

Design of Genset Monitoring & Recording Equipment with The Concept of Internet of Things (IoT) Based on Arduino Uno

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Abstract—Generators are widely used in offices, hospitals and companies that require a 24-hour electricity supply. Generators are often used to replace the main power supply from PLN in the event of a power outage. The purpose of this thesis is to make it easier for technicians to monitor the condition of the output from the generator, namely current, voltage, and rotational speed (RPM) with a monitoring and recording system that can work remotely. With the existence of a system of monitoring and recording remotely via a personal computer that can streamline the technician's time. Arduino uno as a data processing center that is integrated with the database. The monitoring and recording system on the generator is activated by connecting Wifi then this arduino gets input from the current, voltage and rotational speed sensors (RPM) the data will be processed with the arduino uno according to the data created on the system. This system is also displayed using Blynk via a personal computer.

Keywords— generator, monitoring, recording, arduino uno, blynk

I. INTRODUCTION

Generators are able to distribute electricity when there is a disturbance at PLN which is then used to provide priority load supply, usually generators are used in offices, hospitals and large companies. On the other hand, a generator is a backup power generator that is used in buildings that use electricity for 24 hours such as airports [1], [2], [3].

Genset maintenance is carried out routinely in the form of checking the voltage, current and rotational speed of the generator. Checking the voltage, current and rotational speed (RPM) is needed to determine the condition of the generator so that its lifetime and quality of performance are maintained. Thus the problem that occurs is that the monitoring process cannot be monitored remotely. Technicians find it difficult to know the generator output conditions such as current, voltage and rotational speed of the generator. Recording of generator output data that still uses a manual system by writing or entering generator output data into a personal computer or log book [4], [5], [6].

So that a system is designed that can monitor remote recording of the generator output using a current, voltage and rotational speed sensor (RPM) where the Arduino Uno microcontroller will process the data for monitoring and recording the generator output. The existence of a monitoring and recording system makes it easier for technicians to monitor the condition of the generator and the system aims to streamline the time for technicians to

monitor generator output lifetime without being on location [7], [8], [9].

From the background that has been explained above, the author can take the title of the thesis research with the title "Designing a Genset Output Monitoring & Recording Tool with the Arduino Uno-Based Internet Of Things (IoT) Concept". As a system, it makes it easier to monitor the recording of generator output data that is integrated with the database [10][11][12]. However, the human body temperature can change throughout the day. Disinfectant spraying is still done manually and requires staff to operate it [13].

II. METHODS

A. Design Stage

The design stages of the "Design of a Genset Output Monitoring & Recording Tool with the Arduino Uno-Based Internet Of Things (IoT) Concept" are as follows:

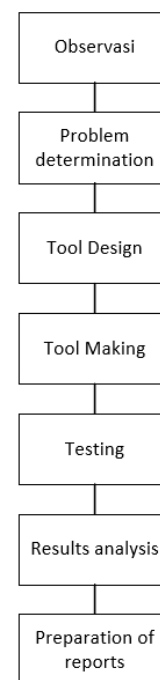


Fig.1 Diagram Research

B. System planning

In the current era, technological developments and advances in the field of electronics are growing rapidly. Currently the monitoring and recording system on the generator can be operated remotely so that technicians can find out the current, voltage and rotational speed conditions on the generator.

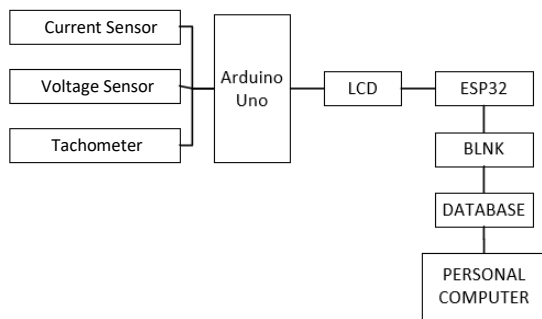


Fig.2 Tools Design Diagram

It can be seen that the authors designed a monitoring system for recording current, voltage and rotational speed conditions (RPM) on generators using Blynk. Users can monitor through a PC (personal computer) connected to the internet network.

This design will monitor and record the output of the voltage, temperature, and rotational speed (RPM) sensors. The first working system of the tool is a voltage, temperature, and rotational speed (RPM) sensor that will detect the amount of voltage, temperature, and rotational speed (RPM) coming out of the generator. Then the data from the sensor will be processed by Arduino uno then displayed on the LCD in this section called the monitoring system. ESP 8266 will capture the wifi signal then send the data and save it to the database will display the data from the database using Blynk access and display it on a personal computer while this section is called the recording system.

C. Tool System Flowchart

The following is an explanation of the flowchart, the initial process of the tool can work, if there is internet access. Furthermore, the current, voltage and rotational speed (RPM) sensors detect the value, from the current, voltage and rotational speed (RPM) sensor value data obtained will be processed by Arduino Uno to detect the amount of output on the generator. Then the data will be processed by Arduino Uno. In processing data and reading data, Arduino Uno displays current, voltage and rotational speed (RPM) readings through the LCD. Data that has been read and processed data is connected using ESP 8266 as the sender of data that has been processed and stored in the database and will then be displayed via Blynk. Then in the Blynk application, the data is

processed into data that can be accessed using a PC (Personal Computer) device by a technician

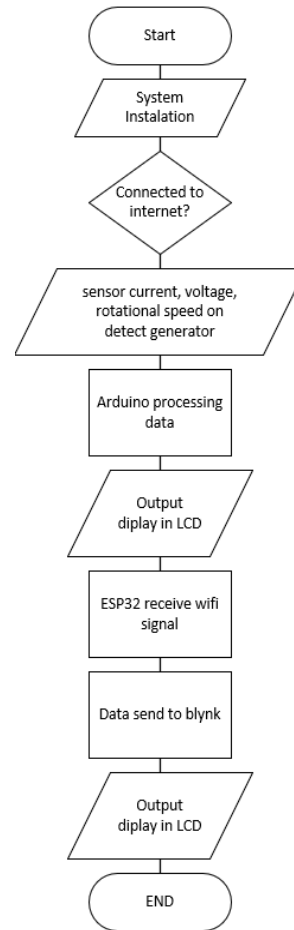


Fig.3 Flowchart diagram

D. Variables and Variable Operational Definitions

A variable is something that differentiates or changes a value. Values may differ at different times for the same object or person or other values may differ at the same time for different objects or people.

1) Independent Variable

The independent variables in this study are current, voltage and rotational speed of the generator which will be detected because these variables allow changes in results during the research process.

The operational definition of the independent variables are current, voltage and rotational speed of the generator set in this study.

2) Bound Variable

The dependent variable is the variable that is influenced or becomes a result of the occurrence of the independent variable. The dependent variable is the voltage sensor, temperature sensor and rotation speed sensor.

The operational definition of the dependent variable is a voltage sensor that is used to read (detect) the voltage value, current sensor to read (detect) the current value

and rotation speed sensor to detect the rotation value on the generator.

E. Data analysis method

The data analysis method applied in this analysis is descriptive analysis, which describes the data according to the test results as follows:

- 1) Monitoring and recording system of generator output displayed in a database that can be accessed via the internet on the Blynk application using the IoT platform.
- 2) Value of current, voltage and rotational speed (RPM) can be seen through the LCD and PC (personal computer).
- 3) The system used can be accessed with Blynk.

III. RESULTS AND DISCUSSION

A. Current Sensor Testing

The results of the test data on the current sensor obtained are in accordance with the test technique described in the previous chapter as follows:

Table 1. PZEM . Current Sensor Test Results Data

Load	LCD	<i>Blynk</i>	Avometer
100 W	0,39 A	0,387 A	0,3 A
60 W	0,24 A	0,241 A	0,2 A
40 W	0,16 A	0,16 A	0,1 A
15 W	0,08 A	0,079 A	0,0 A



Fig.5 Current Sensor Test on Blynk

The results of the test on the PZEM current sensor are taken that the reading of the current value read by the PZEM sensor is the same as the value read on the avometer, LCD and Blynk. It can be concluded that the current sensor used has good quality so that the current value reading is accurate.

B. Voltage Sensor Testing.

The results of the test data on the current sensor obtained in accordance with the test techniques mentioned in the previous chapter are:

Table 2. Data of PZEM Voltage Sensor Test Results

Load	LCD	<i>Blynk</i>	Avometer
100 W	183,5 V	183,5 V	183,5 V
60 W	186,3 V	186,3 V	186,3 V
40 W	186,1 V	186,1 V	186,1 V
15 W	187,7 V	187,7 V	187,7 V



Fig.4 Current Sensor Testing on LCD and Avometer



Fig.5 Voltage Sensor Testing on LCD and Avometer

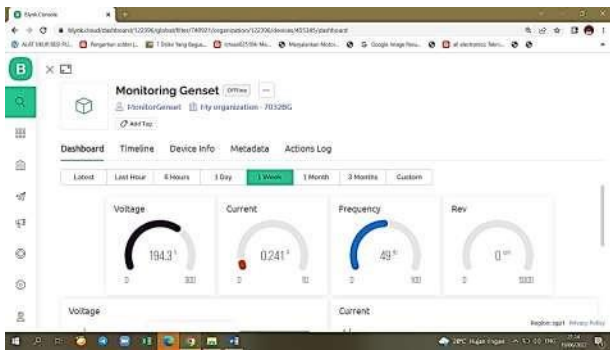


Fig.6 Voltage Sensor Test on Blynk

Tests on the PZEM voltage sensor are taken which have been applied, namely the voltage value detected by the PZEM sensor is the same as the value read on the avometer, LCD and Blynk. In conclusion, the sensor works fine.

C. Proximity Sensor Testing (RPM)

The results of the test data on the rotational speed sensor (RPM) obtained are in accordance with the test technique described in the previous chapter, the table below describes:

Table 3. Data RPM Test Results

Test	LCD (RPM)	Blynk (RPM)
1	1800	1800
2	2880	2880
3	2764	2764
4	2275	2275

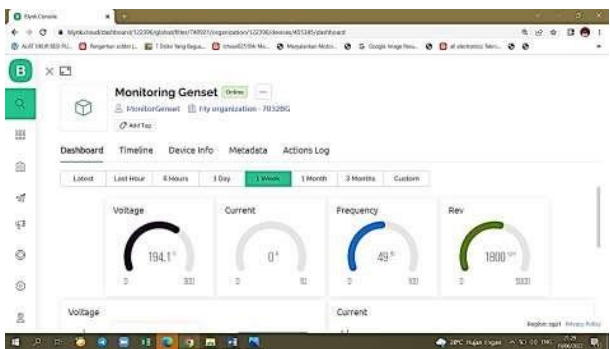


Fig.7 Proximity Sensor (RPM) Testing on Blynk

Known from the proximity sensor (RPM) under normal conditions. It can be proven from the results

displayed on the LCD and the results displayed through the Blynk application are the same. So that the rotational speed sensor shows it is still functioning properly.

D. Arduino Uno Microcontroller Testing

The results of the test data on the Arduino microcontroller obtained are the same as the test techniques that have been applied in the previous chapter along with the test results:

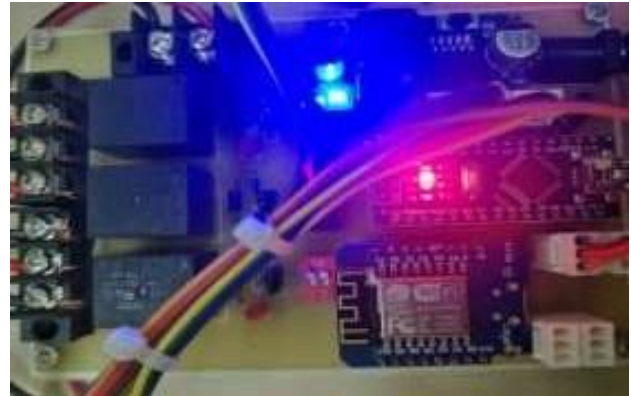


Fig.8 Arduino Uno Testing

It can be concluded from the tests that have been carried out that the Arduino Uno is in appropriate or good condition from the LED indicator that lights up normally.

E. LCD Testing

The results of the test data on the 16 x 4 LCD obtained are in accordance with the test techniques mentioned in the previous chapter as evidenced by the following figure:

Table 4. Data of PZEM Voltage Sensor Test Results

Test	Input (VDC)	Output	Condition
1	5	ON	Normal
2	5	ON	Normal
3	5	ON	Normal
4	5	ON	Normal

16 x 4 LCD testing can be seen the numbers that appear according to the desired Arduino setting program.

F. ESP 8266 Testing

The results of the test data on the 16 x 4 LCD obtained are in accordance with the test techniques mentioned in the previous chapter as evidenced by the following figure:

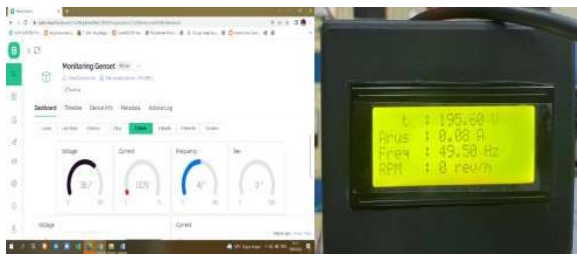


Fig.9 ESP 8266 Testing

In the above test, it can be seen that the data displayed on the LCD is the same as the data sent by the ESP 8266 on the PC. This proves that the ESP 8266 can work well.

G. Testing on the Blynk Program

From a series of tests, the data obtained from testing the Blynk application and the database display on the website are appropriate. The Blynk application can be connected to a microcontroller and is able to monitor and record the generator output results.

The network used in the Blynk application system has been set to ESP 8266. ESP 8266 has been programmed via Arduino IDE to automatically connect to Wifi with user id "AP" and password "12345678". As long as the network signal used is strong, the data will be sent by the ESP 8266 quickly even though the delay is approximately 5 seconds.

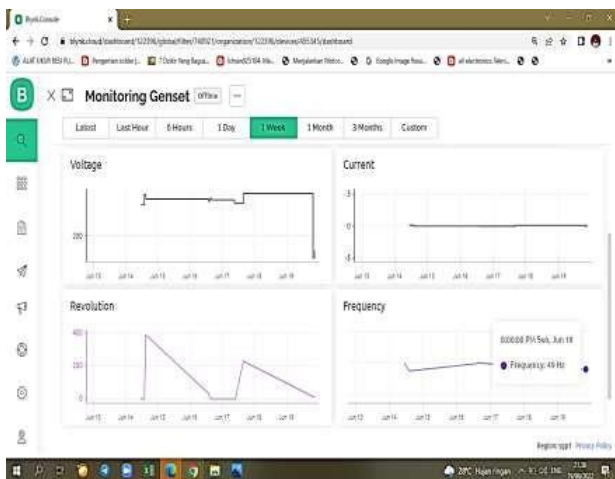


Fig.8 Blynk Aplikasi Application Testing

H. Overall Analysis Discussion

The tests that have been applied to this study can be concluded to work as expected. All sensors have worked well and Arduino is able to monitor the overall device well. The Blynk monitoring application can also run according to the data that has been displayed on the LCD.

In the IoT-based generator recording and monitoring design that has been made by the author, there are several advantages and disadvantages to this tool.

IV. CONCLUSION

Based on the component testing in the previous chapter, conclusions can be drawn, including:

1. It is necessary to design a monitoring and recording generator system through a human interface, requiring supporting components, namely current sensors, voltage sensors, Arduino Uno ESP 8266 and personal computers.
2. From the results of the tool made sensor detection readings can be susceptible to several factors, including the state of the components and component soldering. The results of the current reading are small because the Excitation (DC) used is limited so that the energy produced is low.

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