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System Monitoring Consumption Household Electrical Energy IOT Based

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Abstract

Energy electricity used in a way Keep going continuously cause waste energy, while in development energy alternative need time so long that needed effort in savings energy with system new that can in a way direct applied public For save usage energy electricityMonitoring magnitude electricity distance Far or online need done use know condition real from A system power electricity. Monitoring must give information in a way complex the SMART concept (Specific, Measurable, Attainable, Relevant, Time-bound), namely specific, measurable, achievable attainable, relevant, and in range time Household Energy Consumption Monitoring System Based on Internet of Things (IoT) is an innovative solution to optimize energy management in household environments. This study aims to design and implement a system that utilizes IoT technology to measure, monitor, and analyze energy consumption on electronic devices in households.

Keywords: *Electricity, IOT, System, SMART*

1. INTRODUCTION

The growth adult population in Indonesia has experienced significant improvement , so an impact on increasing the electricity that must be provided by PLN to consumers. Based on results projection need electricity from 2003 to with 2020 carried out by the Planning Service PT PLN (Persero) system and BPPT Energy Team, needs energy electricity in Indonesia grows by 6.5% per year with growth electricity in sector commercial that is by 7.3% per year and followed by sector House ladder with growth need electricity by 6.9% per year [1].

Use the Power of electricity. This can only be seen through the kWh meter provided by PLN as a tool measuring transactional Power electricity. However, for now, some electrical parameters do Enough use the KWh meter only, because the KWh meter only is used for monitoring use electricity in a way overall [2]. The *Internet of Things*, or IoT, is the usual concept used to monitor devices through a smartphone application.

Monitoring of the magnitude of electricity distance, Far or online, needs to be done using known conditions and *real data* from A system's power electricity. Monitoring must give information in a way complex the SMART concept (*Specific*, *Measurable*, *Attainable*, *Relevant*, *Time-bound*), namely specific, measurable, achievable, attainable, relevant, and in range time.[3]

The Household Energy Consumption Monitoring System Based on Internet of Things (IoT) is an innovative solution to optimize energy management in household environments. This study aims to design and implement a system that utilizes IoT technology to measure, monitor, and analyze energy consumption on electronic devices in households.

2. RESEARCH METHODS

2.1. Objects Study

The object of this research is focused on Budhe's house in Sedayu, which is a fairly large house and is inhabited by two people, namely Budhe and the researcher's younger sibling. The selection of Budhe's house as the object of research is based on the consideration of the significant size of the house and the occupants who are representative enough to represent the condition of households in the area. House Characteristics :

2.1.1.Size of House :

This house has a relatively wide size, giving a chance to understand the impact of using electricity in context more spacious context .

2.1.2.Number of Occupants :

The house is inhabited by two people, namely Aunt and sister researchers, who allow focus on the pattern of using electricity in the small House ladder.

2.1.3.Devices :

This house is equipped with devices electricity main as machine washing machine, rice cooker, iron, refrigerator, and others, which can show variation in electricity.

2.2. Design System

2.2.1.Flow chart

The workflow in the flowchart begins with connecting the ESP32 with WiFi, followed by a decision to determine the relay status, whether in the off condition or on.[7] If the relay is in the off state, the tool continues to read PZEM-004T and ACS712 sensor data, as well as count consumption energy. Next, the tool makes the decision whether consumption energy exceeds the limits that have been set. If it exceeds the limit, the relay is turned off; if not, the tool returns to the step beginning for checking repeat. Workflow: This gives control effectively and automatically. For monitoring and controlling energy consumption, with the relay playing a role as a regulator responsive to power to limit energy that has been determined previously, the flowchart image can be seen in Figure 1.1 below

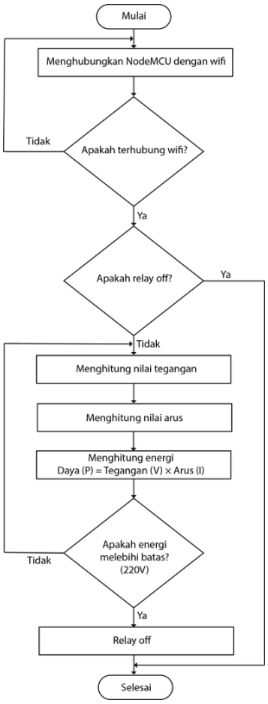

Figure 1.1 *Prototype circuit*

2.2.2.Hardware Design

Hardware design of tools. This is designed as a system for controlling and monitoring the consumption of electricity with use source of energy of 220 volts from PLN.[6] Utilizing a relay that can be set, this tool allows disconnection and connection flow electricity to the load in a way automatic manner, subject to limitations of power that have been determined.[9] The PZEM-004T voltage sensor and the ACS712 current sensor are used. To monitor voltage and current on the load. Data from both sensors is read by the NodeMCU ESP32, which is also responsible for answering to control the relay. In addition, the integration with the MIT App Inventor platform on mobile phones cleverly allows monitoring and controlling distances far. This tool is also equipped with feature automation that turns off the relay when power used by the device reach limit power that has been established.[5] Thus, the system This No only gives efficiency in the use of energy and electricity but also possible to use more smartly and access in a flexible way through application mobile phone smart. The circuit diagram component can be seen in Figure 1.2 below.

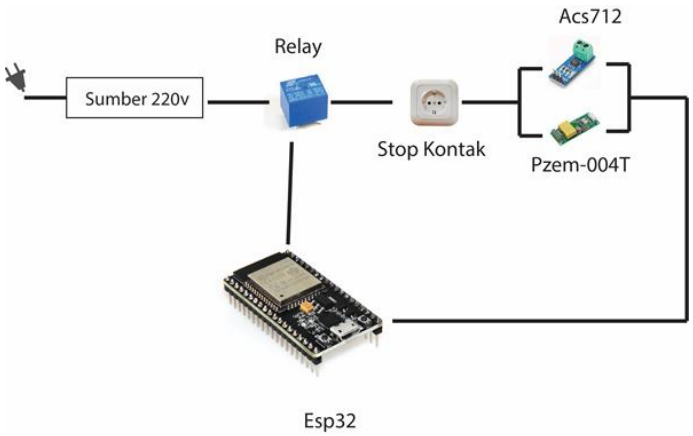

Figure 1.2 *Prototype Design Series*

2.2.3.Hardware Design

System design is the design For A process flow inside A House with the implementation of reading current and voltage. System design can be seen in Figure 1.3

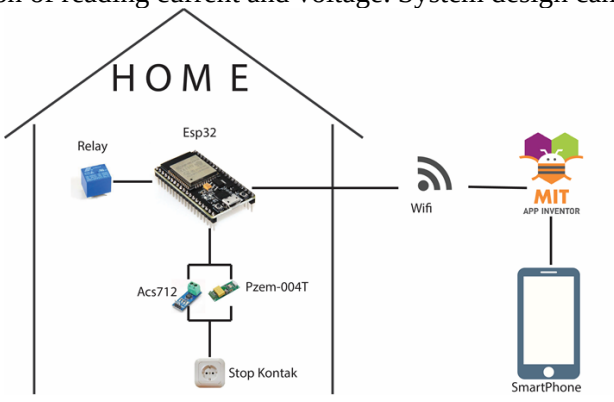

Figure 1.3 *System Design*

3. RESULTS AND DISCUSSION

3.1. Implementation System

Testing and manufacturing System Consumption *Monitoring* Real Time Electrical Energy Based Microcontroller as follows.

3.1.1.Hardware

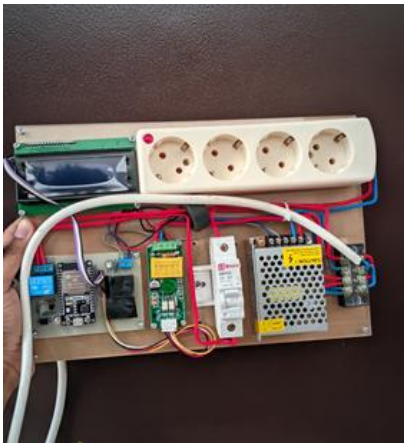

Figure 1.3 *Prototype circuit*

3.1.2.Software

Testing Devices soft aiming for test and analysis function from devices used by the system, as well as ensuring all the devices that will be used are Ready for operation. Design System: This uses the device system software. This consists of:

a. Mit App Inventor

Testing was done to determine the manufacturing process application on MIT App Inventor so that it can be used on mobile phones

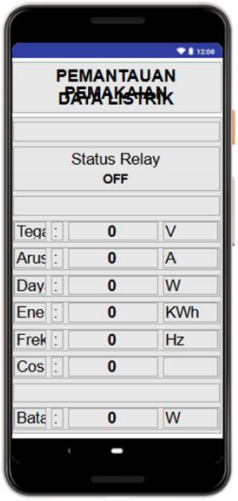

Figure 1.4 *Design on MIT App Inventor*

b. Implementation of Pzem-004 T sensor circuit, and Relay

Early stage testing. This is done by accepting orders from Arduino Uno to Pzem-004T, and relay before Arduino Uno sends a command, enter the program so that connected to the website

```
#if !defined(PZEM_RX_PIN) &&
!defined(PZEM_TX_PIN)

#define PZEM_RX_PIN 16

#define PZEM_TX_PIN 17

#define PZEM_SERIAL Serial2

PZEM004Tv30 pzem(PZEM_SERIAL, PZEM_RX_PIN,
PZEM_TX_PIN);
```

Module 1.1 *Pzem-004T Program*

c. Application

Design: This is done. To know that the data processing on the PZEM-004T sensor can be done with both in an Android application. Here is the application walk :

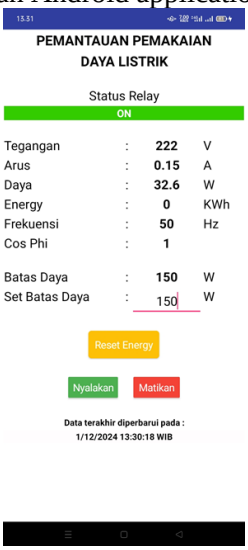

Figure 1.5 View: *If the application has already set the limit power and is already on*

3.2. Results

Study. This is done to obtain accuracy from system testing overall. Testing in a way consists of software testing and testing a tool consisting of ESP32, PZEM-004T, and testing the tool in a way. Here is an explanation from the series testing that has been done :

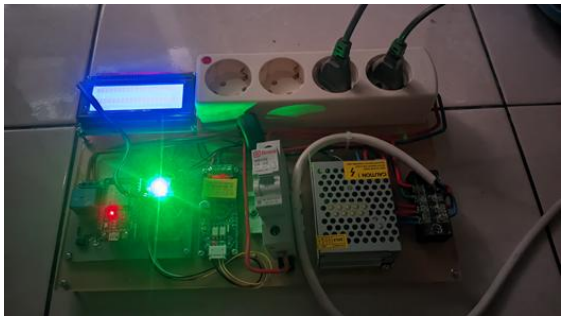

Figure 1.6 Hardware *Monitoring System Running*

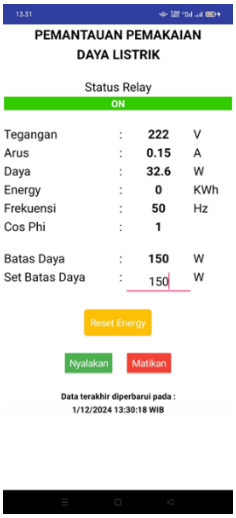

Figure 1.7 *Running Monitoring System* Software

3.3. Discussion

3.3.1.Excess System

a. The monitoring system created can be used by everyone in Auntie's House in a way real-time when the tool process used

b. The monitoring system built can be used by the manager to see all the data in the database

c. A monitoring system can make it easier for everyone to know the consumption energy electricity

d. System monitoring can make it easier to monitor current electricity used and not need moment go out House to forget to turn off the lights, House appliances like a magiccom

3.3.2.System weaknesses

a. The monitoring system can only run on an Android mobile phone

b. This system can only monitor the consumption energy electricity House, not enough for 1000 watts

4. CONCLUSION

Based on results from design and manufacture, System Monitoring Consumption Household Electrical Energy Based on the Internet of Things connected to the application based on Arduino, starting from a theoretical and practical perspective, the writer has interesting a number of interesting conclusions from the results of this design, among others, as follows:

In design and manufacture, System Monitoring Consumption Household Electrical Energy Based on the Internet of Things connected to applications and Arduino Work with good. As for how the design of the tool is, when the PZEM-004T receives Power and is forwarded by Arduino, so that Arduino will give the output to the application, before Arduino sends to the application, the ESP32 functions to connect internet so you can send the output to the application.

In design and manufacture, System Monitoring Consumption Household Electrical Energy Based on the Internet of Things connected to an application and Arduino based enough effective used with a method to connect Power to the power outlet and will read by PZEM-004T, then the data will be automatically displayed directly on the Android application.

SUGGESTION

Based on research results and discussion stated, as following are some suggestions that are expected can become input and materials for consideration :

a. The system can be added with monitoring energy electricity used per day, per week, and also per application used only on Android mobile phones, and suggestions can also be used using IOS
b. For the Mit Inventor App, the application can be replaced with Codular, because more stable and has more features
c. For study, furthermore, can use the PZEM-017 sensor.

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