International Journal of Recent Advances in Multidisciplinary Topics
Volume 2, Issue 12, December 2021
https://www.ijramt.com | ISSN (Online): 2582-7839

Electric Transformation Distribution Panel (DP) Maintenance Using Android Application

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***Abstract*: A distribution panel is that provides the final voltage transformation in an electric power distribution system network by transformer. As of, large number of distribution panels transformers and various components in excess of a wide areas in a power system, the, data acquisition are the critical issues, condition monitoring. The remote monitoring of distributing panel and transformers health with interactive system is a model that examine the transformer using internet of things (IOT) synchronously. It also proposed to send the central database via Wi-Fi module for further process. The real time functioning of concurrent monitoring results of authentic data is proposed in module takes with embedded systems. Sensors and wi-fi are installed at transformer site which reads and measure the physical quantity from the distribution transformer and it converts into the analog signal. As the parameters confines processed and records the data in system. In case of emergency situation at distribution transformer the obtained parameters sense the signal and it sends alert to the Android app regarding information about the parameter signals at distribution transformer according to the data occurred by the micro-controller. Arduino based board designs use a like controllers and microprocessors are the equipped with a set of digital and analog I/O pins are varies that may be interfaced to various expansion boards and other designs of circuits.**

***Keywords*: Transformer fault detection; continuous parameters analysis; automatic alert generation; IoT kit**

1. Introduction

In our day to day life style electricity is widely used. Almost all works are based on electricity. Electricity is a mixture of a lot of components and equipment which makes human lifestyle fast and easy. The transformer is used to transmit the electric power. In power systems, an electrical equipment distribution transformer gives power to the low-voltage users and these operation is an important process of the entire network operation. The greater number of the devices have been in use for many years in different (electrical, mechanical and environmental) circumstances. They are the main components and constitute a large portion of capital investment. Performance of distribution transformer underrated criteria promises their long service life. However, their life is significantly reduced if they are under subjected to overloading, heating, low or high voltage/current giving out put in unexpected non-successful and loss of supply to a large amount of users thus effecting systems liability. An improper in sharing transformer is pass with changes in different activities as Winding temperature,Oil, temperatures, environmental temperature, Load, current, Oil flow(pump-motor), Moisture and dissolved gas in oil, LTC monitoring, Oil level, Bushing condition. Transformers are failed due to Overloading, oil temperature, load current and ineffective cooling. When a transformer stops working properly, transmission process disturbs and so the distribution systems resulting in increase of power system cost and decrease of reliability in electric delivery. The transformer is a mixture of distinct parts so all parts should be tested for proper work of the transformer. The ob serving devices or systems which are currently used form on it or in distribution transformer have some difficulties and inability. To monitor all the parameters we need an real time monitoring system which will signals to the monitoring canter time to time. These creates online monitoring of main function parameter of distribution transformer which will give the current situation of the transformer. With these we can utilize to optimally use the transformers and keep the transformer in work for a longer period. An real time operating system is used to collect and analyze temperature data overtime. This will be useful for identifying or recognizing unexpected situations before any major damage occurs. Which gives a greater reliability and also it is cost savings. Wide number of using mobile networks and GSM modems which have made the main attractive option both for influence media and wide area network applications.

2. Literature Review

This system can monitor the health status of the distribution transformer in real time aspect. Author presents design of a mobile embedded system to monitor load. This system

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integrates Global Service Mobile (GSM) Modem, with single chip micro-controller and sensors. The main drawback of the system is the use of GSM which makes it a costlier system to implement [1].

Another system monitor and record parameters of a distribution transformer like Current, Temperature, Vibration and Humidity. Remote terminal unit is installed at the distribution transformer site. Parameters are processed and recorded using-in-8-channel analog to digital converter (ADC) of the embedded system in the system memory. Due to the ADC, the system will take more time to process and communicate the data [2].

In this system focuses on optimal utilization of available electricity during peak and off-peak hours, this helps to maintain consumer's load curve according to objective load curve. In this technique, we will analyze load curve of customer demand and then shift that load curve from peak load hours to off-peak hours using available resources. This system deals with the load balancing, which involves additional material cost for sub-transformer [3].

The main aim of this scheming the parameters through GSM Module. The scheming of transformer is ended by means of temperature detector. GSM and microcontroller which is awireless disclosure. The voltage, current, temperature of transformer is prohibited by using GSM module. Then throw SMS to the remote location. Use of GSM makes the system bit a costly and less effective [4].

This is the system can monitor the health status of the distribution transformer in real time aspect. Author presents design of a mobile embedded system to monitor load. This system integrates Global Service Mobile (GSM) Modem, with single chip micro-controller and sensors. The main drawback of the system is the use of GSM which makes it a costlier system to implement [5].

This system is low cost, and achieve the remote centralized monitoring function. It has a feature-rich, friendly interface, real-time high, support configuration and so on. Currently, the system has been carried out in the project on-site operation and no real time implementation is available [6]. A transformer not properly working generates gases, catastrophic failure. To prevent the failure, this system is used for monitoring the hydrogen [7]. This system could help in estimating the proper cause of the failure in the transformer system. Respective corrections in manufacturing practices can be incorporated. Does not have a mechanism for real time monitoring to avoid failure [8]. This system integrates online monitoring system, which contains the monitoring of gas-in-oil analysis (DGA), partial discharge (PD), and contamination of the bushing surface, the equivalent capacitance and dissipation factor (tan) of the bushing [9]. Transformer Diagnostics Monitoring (TDM) system is described as system most fully assess condition all transformer parts. Does not have any system to interpret the collected data [10].

3. Research Methodology

1) Block Diagram

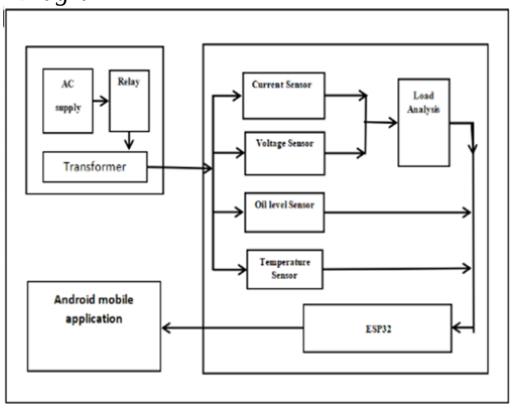

Fig. 1. Iot based circuit Transaction

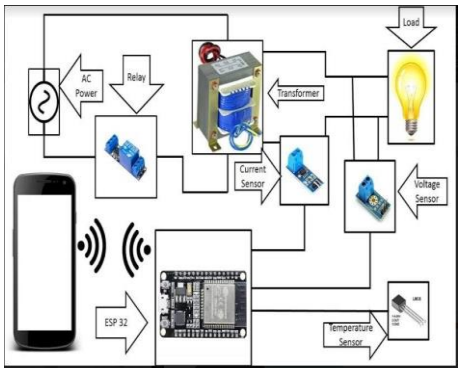

Fig. 2. Circuit Transaction Module

2) Process descriptions

As shown in Fig.1

- These applied systems explores (Temperature, load, Current, Voltage) processed data. These data is processed through the ER32- Integrated chip and analysis might be maintained to transfer from the sensors.
- The records analyzed by the IoT kit from the sensors detected by the sensors, Oil level sensor separately.
- These records will be computed through mobile application such as android the parameters are fixed through their sustained values.
- Generating reports get fluctuated it will send on the mobile device for monitoring to check the system is working properly or not.
- Then application of monitoring engineer at base station gets reports being check the system data is transferred to the android decides certain actions.
- The transferring signals to the particular engineering analyses these module works for transferring and maintenance of distribution panel and transformer health, if any problem occurs the alerts will directly send through our module.

4. Design Representation

Following circuit diagram represents the circuit transaction module which contains AC power, Relay, Transformer, wi-fi,

Sensors. Here we show the connections between all components.

1) Working

We can collect all the data from sensors like current sensor, voltage sensor, Temperature sensor, load sensor, etc to analyze them. Then this data is proceed through the ESP32 arduino integrated chip and analysis could be maintained to transfer. The oil level also detected separately by the oil level sensors to keep records in the analyze data from the sensors. The data is transferred to the Android application (mobile) of monitoring engineer at base station as mentioned in Fig: 1.2.

- *Relay* - When an electric current is passed through the coil it generates a magnetic turf that trigger the armature, and the resulting movement of the movable contact moreover create or breaks, and connect with a fixed contact. Mostly relays are manufactured to function quickly. In a low-voltage relevance this condense noise; in a high voltage or current application it act as switch reduce sarcing.
- *Transformer* - Electromagnetism is the principal which is used in transformer to change one AC voltage level to another. Thus the submissive element (Passive component) has no external power supply. In the transformer magnetic circuits and transformer core are present in which magnetic flux, permeability, magnetic circuit, reluctance, the Magneto motive force are present and some common type of transformer cores. The transformer are generally highly reliable so overheating also occurs and due to that the transformer fault occurs also because of that some internal damage occurs.
- *Voltage Sensor* – It is a based on principle of EMF and potential difference generally resistance point pressure one of the. It can convert the input voltage of terminal reduce 5 times of original voltage which is use to analyze the voltage frequency. The max digital circuits like arduino has input voltage is 5 V, so the input voltage of this module should be not more than 25 V. The 3 Pin Dual-female come with sensor module and Jumper for the interactive connection with voltage sensor module with ESP32 sensor shield through 3 Pin sensor cable, not only can easily realize to detect and control the voltage, we can display the voltage through the IIC LCD1602 LCD module and make voltage monitor but we are using android phones for the same.
- *Current Sensor* – To sense the current indirectly the ACS712 current Sensor uses Sensing method to calculate the current. This IC uses Hall principal to compute the current i.e. when current passes through copper coil produces magnetic field in it. The Hall sensor is used to sense magnetic field proportional to the voltage of the current, this is used to measure current. The accuracy of the device depends on proximity of the magnetic signal to the Hall sensor. Closer the magnetic signal higher the accuracy. In this IC current flows from 4 four pins. This forms the sensing for conduction path detects current.
- *Temperature sensor* – The integrated circuit LM35 series is use to analyze temperature of the Transformer with proportional to output voltage linearly. The linear temperature over the sensors calibrated in Kelvin, obtain convenient centigrade scaling. The temperature range varies dependent on transformers size. In this module the device is used with single power supplies, or with plus and minus supplies.
- *ESP32 - ESP32-WROOM-32* is a very powerful, generic Wi-Fi + BT (Bluetooth) + BLE MCU module. It contains the powerful Wi-Fi, Bluetooth, Low Energy (BLE) combination unit that utilizes the multipurpose ESP32- DOWDQ6 chip. The device offers a PCB antenna and comes fully-equipped with 2 dual CPU cores that can be controlled and powered individually, as well as with a flexible clock frequency adjusted between (80 MHz to 240 MHz). To use low power it turn OFF its CPU and continuous monitoring the co-processor to by analyzing all peripherals for changes or crossing parameters defined thresholds. The ESP32 chip uses less than 5μA and can support data rates of up to 20dBm and 150 Mbps output power at the antenna, allowing for a wide physical range. Ranging from capacitive touch sensors, Hall sensors, ESP32 integrates a rich set of peripherals, Ethernet, high-speed SPI, UART, I2C and I2S.The operating system chosen for ESP32 is free LwIP with RTOS.
- *Oil-level sensor* - It is very curtail for big transformers to work subsequently thus it can use conduction generates, oil container is imposed with their circuits along the systems to for cooling the transformer. In this project we can are not implementing the oil level system as we are only giving the prototype for the emerging IoT based system, but by using different kind of sensors we will get analog values of oil level which is possible to convert in to digital values and can be transfer to share the data to analyzing engineer at the base station using this system we are using vehicle oil indicator in this if needed.
- *Mobile device* – We are using android device of the successive module to elaborate the functions in our project, which can collect the data through IoT kit developed by using the defined modules as above. It is able to fetch and process data from the system using wireless connection i.e. internet also generating graphical reports

5. Conclusion

We are prototyping this module for the outcomes in the welfare of the power transmissions project. In this structure is use to get synchronal statistics of parameters in continuously. It helps in further research of wireless current and transmission projects. The execution of proposed project requires more research, The base system overcome all the drawbacks of manual system. Main disadvantages of manual monitoring such as overheating and overloading are prevented through real time

monitoring system. Wi-Fi Module and android App is used for online monitoring of parameters of distribution transformer which can also be used in rural area as well as anywhere, where manual checking and maintenance is possible without going to actual location after a system successfully setup and transformers is being monitored. It will deduct the preservation cost of and transportation costs and efforts of the monitoring team. Which can eventually turns into grater help to the electrical transformation and distribution economically.

References

[1] Sajidur Rahman, Shimanta Kumar Dey, Bikash Kumar Bhawmick,Nipu Kumar Das,"Design and implementation of real time transformer health monitoring system using GSM technology", International Conference on Electrical, Computer and Communication Engineering (ECCE),IEEE2017.

[2] Rohit R. Pawar, S. B. Deosarkar ,"Health condition monitoring system for distribution transformer using Internet of Things (IoT)", International Conference on Computing Methodologies and Communication(ICCMC), IEEE 2017

[3] Majid Ali, Adnan Yousaf, Fuad Usman, "Designing and simulation of load control & monitoring system through Demand Side Management technique",8th International Renewable Energy Congress (IREC),IEEE2017.

[4] Rashmi Ashok Panherkar, Prajakta Vaidya,“ Transformer parameter monitoring system using PROTEUS software", Second International Conference on Electrical, Computer and Communication Technologies (ICECCT),IEEE2017.

[5] Kazi Ahmed Asif Fuad, Md. MarufIbne Hasan, Laila Nawsheen Manzoor, Mohammad Abdul Mannan, "Design and simulation of centralized load controlled automated power system network (CLCAPSN)",IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE), IEEE2015.

[6] Qin Zhou, ZhengCaiFu,"Research and implement of cost-effective remote transformer monitor system", International Conference on High Voltage Engineering and Application, IEEE2012.

[7] Alfonso de Pablo, Walter Ferguson, Anatoliy Mudryk, Dmytro Golovan,"On-line condition monitoring of power transformers: A case history", Electrical Insulation Conference (EIC), IEEE 2011.

[8] Chelladurai E. Denny, Kumar A. Santosh, ManishYadav, A. Venkatasami, "Design review as a diagnostic tool for power transformers — A case study", International Conference on Condition Monitoring and Diagnosis, IEEE 2008.

[9] ShuangzanRen, Xu Yang, Wenhu Yang, Baofeng Xi, Xiaolong Cao,“ Research on Insulation Condition Monitoring System for Power Transformers",International Conference on Condition Monitoring and Diagnosis, IEEE 2008.

[10] V. Rusov1, S. Zhivodernikov2 1 Vibro-Center, Perm, Russia 2Federal Grid Company of Unified Power System, Novosibirsk, Russia “Transformer Condition Monitoring”, IEEE2008.