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TRANSFORMER REAL TIME HEALTH MONITORING BY USING IOT

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Abstract: This Project is used to detect the real-Time fault detection in the transformer with the help of Io/T based software system connected to this project. For this real-time aspect, we made use of one temperature sensor, one potential transformer, earth fault, oil level, and one current transformer for monitoring the Temperature, Voltage, and current data of the transformer and then send them to a remote location. These five analog values are taken in multiplexing mode and connected to a programmable microcontroller of PIC18f4550 families through an ADC inbuilt. They are then sent directly to a Wi-Fi module under TCP IP protocol to a dedicated IP that displays the data in real-time chart form in any web-connected PC / Laptop for display in 3 different charts. So, This Transformer Health Measuring will help to identify or recognize unexpected situations before any serious failure which leads to greater reliability and significant cost savings.

Index Terms **–OIL LEVEL SENSOR, TEMPERATURE SENSOR, CURRENT SENSOR, VOLTAGE SENSOR, PIC18F4550**

I. INTRODUCTION

An Electricity transmission line is one of the important needs and features of an Io/T-based monitoring system. High voltage transmission lines come under many natural disasters which can affect the stability and reliability of the system. At present, many wireless network systems have been put into practice, but there are some problems of high maintenance and operation costs. IoT monitoring of transmission lines is composed of two parts: one is to monitor the transmission line conductor state while the other is to monitor the tower condition state.

II. BLOCK DIAGRAM

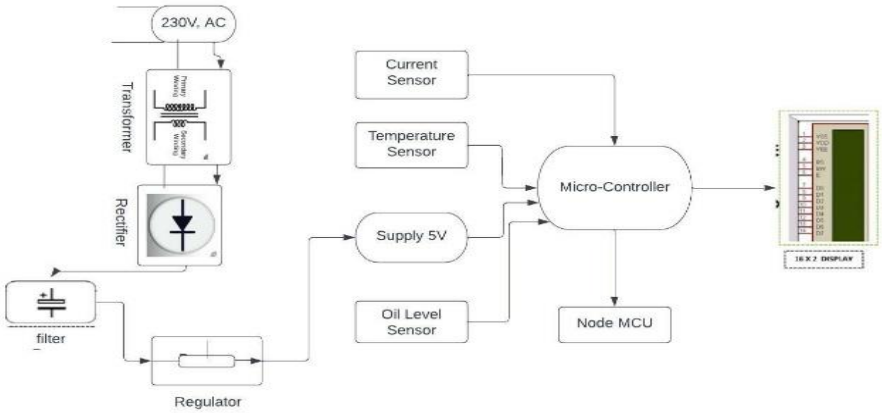


Fig.2 Block Diagram

III. COMPONENTS

I. Node MCU:-

Node MCU is an open source firmware for which open source prototyping board designs are available. The name "Node MCU" combines "node" and "MCU" The term "Node MCU" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source The firmware uses the Lua scripting language. The firmware is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. This Module is used in various System to provide connectivity. The prototyping hardware typically used is a circuit board functioning as a dual in line package which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in Io/T application.

Node-MCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna

II. Current sensor:-

A device that is use to detect or sense the flow of current. There are a wide variety of sensors, and each sensor is suitable for a specific current range and environmental condition.

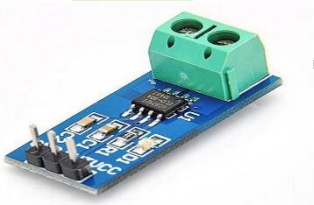
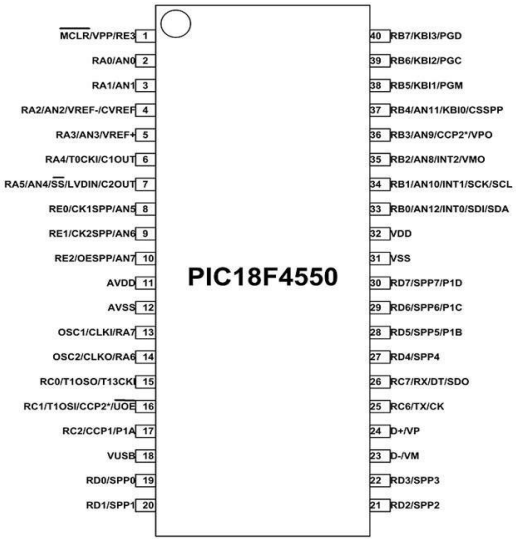


Fig: Current Sensor.

Sensing and controlling current flow is a fundamental requirement in a wide variety of applications including, over-current protection circuits, battery chargers, switching mode power supplies, digital watt meters, programmable current sources, etc. This ACS721 current module is based on ACS712 sensor, which can accurately detect AC or DC current. The maximum AC or DC that can be detected can reach 5A, and the present current signal can be read via analog I / O port of PIC18F4550.Hall IC and converted into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which is programmed for accuracy after packaging. The output of the device has a positive slope hen an increasing current flows through the primary copper conduction path which is the path used for current sensing. The internal resistance of this conductive path is 1.2 mΩ typical, providing low power loss. The thickness of the copper conductor allows survival of the device at up to 5× overcurrent conditions. The terminals of the conductive path are electrically isolated from the sensor leads (pins 5 through 8). This allows the ACS712 current sensor to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques. The ACS712 is provided in a small, surface mount SOIC8 package. The lead frame is plated with 100% matte tin, which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free, except for flip-chip high-temperature Pb-based solder balls, currently exempt from RoHS. The device is fully calibrated prior to shipment from the factory

III. PIC :-

Fig: PIC Micro-controller



PIC18F4550 belongs to '**PIC18F**' family of microcontrollers. PIC18F4550 is one of popular Microcontrollers from the microchip technology, comes with a High-Performance, Enhanced flash, USB Microcontroller with Nano -Watt-Technology. This is an 8-bit microcontroller popularamong makers and engineers due its features and easy applications. PIC18F4550 comes in various packages like DIP, QPF and QPN and can be selected according to the project requirement.

PIC18F4550 Pinout Configuration

It is a 40 pin device as shown in **PIC18F4550 pin diagram**. There are so many features for a controller the manufacturer cannot provide that many I/O pins. So many pins of controller have multiple features. These features can be enabled through programming depending on requirement. We will describe each pin functions briefly below.

IV. Temperature Sensor:-

Fig: Temperature Sensor.

It is a semiconductor type model, means that it may have greater resistance than conducting materials, but lower resistance than insulating materials. The relationship between a thermistor's temperature and its resistance is highly dependent upon the materials from which it's composed. The manufacturer typically determines this property with a high degree of accuracy, as this is theprimary characteristic of interest to thermistor buyers. Thermistors are made up of metallic oxides, binders and stabilizers, pressed into wafers and then cut to chip size, left in disc form, or made into another shape. The precise ratio of the composite materials governs their resistance/temperature "curve." Manufacturers typically control this ratio with great accuracy, since it determines how the thermistor will function. Thermistors, derived from the term thermally sensitive resistors, are a very accurate and cost- effective sensor for measuring temperature. Available in 2 types, NTC (negative temperature coefficient) and PTC (positive temperature coefficient), it is the NTC thermistor that is commonly used to measure temperature. Thermistors are available in two types: those with Negative Temperature Coefficients (NTC thermistors) and those with Positive Temperature Coefficients (PTC thermistors). NTC thermistors' resistance decreases as their temperature increases, while PTC thermistors' resistance increases as their temperature increases. Only NTC thermistors are commonly used in temperature measurement. Thermistors are composed of materials with known resistance. As the temperature increases, an NTC thermistor's resistance will increase in a non-linear fashion, following a particular "curve." The shape of this resistance vs. temperature curve is determined by the properties of the materials that make up the thermistor. Thermistors are available with a variety of base resistances and resistance vs. temperature curves. Low-temperature applications (-55 to approx. 70°C) generally use lower resistance thermistors 2252 to 10,000Ω). Higher temperature applications generally use higher resistance thermistors (above 10,000Ω). Some materials provide better stability than others. Resistances arenormally specified at 25°C (77°F). Thermistors are accurate to approximately ± 0.2°C within their specified temperature range. They're generally durable, long-lasting, and inexpensive. Temperature Range, Accuracy and Stability Thermistors are highly accurate (ranging from ± 0.05°C to ± 1.5°C), but only over a limited temperature range that is within about 50°C of a base temperature. The working temperature range for most thermistors is between 0°C and 100°C. Class A thermistors

offer the greatest accuracy, while Class B thermistors can be used in scenarios where there's less need for exact measurement. Manufacturing process is complete, thermistors are chemically stable andtheir accuracy does not change significantly with age

V. Potential Transformer:-

It is used as Step down transformer as well as Voltage sensor. It works from step down the voltage from 230 V to 12 V AC. It is one of the most essential part of the project it work as the heart of the model.

Fig: Potential Transformer.

VI. Oil Level Sensor:-

Fig: Oil Level Sensor

Float level sensors are continuous level sensors featuring a magnetic float that rises and falls asliquid levels change. The movement of the float creates a magnetic field that actuates a hermetically sealed reed switch located in the stem of the level sensor, triggering the switch to open or close. Different variations of float switches are used for commercial and industrial applications involving water, oil, chemicals, and other liquid materials. There are vertical mount and side mount options, and the choice of a stem made from either hard plastic or non-magnetic metalsuch as stainless steel. We manufacture several varieties of float switches including programmable level sensors, miniature float switches, suction pipe sensors, and bulk material switches. All our products feature a robust housing design and are offered in various configurations to meet your uniqueneeds. Learn more about our float level sensor products below or contact us for assistance in selecting the right option for your application and operating environment.

VII. LCD Display:-

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.
The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.
VEE pin is meant for adjusting the contrast of the LCD display and the contrast can be adjusted by varying the voltage at this pin. This is done by connecting one end of a POT to the Vcc (5V), other end to the Ground and connecting the center terminal (wiper) of of the POT to the VEE pin. See the circuit diagram for better understanding.

, the module will recognize it as a command.
Pin Description:

ALL LCD HAVE

- Eight(8) Data pins
- VCC (Apply 5v here)
- GND (Ground this pin)
- RS (Register select)
- RW (read - write)
- EN (Enable)
- V0 (Set Lcd contrast)

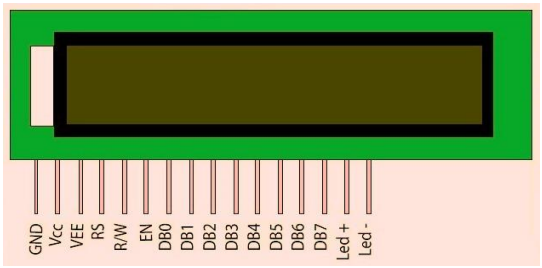


Fig: 16*2 LCD Display.

IV. CIRCUIT DIAGRAM

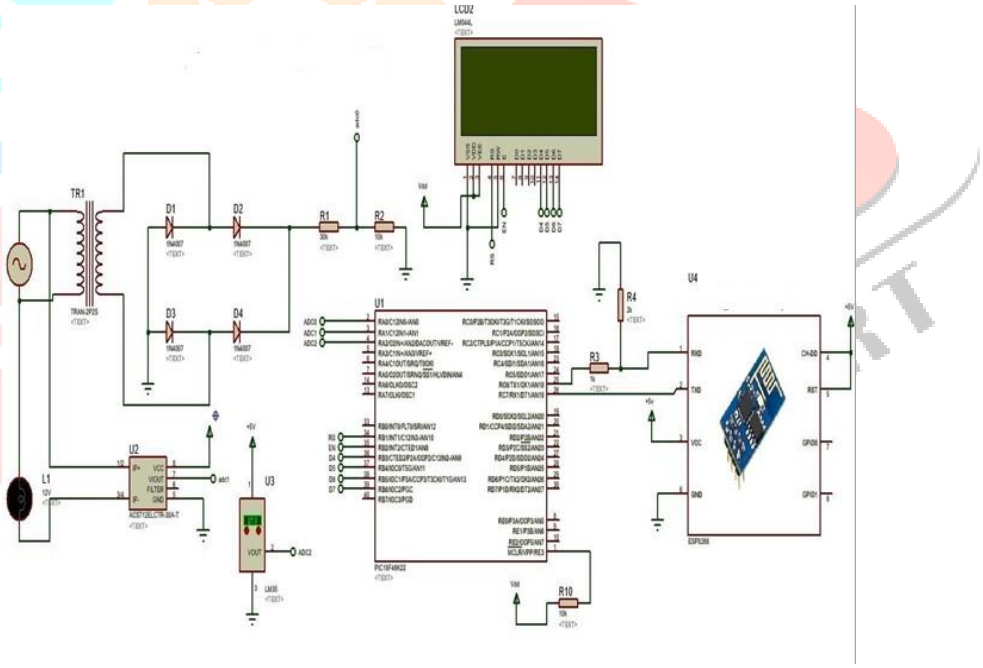


Fig.4 Circuit Diagram

V. WORKING OF PROTOTYPE MODEL

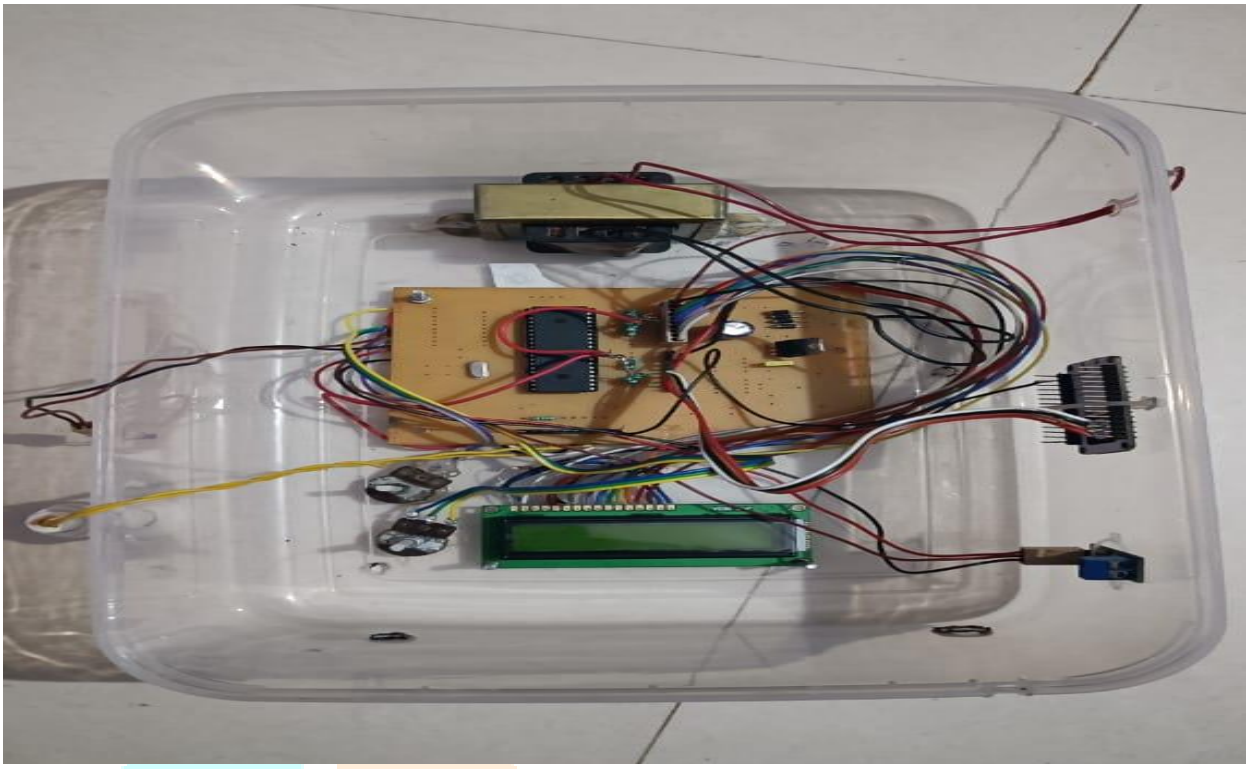


Fig. 5 Working Prototype Model

5.1 Working:

In this project initially we provide the input current of 230 V to the transformer, it covert the input 230 V to 12 V and send to the Capacitor filter. Which contain Capacitors, diode, Voltage Regulator, Bridge Rectifier. In Second It again convert 12V alternating current to 5 V direct current and received by the several components such as PIC18F4550, LCD Display, oil level sensor, node MCU, current sensor and Temperature sensor. For efficiently increase in display brightness and power to the display we use pull up Resistors. The main work is to give information about oil level detection, temperature detection, current detection, and voltage detection. Whenever the oil level decreases in the transformers oil tank it is sense by the oil level sensor which is placed over there and data send to the Micro-Controller. When Heat increases it is sense by the Temperature Sensor and send to the Micro-Controller. Similarly current sensor sense the current and voltage sensor sense the voltage and data send to the Micro-Controller the all Data received in Micro-Controller is get converted from Analog to Digital data by using ADC which is inbuilt in Micro-Controller this all data is get reflected towards LCD Display and Io/T device which is node MCU. There is immediate data reflection on LCD Display and little Time delay reflection in Io/T based Programmed Web page. Which is used to monitor the Transformer

.Advantages And Application

6.1 Advantages:

- This remote monitoring of transformer /generator health over internet system could beused for the real-time data monitoring of transformer or generator.
- This system could be used for real time data monitoring of industrial loads.
- This system could be used for real time data monitoring of domestic load.
- By using this system, the user or supply company can easily check the instant temperature, current or voltage of transformer or generator if they increased their rated parameters then the user can shift the load to another supply source before something occurred.
- This system is more reliable, cheap and compact as compared to the other systems.

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6.2 Applications:

Substations under distribution companies are large in number and so do the distribution transformers, even they are at different geographical areas, thus system introduced can be used inmonitoring all distribution transformers of an area under a substation autonomously.

Distribution companies usually have large number of substations. These substations are situated at remote areas from urban headquarters of utilities. Moreover, these substations are situated at geographically dispersed locations.

VI. CONCLUSION

The proposed technique with results has shown that the protection scheme worksproperly with accuracy, sensitivity of this scheme very high for the abnormal and faulty conditions. Transformer Health Monitoring will help to identify or recognize unexpected situations before any serious failure which leads to greater reliability and significant cost savings. If transformer is in abnormal condition we can know from anywhere. No human power need to monitor the transformer. Details about the transformer are automatically updated in webpage when the transformer is in abnormal condition.

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VIII. REFERENCES

[1] R. a. D. S. Pawar, "Health condition monitoring system for distribution transformer using internet of things (IoT)," in *International Conference On* Computing Methodologies And Communication (Iccmc), 2017.

[2] Techopedia, "techopedia," [Online]. Available: www.techopedia.com/definition/28247/internet-of-things-iot. [Accessed 30 October 2018].

[3] AEMO, "About the industry," [Online]. Available: www.aemo.com.au/about-aemo/about-the-industry. [Accessed 2 March 2019].

[4] M. M. a. S. Ballal, "Online condition monitoring system for substation and service transformer," *IETElectric Power Applications*, vol. 11, no. 7, pp. 1187-1195, 2017.

[5] M. a. S. Wang, "Review of condition assessment of power transformer in service," *IEEE ElectricalInsulation Magazine*, vol. 18, no. 6, pp. 12-25, 2002.