

DC to AC Inverter Prototype for Small Scale Power Supply with SPWM Method

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Abstract— Inverter is a device to convert Dc current voltage into AC current voltage. In this article, the inverter is designed using the H-Bridge configuration. The advantage of this configuration is that there is no need for diodes and capacitors to balance the voltage. The main components in designing this inverter are the Arduino Nano, the IR2103 IC, and also the MOSFET. The switching method used is SPWM with H-Bridge configuration which is controlled by 2 IC IR2103. Based on the test results, the output voltage of this inverter is 7.45 Volts. With a DC voltage of 12 Volts. With the use of an oscilloscope that is used to measure the output waveform from the switching results of the MOSFET, the signal is still in the form of a square wave. To make a sine wave, an inductor filter is needed which functions to produce a signal to become a sine wave, and to keep the frequency at 50Hz. The voltage generated from the step-up transformer can be adjusted by rotating the feedback tripoint. The resulting voltage is 88 Vac to 260 Vac, and can accommodate a maximum load of 250 Watts. This inverter is also equipped with a PZEM-004T sensor which functions to read voltage, current, frequency and power data.

Keywords— Inverter, Arduino Nano, SPWM, H-Bridge, Mosfet

1. INTRODUCTION

At this time electricity is a very basic thing, especially for household use as well as for industrial needs. Many various electronic equipment that uses electricity to help complete human work [1]-[3]. When the electricity from the PLN goes out, the electronic equipment that is sourced from AC power will definitely stop working, so to help turn on the equipment you have to use a generator or inverter device. The inverter itself is divided into several groups, namely pure sine wave inverter, modified sine wave inverter, and square wave inverter. Of the three types of inverters have different waves. The pure sine wave inverter is the best type because it has sine waves like PLN electricity. The advantage of a sine wave inverter is that it can be used for all household appliances and is also safe for induction equipment. Unlike the square wave and sine wave type inverters, although these inverters are the same as producing AC current, they cannot be used for induction equipment. In this research is to make an inverter equipment that is designed to meet electricity needs when in an emergency. The inverter is designed in such a way as to be able to produce electricity and the same frequency as PLN with sine waves which can later be applied to all electronic equipment with a maximum power of 250W [4].

The inverter designed by rizki kurniawan Penulis makes control of this inverter system using a DC source input with a 12V voltage. The Arduino Uno microcontroller is programmed to control circuits such as processing soil moisture sensor input data, generating 50 Hz and 25 Hz SPWM waves, displaying indicator lights, and Arduino being programmed to control active filters in system circuits according to the frequency of the inverter. This inverter is designed with an H-bridge topology [5]-[8]. This topology is one of the topologies used to manipulate DC (unidirectional) power sources into AC (alternating) electricity. Based on test results, the inverter control system prototype is capable of producing sine waves with a frequency according to the percentage of soil moisture content, in dry soil conditions with a moisture percentage of less than 25%, the inverter produces a frequency of 48.83 Hz, for moist soil conditions with a percentage of 25-40%, the inverter produces a frequency of 24.61Hz and on wet ground with a humidity percentage of more than 40% the inverter is in standby mode. The inverter voltage is capable of producing 200 Volts at the same frequency, after being connected to the water pump motor, the inverter experiences a voltage drop, so that the inverter voltage in dry ground conditions is measured at 163 Volts, while in moist soil conditions the measured voltage is 137 Volts [9].

Research conducted by Yustinu the author used a push-pull inverter with the TL494 IC. This inverter circuit changes the 12 Volt DC voltage from the battery to 220 Volt AC with a frequency of 60 Hz. This inverter uses IC TL494 as a square wave generator. The author has conducted 10 tests of mylar capacitors, trying to get a frequency of 60 Hz. In load testing, the authors tested it 11 times with different wattage lamps from 5 W to 55 W. Based on the test results, the greater the wattage of each lamp, the dimmer the lamp will be. When measured with an oscilloscope, the output of this inverter waveform is a square wave [10].

Research conducted by Jeremiah designed an inverter consisting of a DC-DC step-down converter circuit. For push-pull mode, the dc-dc buck converter requires only one transistor and two inverting transistors. Compared with full bridge inverter inverter, this inverter has the advantages of fewer switches and easier control. The main single-phase inverter circuit consists of a buck converter circuit and a push-pull inverter. A buck converter is used to produce the

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