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Finding Location of Transformer that overload using IoT Method

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Abstract**—**In the electric power distribution operation, the transformer is said to be the heart of transmission and distribution, because it have important function specially for the lives of many people. Unfortunately, many constraints that occur at this time because there is no the routine maintenance and it known after the problem have occur at the transformer at another day, as like the overload case. Usually the case occur when the NH Fuse is installed which is not as it should. Which results in loading exceeding the transformer capacity. This paper propose method to avoid the protection failure by periodic checking to some circuit board for low voltage so that the failure of transformer can minimized. The result reported online IoT based using Blynk Application. The change in current data is used as a parameter of the condition of the transformer being tested. If there is a change from normal characteristics, the transformer condition can be known in advance by sending microcontroller reading data then forwarded to the later application which also displays the transformer location information measured. With this monitoring system it will be known early if there is a change in the normal characteristics of the transformer.

Keywords**—**Distribution transformer, transformer monitoring, overload, IoT, Arduino, microcontroller.

I. INTRODUCTION

In this modern era, technology is developing very rapidly. In electric power distribution operations, the transformer can be said to be the heart of transmission and distribution. In this condition, a transformer is expected to operate optimally [1]. To improve the services of PT. PLN to consumers of electrical energy, continuity needs to be maintained from time to time. Distribution of electrical energy to consumers from the 20 KV network always passes through the power transformer to convert the voltage to 220 VAC which enters the PHB TR (Connecting Panel for Low Voltage) can be utilized by consumers. Constraints that

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occur in general are power transformers that are in a voltage condition that cannot be detected in advance whether the transformer has an error. So far, PT. PLN only carries out routine maintenance according to the schedule at a certain time and it is very difficult to know the condition of the transformer that is experiencing interference if there is interference outside the maintenance schedule [2]. An example of an incident when on the field is the NH Fuse installed that is not suitable / larger than what should be installed. This makes the load transformer exceed 100%. Based on this condition, an online transformer condition monitoring system is required. It bring the concept of the Internet of Things to this tool. We can monitor the current with the sensor. Which will be read by the microcontroller then forwarded to the application while displaying information from the location of the transformer using the application. In the tool there is a current sensor for parameters to find out how the state of the secondary transformer [3]. Although this has to add costs, the benefit is that it is easier for employees to investigate disruptions, and speed up handling. Normally when there is an interruption the employee takes 45 minutes - 60 minutes to find the location of the disturbance. And this makes it easier for employees to directly find the location of disturbances and make time efficient. With this concept, PT. PLN can know from the start that the transformer is experiencing interference. Such monitoring is very necessary, related to the need for sustainable and guaranteed electrical energy distribution.

II. LITERATURE SURVEY

A Failure Modes and Effects Analysis were conducted in Dangila town from April 1 to June 3, 2019. Dangila is the capital city of Dangila woreda in Amhara regional state. It is 78 km away from Bahir Dar which is the capital city of Amhara regional state. Te city has fve sub towns, one substation, which gives serves to the town and the surrounding people. Questionnaires were distributed to Ethiopia Electric Utility maintenance stafs. Te questionnaire assesses the consequences of failures in terms of electric power interruption, damage of the components or further damage of subsequent sub systems.

III. PROPOSED SYSTEM

A. Block Diagram

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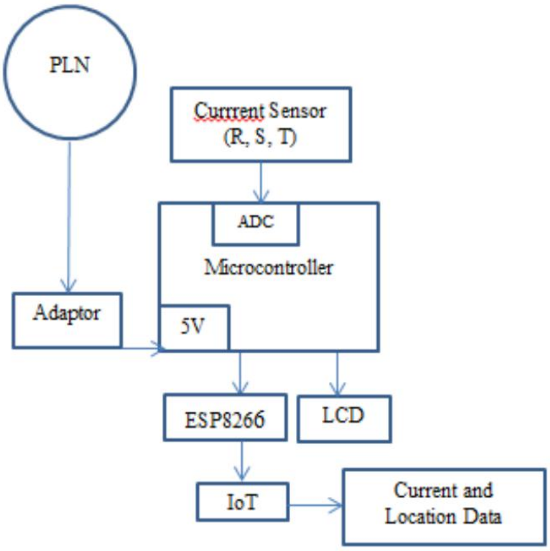

Fig. 1. Block Diagram

The block diagram above shows a system consisting of several stages. In the first stage the current sensor will be connected to a phase in the low voltage air channel to observe the current. Then it will be read by the Arduino Mega microcontroller. ESP8266 will capture the wifi signal and send the current information and location of the location after the disturbance is detected due to overcurrent that is already connected to Android or Smartphone [4]. And later it will send notifications when there is more flow or interference. Notification or notification itself will use e-mail and the Blynk application itself [5].

B. Application Display On Smartphone

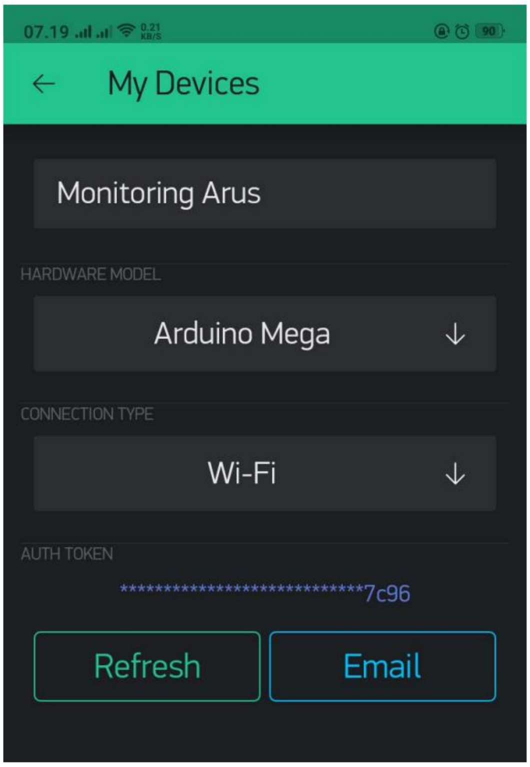

Fig. 2. App Display

Blynk application can be downloaded in the Play Store for Android, and in the App store for Apple. many features are provided for creation. and the features used for this project are as follows.

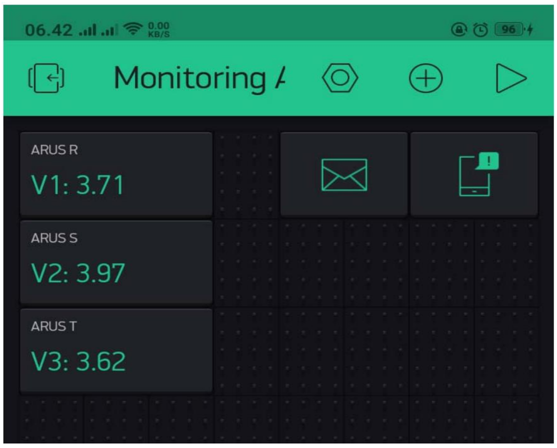

Fig. 3. Features in Application

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The features used in accordance with the image above are V1, V2, V3 where it indicates virtual writing is read by the current SCT 013-000 sensor [6]. beforehand to get good results, it must be calibrated on the sensor. then also install sensor notifications on cellphones and also e-mail [7].

IV. RESULTS

A. Current Sensor SCT 013-000 the current sensor used is SCT 013-000 with readings up to 100A. this project uses sensors with a range of up to 100A because it is intended for distribution transformers. The following results from the calibration of the 3 current sensors [8]. This refers to journals with titles "Soft Starting & Performance Evaluation of PI Speed Controller for Brushless DC Motor Using Three Phase Six Step Inverter".

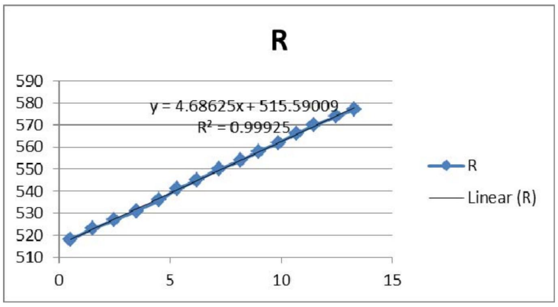

Fig. 4. SCT 013-000 1 Calibration Results

after calibrating the sensor, a formula for linear results will be obtained. The following are the results of the experiments conducted.

Table 1. Percent Error SCT 013-000 1

Clamp (A)	Sensor (A)	Error (%)
1.007	1.15	14.20
1.496	1.56	4.28
2.5	2.65	6.00
3.58	3.72	3.91
4.623	4.57	1.15
5.689	5.64	0.86
6.69	6.7	1.15
7.66	7.77	1.44
8.62	8.62	0.00
9.56	9.69	1.36
11.35	11.17	1.59
12.99	13.1	0.85
13.83	13.74	0.65

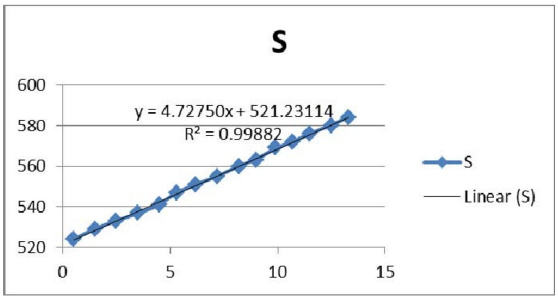

Fig. 5. SCT 013-000 2 Calibration Results

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Table 2. Percent Error SCT 013-000 2

Clamp (A)	Sensor (A)	Error (%)
1.007	1.22	21.15
1.496	1.43	4.41
2.5	2.49	0.40
3.58	3.34	6.70
4.623	4.6	0.50
5.689	5.66	0.51
6.69	6.51	2.69
7.66	7.78	1.57
8.62	8.41	2.44
9.56	9.47	0.94
11.35	11.37	0.18
12.99	13.07	0.62
13.83	13.85	0.14

Fig. 6. SCT 013-000 3 Calibration Results

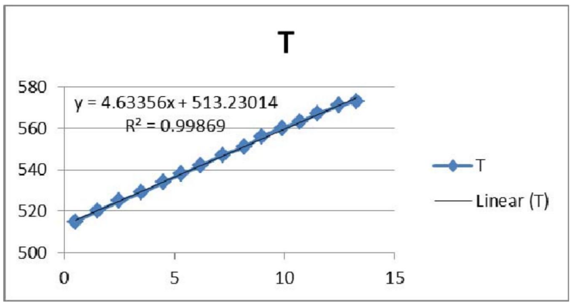

Table 3. Percent Error SCT 013-000 3

Clamp (A)	Sensor (A)	Error (%)
1.007	1.25	24.13
1.496	1.45	3.07
2.5	2.54	1.6
3.58	3.62	1.12
4.623	4.7	1.67
5.689	5.78	1.6
6.69	6.64	0.75
7.66	7.72	0.78
8.62	8.8	2.09
9.56	9.66	1.05
11.35	11.18	1.50
12.99	12.95	0.31
13.83	13.76	0.51

from the calibration results, it has also found what percentage of errors in each step of the experiment. when the program is set to give a set point how much current can flow to later get a warning or notification. the notification will be in the form of a location and will appear on the cellphone as well as e-mail [9].

B. Blynk Application This Blynk application is used to monitor how much current flows. and if the current flowing exceeds the set value, there will be a

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notification and will send the location of the transformer that has a fault. this will accelerate the process of handling disruptions and improving service quality. This refers to journals with titles “Design and implementation boost converter with constant voltage in dynamic load condition”.

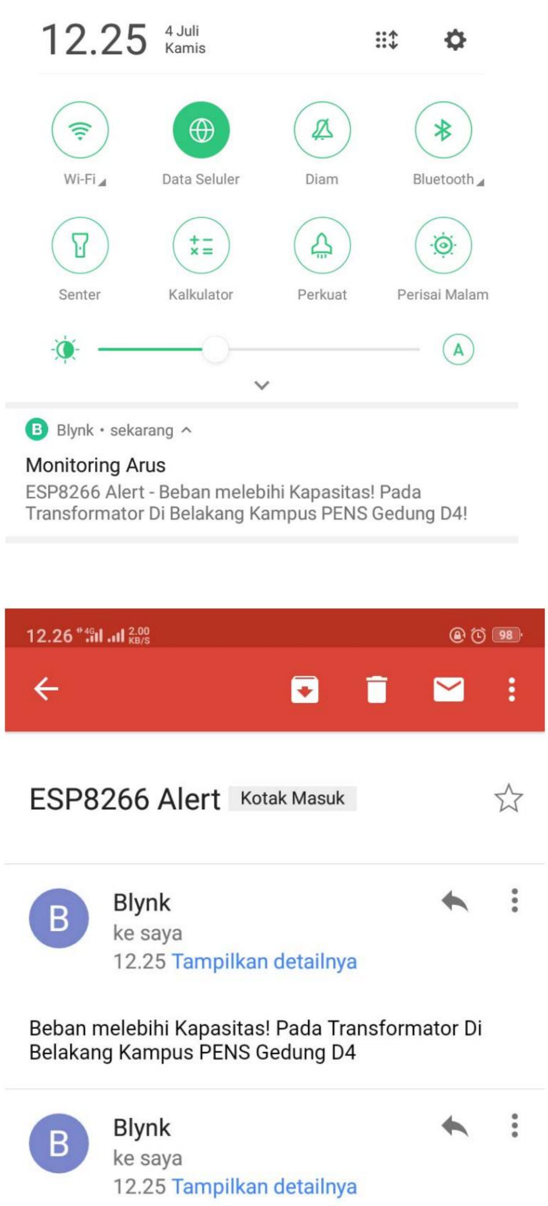

Fig. 7. Email And Smartphone Notification

Display above is a display of the Blynk application and notifications sent via cell phone and email.

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