Smart Single Phase to Three Phase Convertor

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***Abstract*—Single-Phase to Three-Phase Converter for Low-cost AC Motor Drive is proposed. The Proposed Converter Employs Only Six Switches and Incorporates An Active Input Current Shaping Feature That Results In Sinusoidal Input Current At Close To Unity Power Factor. The Front-end Rectifier In The Proposed Converter Permits Bidirectional Power Flow and Therefore Provides for Excellent Regulation Against Fluctuations in Source Voltage. This Feature Also Facilitates Regenerative Braking of The AC Motor Drive. An Easy to Implement Control Strategy to Maintain near Unity Power Factor over the Full Operating Range is detailed. Suitable Design Guides for The Selection of Filter Components is presented. Finally, Experimental Results are given to verify the Development Theoretical Models.**

Index Terms— AC to DC converter, DC to AC converter, IGBTs, drive system, inverter, Boost converter, PWM, H, CRO.

I. INTRODUCTION

In The Past Single Phase to Three Phase Converter is Complicated Due to The Use of Capacitors and Reactors with Autotransformer Converters. Such Kind of System Was Expensive and Less Efficient, so to Overcome This Power Electronics Components are Used. At the Beginning of Solid-State Power Electronics Devices, These Were Normally Used as Switches and Were the Major Technology Used for Power Processor. Beyond The Power Switches Different Circuit Topology Were Invented with The Help of Power Electronics Devices Such as Three-Phase to Three-Phase, Single Phase to Single Phase and Three-Phase to Single Phase Conversion Systems. There Are Some Rural Areas in Which the Single-Phase Supply Is Only Available, So It Is Very Difficult to Get a Three Phase Supply for Industrial Purpose Therefore It Is Better to Convert Single Phase to Three Phase Converter. This Paper Proposes an Alternative Solution for Phase Conversion with Very Low Overall Cost, Moderate Performance During Start Up and High Steady-State Performance at Line Frequency. This System Fits the Requirements in Rural Areas Where Only a Single-Phase Supply Is Available.

II. LITERATURE SURVEY

1.Smt. Smitha Paulose, Charles K J, Xaviour K, Niju Raphael"Single Phase to Three Phase Converter" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (A High Impact Factor, Monthly, Peer Reviewed Journal)Website: www.ijareeie.com Vol. 7, Issue 3, March 2018 Copyright to IJAREEIE DOI:10.15662/IJAREEIE.2018.0703047 1519

This paper presents a single phase to three-phase converter topology using power electronic devices. Different converter section is used for the conversion. This idea will reduce the switching current and harmonic distortion of input side converter. The input to the converter is a single-phase supply and the output taken is a balanced three phase. With the help of IGBTs which is used for six leg inverters. The sinusoidal waveform is remained constant even though the load is increased. Simulation and experimental results are provided to illustrate and compare the operation of the system.

2. Mr. Pawan D. Kamdi" Conversion of Single phase to Three Phase Supply by AC-DC-AC link Converters using IGBT" ISSN: 2455-2631 © December 2016 IJSDR | Volume 1, Issue 12 IJSDR1612024 International Journal of Scientific Development and Research (IJSDR) www.ijsdr.org 116

This paper presents a simple converter topology for driving a load with a single-phase ac supply. Using only six active switch IGBT's. 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 convertor takes single-phase supply and converts it into three-phase supply with the help of thyristors. The single-phase supply is first converted into dc

supply by using rectifier again dc supply of rectifier is given to inverter where IGBT's are used and converts the dc supply again into three phase ac supply. The experimental result showed that sinusoidal waveform produced remained approximately constant with increase in load and the developed hardware has satisfactory converted the single-phase power to three phase power supply.

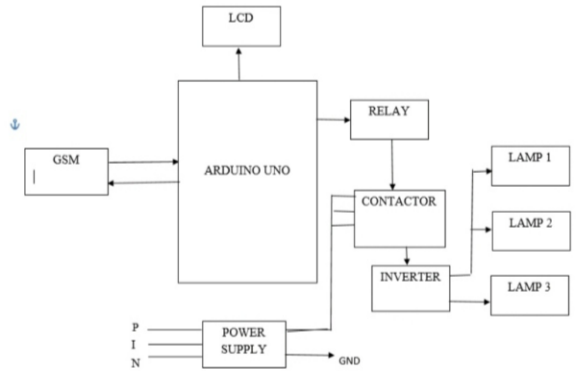
III. OBJECTIVE

The objective of a smart single-phase to three-phase converter is to convert a single-phase electrical supply into a three-phase output. This conversion is necessary in situations where three-phase power is required for operating three-phase electrical equipment or machinery.

1. Conversion Efficiency: The converter should have high efficiency in converting single-phase power to three-phase power. This ensures that minimal energy is wasted during the conversion process.
2. Power Quality: The converter should provide a stable and balanced three-phase output with low harmonic distortion. This ensures that the converted power meets the required quality standards and does not cause any issues with the connected equipment.
3. Control and Monitoring: A smart converter should have advanced control and monitoring capabilities. It should be able to adjust the output voltage, frequency, and other parameters as per the requirements of the connected load. It should also provide real-time monitoring of various electrical parameters such as voltage, current, power factor, etc

These objectives ensure that a smart single-phase to three-phase converter provides a reliable, efficient, and cost-effective solution for converting single-phase power to three-phase power in various applications.

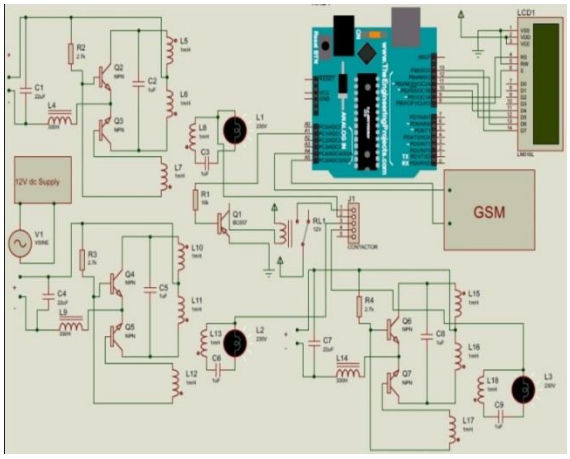
IV. METHODOLOGY



Block Diagram:

Power source for the working of Arduino uno can be given through the 9V DC battery with the help of power cord whereas the alternative one is the connection of AT mega 328 to the Power supply using Adaptor cable. GSM modem is a device that can be either a mobile phone or a modem device that can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB, or Bluetooth connection. The majority of phase converters are used to produce three-phase electric power from a single-phase source. A contactor is an electrically-controlled switch used for switching an electrical power circuit. A contactor is typically controlled by a circuit which has a much lower power level than the switched circuit, such as a 24-volt coil electromagnet controlling a 230-volt motor switch. Relay module is a magnetically operated switch, which closes the external circuit based on signal received from the Arduino UNO board. A power inverter, inverter or invertor is a power electronic device or circuitry that direct current (DC)alternating current (AC). The resulting AC frequency obtained depends on the particular device employed. Inverters do the opposite of rectifiers which were originally large electromechanical devices converting AC to DC. We connect an LCD to the Arduino board. there are may types of LCD but in this paper, we take LCD 16*2(16columns, 2 rows) in this project.

V. A. CIRCUIT DIGRAM:



From the circuit diagram shown above the single phase supply is converted to DC and again inverted to AC [2] .The gate drive circuit needs an interface between the controlling signals coming from the microcontroller and the IGBT in the circuit. The microcontroller gives 5V signal, while the waveform generators allow for a specified voltage level. The gate to source voltage needed for desired operation of the IGBT is on a 110 DC level, but in order to get line to line voltage of 415V AC as output the DC level of IGBT is to be more than 110V. In addition, the high side IGBT in this circuit do not have the source connected to ground, so the actual voltage needed to drive the gate depends on the varying voltage at the source. One drawback to the high switching frequencies is the decrease in efficiency that occurs from switching loss and also generates little acoustic noise since the switching frequency lies in the audible acoustic range (20 Hz – 4 k – 20 kHz). These control schemes also provide good dynamic performances. However, this application does not need good dynamic performance since there are no dynamic load and speed requirements. The rating of power element such as power IGBTs DC bus is of 1200V.

B. Result and MODEL:

The 3phase load Drive with single phase .AC supply using six active switch IGBT s the converter supplies balanced output voltage at rated frequency takes single phase supply and convert into DC supply using rectifier it gives to converter IGBT are used and convert the DC supply again into 3phase supply.

C. Conclusion:

It can be concluded that “Smart single phase to three phase converters” was a success. This system consists of a micro controller At mega 328, volt meter, ammeter, relay, load bank, power sockets. It is user friendly and it is cost effective. Also, it can be concluded that the objectives of this project have been successfully met and they are as follows:

•Constructing a smart single phase to three phase converter system with microcontroller.

•Designing and implementing cost effective single phase to three phase converter system yet an efficient one.

•Designing the rectifier and inverting or sensing unit (VFC) circuit.

•Designing a user friendly and a safe system to control three phase magnitude of voltage and current is industrial or agricultural.

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