At the same time seeing that an alternative in the direction of convenience installed in the three-phase, revolving point converters, stationary converters and phase converting variable frequency drives (VFD) included. These are principally used for decades in the direction of generate three-phase power from a single-phase source. Erection of three-phase power lines canister cost as much as Rs 20,000 per mile and preserve contain a quantity of undesirable ecological impacts. Even as soon as three-phase lines are nearby, the cost of mechanism is significant. Based on predictable electricity demand for the three-phase application, the effectiveness could charge the patron designed for the expenditure of installation. Continuing monthly surcharges designed for the provision as common. Phase converters contain previously employed utility three-phase power was unavailable, or where the electricity demand did not validate the cost of usefulness three-phase mechanism. Bargain motor being caused by voltage and current discrepancy, harmonics that contaminate the power grid and damage equipment, or the lack of ability is to operate perceptive apparatus or many loads are in a minute some of the inconvenience with the intention of limited use of phase converters.

OBJECTIVES OF THE STUDY

MATLAB is used to simulate single phase to three phase converter. Hardware is fabricated for testing with three phase induction motor. The rotation of motor controlled by using microcontroller.

WORKING METHOD OF SINGLE PHASE TO THREE PHASE CONVERTER

The block diagram explains the operation of conversion as soon in figure 1.

INTRODUCTION ABOUT BLOCK DIAGRAM

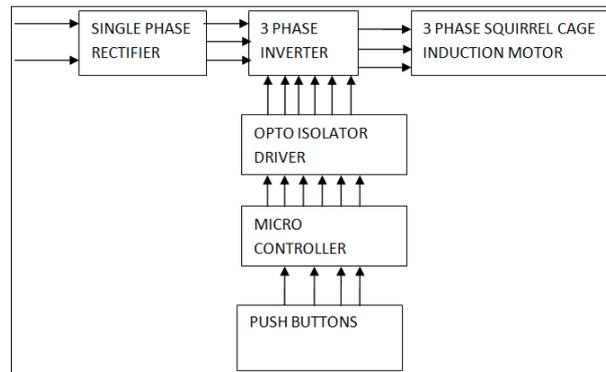


Figure 1: Overall Block Diagram

SINGLE PHASE RECTIFIER

It is used to convert AC voltage to DC voltage. A rectifier is a power controller that converts AC voltage to DC voltage. It is fed by a single phase supply. Diodes are used as rectifying devices and are connected in the form of a bridge. Therefore, we use single phase uncontrolled bridge rectifier. If the output voltage of the rectifier is of constant magnitude as in a battery and it draws sinusoidal current at UPF from the AC source, then the rectifier is to have the best performance.

THREE PHASE INVERTER

It is used to convert DC power to AC power of variable voltage and frequency. An inverter is an electrical device that converts direct current (DC) to alternating current (AC). The converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching and control circuits. The inverter performs the opposite function of a rectifier. A pure sine wave inverter produces a nearly perfect sine wave output (less than 3% total harmonic distortion) that is essentially the same as utility-supplied grid power. Thus it is compatible with all AC electronic devices. This is the type used in grid-tie inverters.

OPTO ISOLATOR

It is designed to transfer electrical signal by utilising light waves to provide coupling with electrical isolation between its input and output.

MICROCONTROLLER

The rotation of motor has to be changed in forward and reverse direction with the operation of execution of coding.

PUSH BUTTONS

The push buttons, which are coupled to the microcontroller, it is used to increase or decrease pulse width and frequency of the PWM waveform.

ISIMULATION OF SINGLE PHASE TO THREE PHASE CONVERTER USING MATLAB

MATLAB is a high recital lingo for technological computing. It integrates computation, hallucination along with programming in straightforward setting where effort and solutions are articulated in well-known statistical information. Emblematic uses incorporate Math and calculation, Algorithm maturity, Data possession Modeling, simulation and prototyping statistics analysis, exploration and hallucination systematic in addition to engineering graphics relevance maturity, as well as graphical punter interface edifice.

RESULTS AND DISCUSSIONS

Simulation Circuit

Circuit Diagram for Conversion of AC-DC

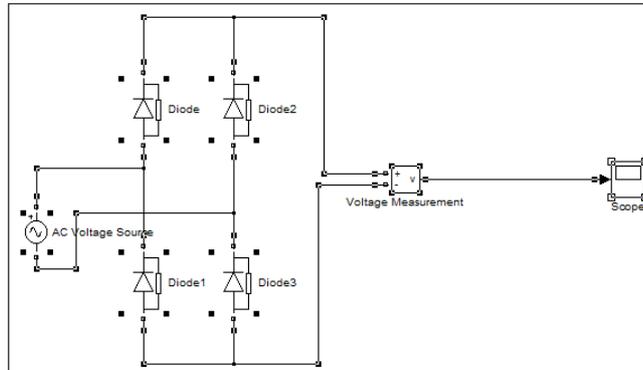


Figure 2: Single Phase Bridge Rectifier

Figure 2 shows single phase bridge rectifier. The single phase ac supply is fed to the rectifier. Diodes are used as rectifying devices and are connected in the form of a bridge. The output voltage cannot be controlled as diodes are uncontrolled rectifying devices.

DC OUTPUT VOLTAGE WAVEFORM FOR RECTIFIER

Figure 3 shows the DC output voltage waveform for rectifier observed from DSO.

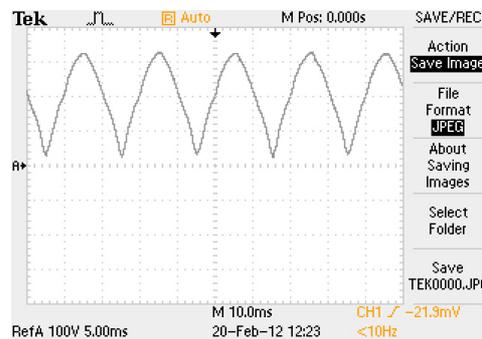


Figure 3: DC Output Voltage Waveform for Rectifier

CIRCUIT DIAGRAM OF INVERTER

Figure 4 shows Three Phase Inverter circuit. The drive system contains 6 unipolar MOSFET switches which are turned ON by giving gate pulses. DC voltage is converted to the ac voltage by driving the inverter circuit.

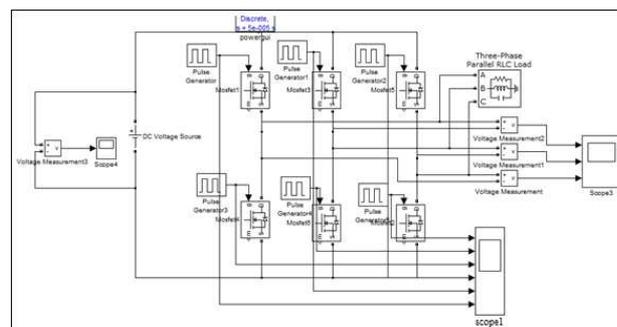


Figure 4: Circuit Diagram of Inverter

SINGLE PHASE TO THREE PHASE CONVERTER

RLC Load

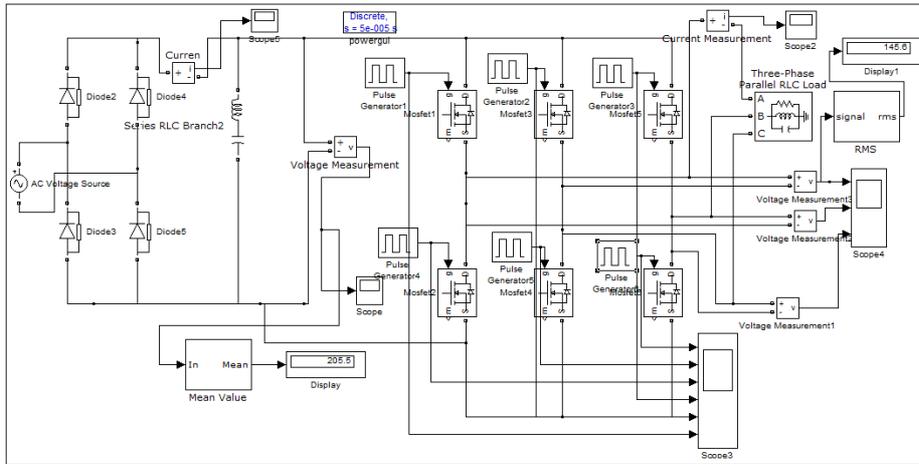


Figure 5: Single Phase to Three Phase Converter Circuit Diagram with RLC Load

Figure 5 shows the overall circuit diagram for single phase to three phase converter with RLC load.

INDUCTION MOTOR AS LOAD

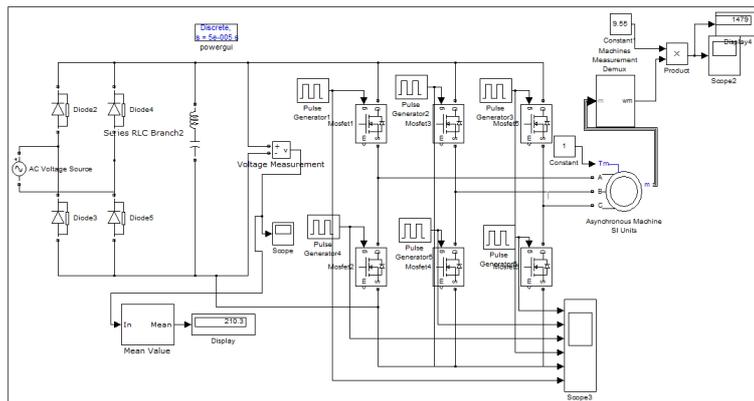


Figure 6: Single Phase to Three Phase Converter Circuit Diagram with Motor Load

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.

SIMULATION OUTPUT

Output Voltage Waveform for Single Phase to Three Phase Converter

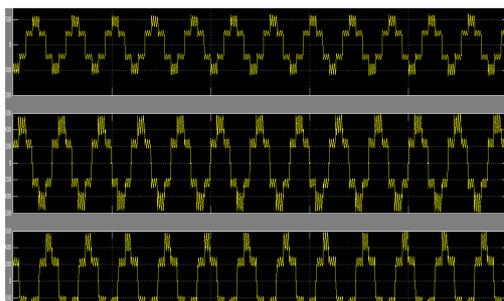


Figure 7: Simulated Waveform for Single Phase to Three Phase Converter

CONCLUSIONS

In our development we enfold built-up single phase to three phase converter to scamper a three phase induction motor (1HP). This converter be able to work where the convenience of three phase power be engaged or where electrical energy stipulate did not give explanation intended for the charge of convenience three phase mechanism. It is pertinent for cultivation, hefty buildings, diminutive degree industry, garages and workshops. In suburban areas only 4 to 6 hours of 3-phase supply which survive not satisfactory to dampen the meadow suitably. Accordingly, this provide single phase to three phase adaptation.

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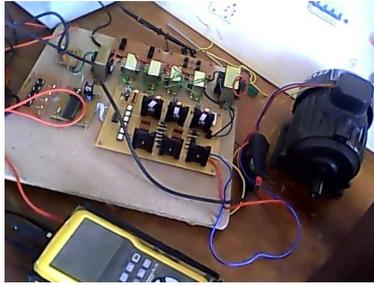
APPENDICES**Hardware**

Figure 8: Single Phase to Three Phase Converter

Figure 8 shows the single phase to three phase converter connected to the power quality meter.