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MODIFIED SINUS WAVE OF RENEW INVERTER IN SOLAR POWER PLANT HOUSE

Hamdani [1], Solly Aryza[2], Zuraidah Tharo[3], Siti Anisah[4]
Lectures Of Program Study Electrical Engineering
University Of Pembangunan Panca Budi

ABSTRACT

This research aims to produce an inverter device which is implemented in a solar power plant for homes. In solar power generation systems, an inverter is a device that functions to change the direct cureent into alternating current. In this study, an inverter device was designed to produce an output of electrical quantities in accordance with the needs of residential electrical equipment. The design shows the important role of the microcontroller as a control unit and IGBT component as a component of power electronics. the test results show that the inverter has been able to produce an output with a voltage of 220 V and a frequency of about 50 Hz with a sine wave output, but there are still defective wave. Until this article is prepared improvements are still being made.

Keywords: inverter, solar power plant, power electronic, microcontroller

I. PRILIMENERY

Solar power plant is a power plant that has the potential to be developed in Indonesia. because geographically the location of the Indonesian archipelago is on the equator. this condition allows the Indonesian archipelago to receive optimal sunlight intensity throughout the year compared to countries in the northern or southern hemisphere. Based on 2009 BPPT data that the potential of solar energy in Indonesia is very large around 4.8 KW / m2 / day. The solar power plant system consists of a number of sub-systems, including an inverter. In the general market we can get an inverter with various types and specifications (S. Aryza et al., 2018) . The quality of the inverter can affect the performance and lifetime of household electrical or electronic equipment . Low quality inverters have the potential to damage household electrical and electronic equipment. The quality of the inverter is determined by several parameters, including: the amount of output power, voltage stability, frequency stability, and waveform.

The purpose of this research is to design an inverter with a simple circuit but can produce 220 v ac voltage, 50 Hz frequency and near sine waveforms. This inverter is expected to be applied to solar power generation systems for residential homes (Deptt & Jabalpur, 2013).

II. LITERATURE REVIEW.

2.1. Inverter

One type of power converter that is widely used is an inverter. Furthermore, with various demands, inverter develops into various types where one of the variants is multilevel inverter. Multilevel inverters are dc-ac converters where the output voltage forms more than two levels (three levels, five levels, seven levels and so on) (Study, Converter, & Induction, 2005). The number of output levels of a multilevel inverter is set with the control circuit (switch) and the switching circuit, the more the voltage level, the output will approach the sinusoidal wave, and. the quality of the power produced is better. Multilevel inverters that are developing at this time can be recognized based on architecture (topology), such as topology of Clamped Diode, Flying Capacitor and H-Bridge. The simplest multilevel inverter topology today is a three-level inverter, where the resulting voltage level is positive voltage, zero voltage and negative voltage generated using four power switches. Nevertheless, a number of studies continue to be carried out for the development and to produce a three-level voltage form by reducing the power switch components used (Trzynadlowski & Trzynadlowski, 2001)

2.2. IGBT and MOSFET

IGBT and MOSFET are two basic electronic component technologies which are very popular in low power converters. Some things that cause it, among others, both are controllable switches and do not require complicated gate drivers. Another consideration is that it is available in various sizes of current, voltage, as well as a large switching frequency range from audible frequencies up to hundreds of kilos of Hertz. On state losses or losses that arise when the device is on because of the ideals of a real semiconductor switch, it is also getting better (decreasing), as indicated by the low VCE (on) value for IGBT and the RDS value (on) in millisecond Ohms for MOSFETs (Solly Aryza et al., 2018).

III. SYSTEM DESIGNING

The overall inverter circuit is shown in the following figure
The circuit above can be divided into several sub-circuitss, namely:
1. Arduino Uno microcontroller as the control circuit,
This circuit produces two digital signal outputs with opposing logic conditions. The resulting digital signal is used as a trigger for the electronic power switch circuit, transistor and mosfet q9, q10, q11 and q12. the period and frequency of the signal generated by the control circuit must be adjusted in such a way as to provide a pulse of ignition in the mosfet
2. Power elektronic switch circuit,
This circuit serves to generate alternating current by connecting and disconnecting the battery from the transformer. This power switch circuit works alternately with the same period and frequency. This circuit consists of a transistor as a driver and a mosfet as a power switch. Transistor q 11 controls the q9 mosfet while the q12 transistor controls the q10 mosfet.
3. Step up alternating voltage
As an alternating voltage booster in this circuit a transformer is used, with a primary side voltage input of 12 volts and an output of 220 volts. The primary side applies the coil with the center branch model 12 0 12.
4. Voltage rectifier circuit
This circuit consists of four diodes connected by a bridge. serves to form a direct voltage 220 Volt
5. The series of enumerators
This circuit serves to count DC 220 V voltage into alternating voltage. This circuit is composed of 4 transistors as drivers and 4 mosfets as power switches. namely q1, q2, q3 and q4. the four mosfets are arranged as H bridges, operating alternately. q1 paired with q4 operate simultaneously. Whereas q2 operates simultaneously with q3.
6. Second control circuit
identical to the previous control circuit, this circuit functions to regulate the period and frequency of mosfet switching, i.e. mosfet q1, q2, q3, and q4

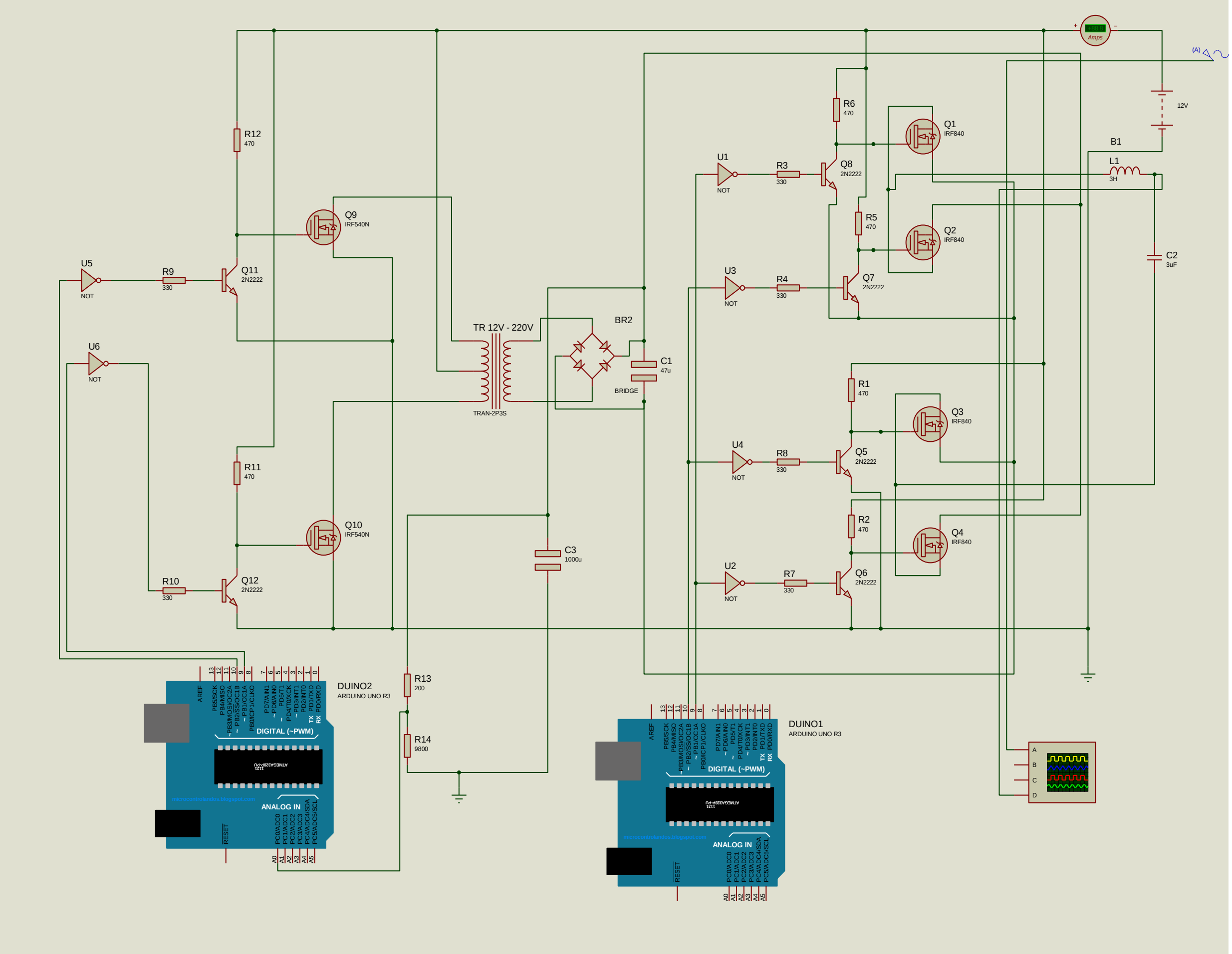
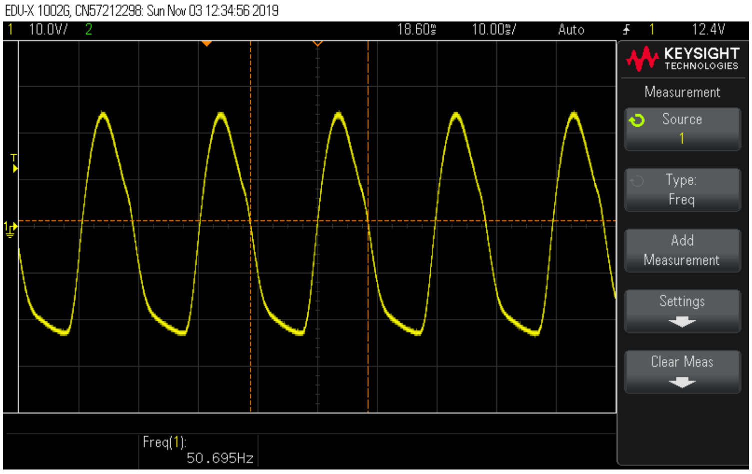


Figure 1. Model of Controlling

IV. PRELIMINARY TEST RESULTS:

The test is carried out using an oscilloscope.
here are some results of oscilloscope data screen shots

1. measurement results of output



Figures 2. Picture of Oscilosscop

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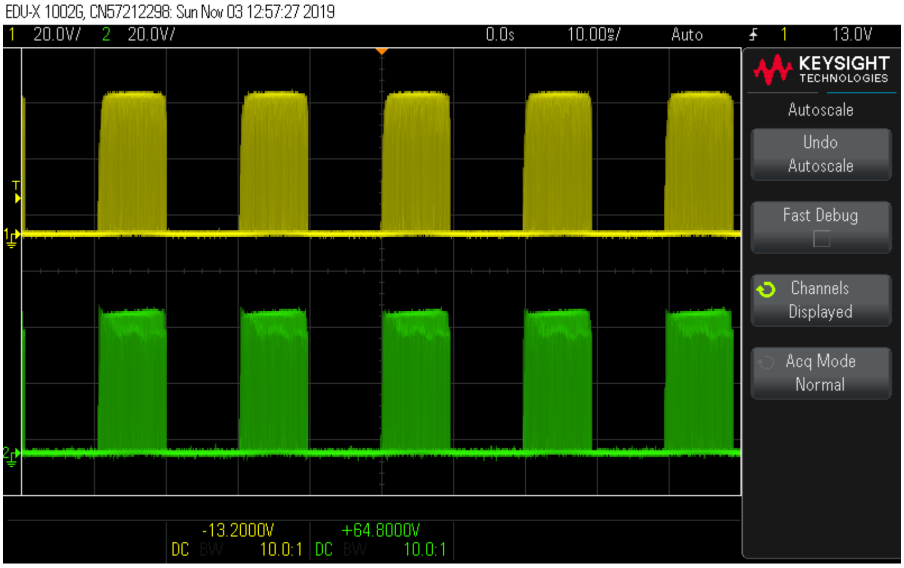
based on the picture it can be seen that the output waveform is approaching pure sine, there is a defect in the negative cycle

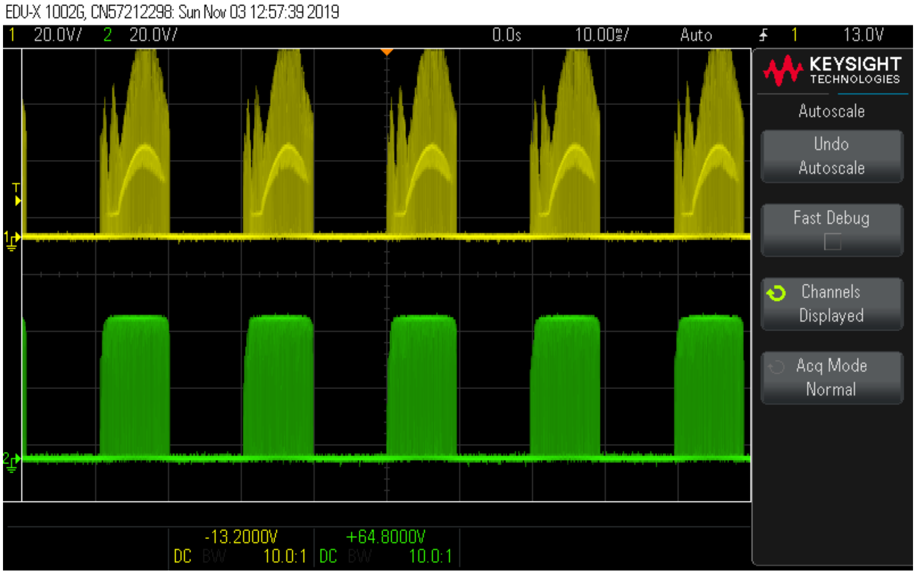
2. The measurement results of the Mosfet 1 and 4 gate signals



Figures 3. Mosfet Gate 1 and Gate2

The picture above shows that the gate signal mosfet 1 and 4 are in the same phase, meaning that these two mosfets operate together.

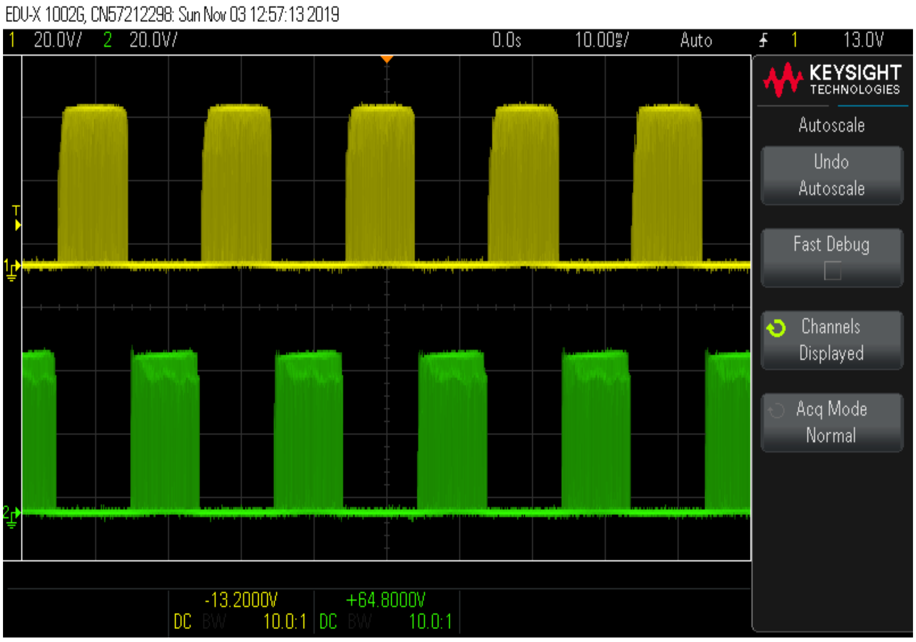
3. The measurement results for gate mosfet signals 2 and 3



Figures 4. Mosfet Signal 2 and 3.

The picture above shows that the gate signal mosfet 2 and 3 are in the same phase, meaning that these two mosfets operate together.

4. The measurement results of gate mosfet signals 3 and 4



Figures 5. Mosfet Signal 3 and 4.

From the picture it appears that mosfet 3 and 4 operate alternately.

V. CONCLUSION

In this paper have conclusion like in below.

1. Microcontroller can be used as a controller of power electronics components.
2. The timer settings of the microcontroller affect the output frequency of the inverter
3. The addition of inductor and capacitor components is needed to improve the shape of the output waveform

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