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Design of Electronic Welding Machine Design And Simulation of Electronic Welding Machine Using H-Bridge Inverter And Using 8051 Controller.

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Abstract :- *Welding serves a variety of purposes across domains. Machinery and equipments fabricated, pipeline and manifold welding, structural welding, offshore welding and ornament welding are examples of welding that take place in business and industry. Welding equipment has become of the most important tools that a producer cans posses hence the need to design and construct an arc welding machine. In this paper, authors designed and constructed 3-phase electronic welding machine of 10 kHz switching frequency with arc welding as application.*

Keywords: - *arc welding, equipment fabrication, transformer, inverter.*

I. INTRODUCTION

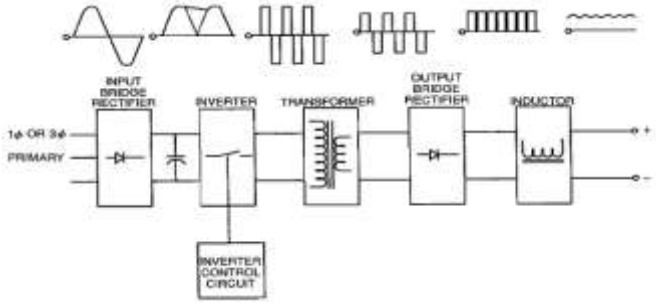
The arc welding process consists of heating the Secondly, the output welding current of an electric arc metal surfaces of the parts to be joined to their plastic Temperature through passage of high AC or DC electric current. The electric arc (that is discharge into a gas) is ignition between the electrode and the pieces at low voltage drops (10-40 V) at high currents (5-2000 A) .The manual-metal arc welding with consumable electrodes (sticks) form approximately 30% of all welding systems the manual welding machines use the high frequency inverters to provide high capacity currents during operation. The inverter operation frequency is between 20-100 kHz through the use of semiconductors devices with power performances (MOSFET and IGBT transistors) .In this paper a Half Bridge high frequency inverter is used to provide an appropriate current on welding point. The conventional analog welding machine generates the steady PWM for driving IGBT of its inverter and controls the output welding current by turning on or off of IGBT switches. So it cannot regulate well the quality of welding current to track the setting welding Current . In The other control method, the output welding current controlled by changing the duty cycle of PWM. The changes Based on the error between the values of feedback output welding current and the setting current applied to a controller. The requirements for a good DC-arc welding machine can be explained as the following: Firstly, an output welding current easily achieves the setting welding current at first welding. Secondly, the output welding current of an electric arc must be maintained constant during welding process.

II. BLOCK DIAGRAM OF INVERTER WELDING MACHINE

1. Rectifier unit

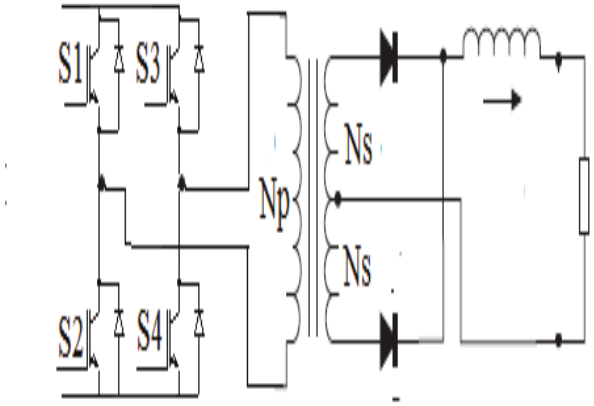
The AC input voltage rectified by input AC/DC rectifier and applied to high frequency inverter. The Switching device like mosfet ,igbt or transistors S3 and S4 are commanded alternatively a semi period. The voltage drops on capacitors C is equal with 1/2Vdc and connects alternatively transistors in sticks. A control circuit is used to control the output current of welding machine.

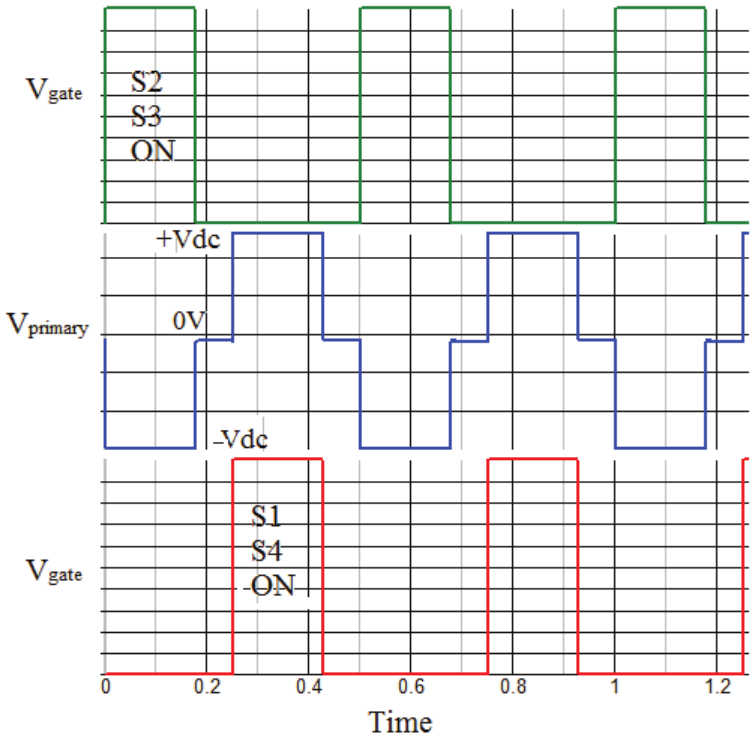
The three-phase bridge rectifier circuit has three-legs, with each phase being connected to one of the three phase voltages as shown in Figure. The rectifier unit, at the input, is used to rectify the three phase AC voltage into dc and store into a capacitor bank.



2.Full bridge topology of inverter used in this project:-

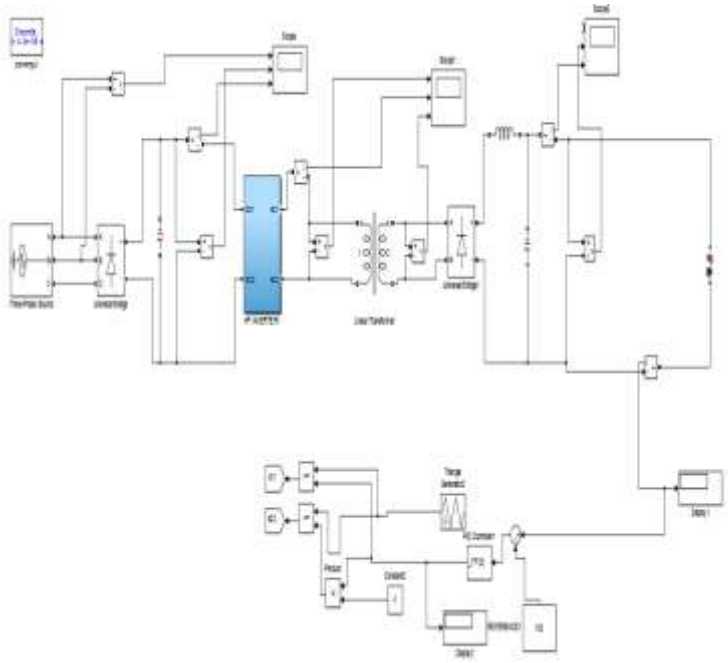
The transformer primary voltage is 0V when all four switches are off. To avoid a short circuit, and thus the breakdown of the switch, the turn on time of *S1* must not overlap with the turn on time for *S2*. The same condition applies to *S3* and *S4*.The full bridge circuit is used in high power applications. The advantage of a full bridge over a half bridge is that, the voltage imposed across the primary is a square wave of $\pm V$, instead of $\pm V\,dc/2$ for the half bridge.





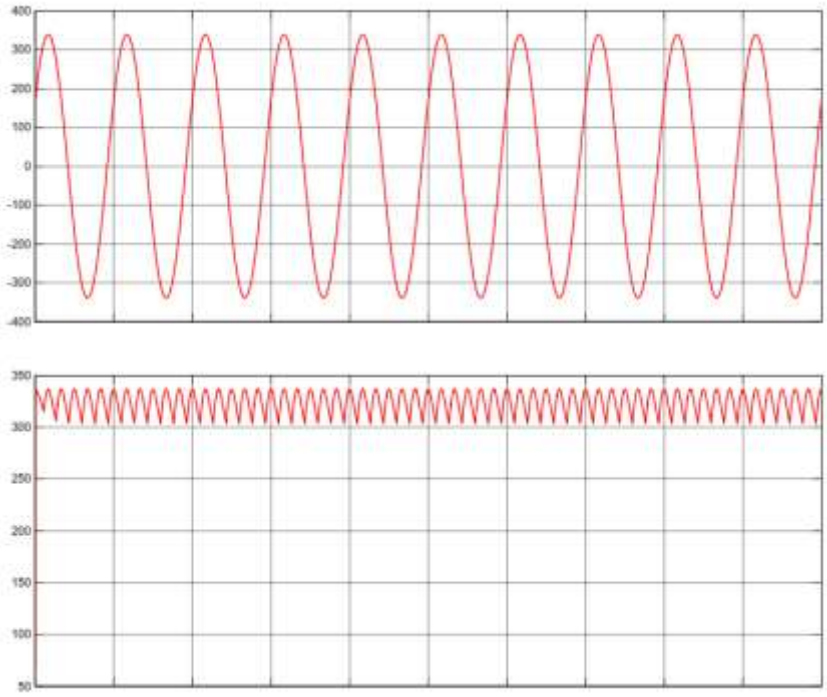
In the full bridge, the transformer's primary turns must be twice those of the half bridge as the primary winding must sustain twice the voltage. The peak and RMS currents are half of the half bridge because, the transformer Primary supports twice the voltage as compared to the half bridge. With twice the primary turns but half the RMS current, the size of the full-bridge transformer is identical to that of the half bridge at equal output powers.

A. Simulation Of Weliding Machine In Matlab-2013

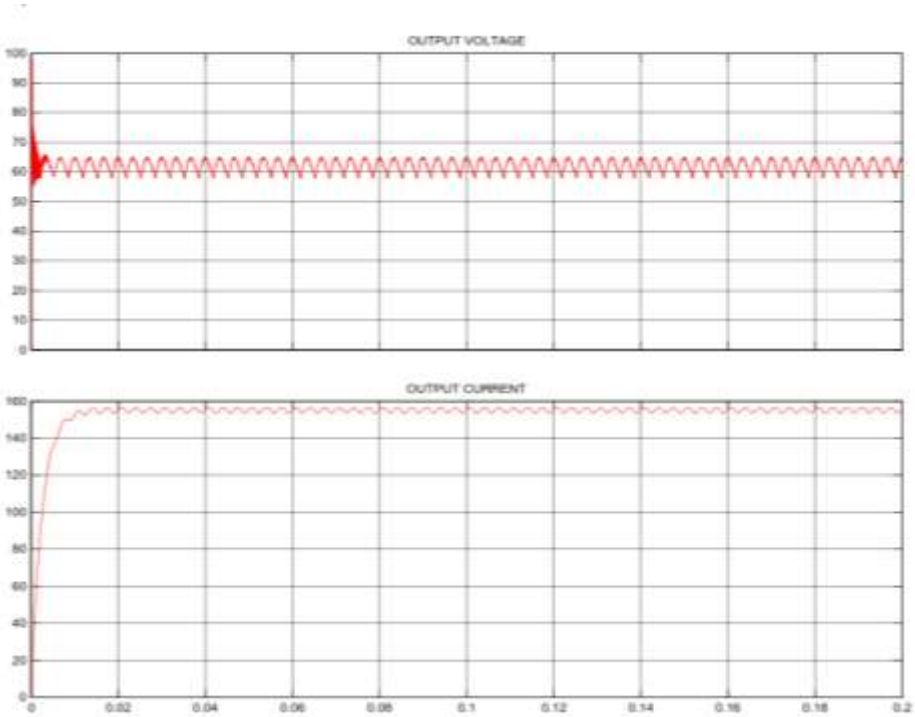


Result Of Output Voltage Of 3- Phase Full Bridge Rectifier Welding Machine In Matlab:-

1. Output Voltage 339volt Dc.

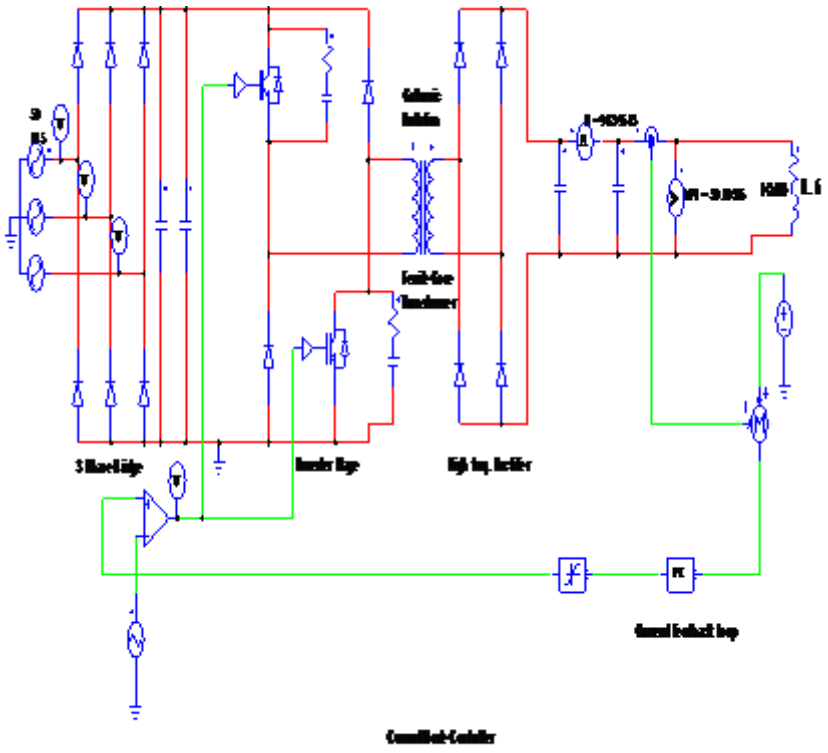


2.Result Of Output Voltage (60v Dc) And Output Current (100amp):-

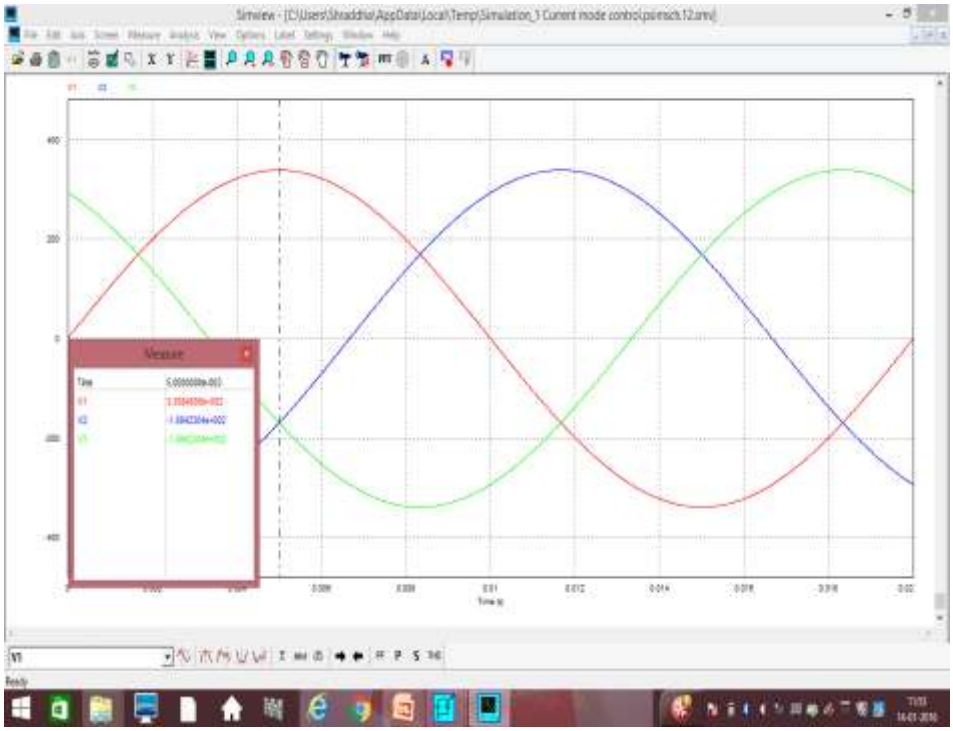


III. SIMULATION USING PSIM

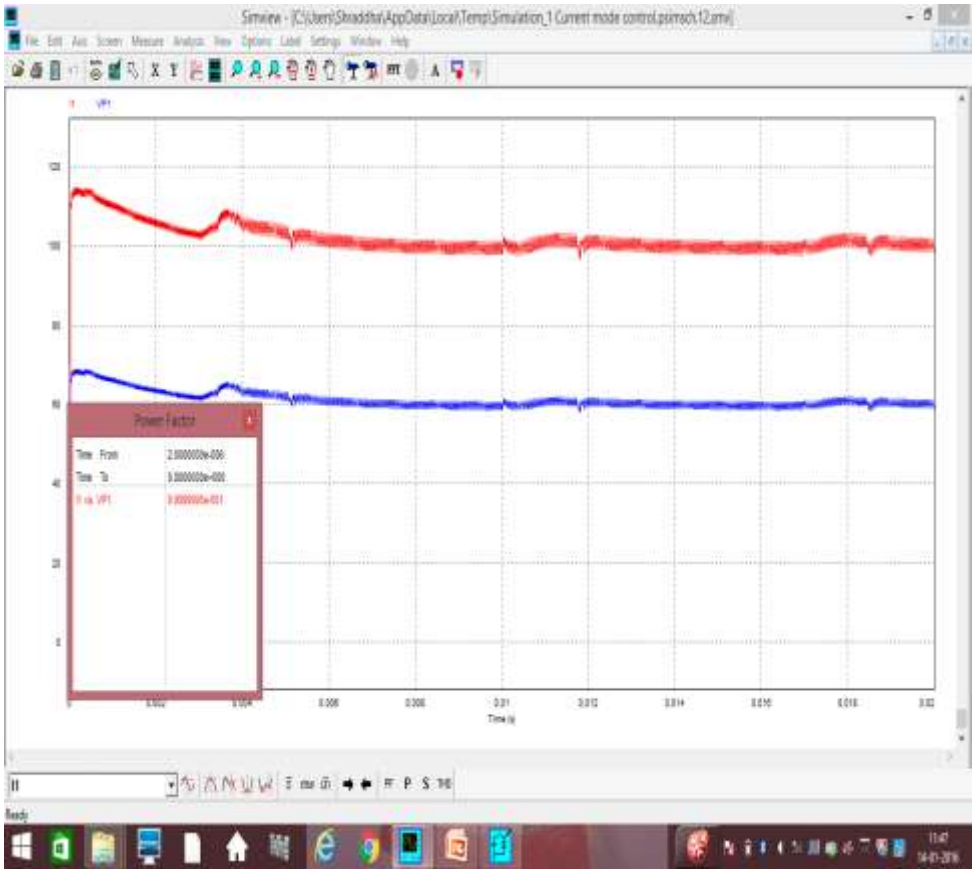
1. Welding Topology With H-Bridge Inverter In Psim Software:-Constant Current Mode



A. **3-Phase Input Voltage Waveforms In Psim .**



B.Output Voltage And Output Current: (60v Dc,100amp)



IV. CONCLUSION

1. The main task of this work is to develop and improve the control circuit for a single phase inverter which has been implemented using PIC controller.
2. The used method to control the inverter switch is the PWM technique. This method is superior to other methods to improve the output waveforms.
3. The simulation results are performed at PSIM and matlab-2013 and compared the experimental results.
4. The tested inverter is loaded at various ac loads 11w,15w and 26w.

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