

# IoT Based Transformer Health Monitoring and Protection System

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## ABSTRACT

Transformers are the primary constructing block in a electricity system. Any damages in transformers adversely have an effect on the stability of a electricity system. The damages are specifically taking place because of overloading and inefficient cooling. The major goal of the is actual time tracking of the fitness situations of the distribution transformer the use of IOT generation. The parameters together with temperature, voltage and present day of a transformer are monitored, processed and recorded in servers. For this purpose, we use 3 sensors interfaced with AT328. The recorded facts may be ship the use of Wi-Fi module and accessed from everywhere round the sector the use of IOT generation the use of HTTP protocol. This facilitates in figuring out without human dependency. This facilitates in figuring out and fixing a hassle earlier than a failure without human dependency.

**Keywords:** Battery Energy Storage System, Charging Station, MPPT INC etc.

## 1 Introduction

The distribution transformer immediately affords the low voltage customers with energy supply. Thus, the operating circumstance of the transformer performs an essential function in distribution network. The transformers need to be operated in rated circumstance for his or her lengthy life. This isn't always viable at some point of whole operating periods. Overloading and poor cooling of transformers can purpose sudden failure in transformers that can disturb handing over of strength over many consumers. The guide check-up of upward push in voltage, upward push in ambient temperature, load cutting-edge etc. has a tendency to be greater complicated as incidental parameters can't be accessed. In IOT, interplay among the bodily and virtual worlds the use of sensors and actuators are carried out. A sensor or a community of sensors is used to experience the bodily parameters or the respective environment. These processed sensor output are then ship to the principle server or cloud with the assist of numerous community devices. The records may be accessed over net from everywhere across the world.

### 1.1 IoT

Things have advanced because of the convergence of more than one technologies, real-time analytics, gadget learning, ubiquitous computing, commodity sensors, and embedded structures.[1] Traditional fields of embedded structures, Wi-Fi sensor networks, manage structures, automation (along with domestic and constructing automation), and others all make contributions to permitting the Internet of things. In the purchaser market, IoT era is maximum synonymous with merchandise relating the idea of the "clever domestic", along with gadgets and appliances (inclusive of lights fixtures, thermostats, domestic safety structures and cameras, and different domestic appliances) that aid one or greater not unusual place ecosystems, and may be managed thru gadgets related to that ecosystem, inclusive of smartphones and clever speakers. The IoT also can be utilized in healthcare structures. There are some of extreme issues approximately risks with inside the boom of the IoT, mainly with inside the regions of privateers and safety,



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and therefore enterprise and governmental actions to cope with those issues have started along with the improvement of global standards.

## **1.2 Faults In Transformers**

The primary faults taking place in a transformer are overload, over / beneath neath voltage, temperature rise, oil stage fault etc. The fashionable winding faults in transformer are both earth faults or inter-turns faults. ... The faults on this institution are particularly inter-lamination quick circuit because of insulation failure among center lamination, reducing the oil stage because of oil leakage, blockage of oil go with the drift paths.

**Overload / Overcurrent:** Overload / Overcurrent is the glide of fault present day going on with inside the energy device via the transformer. These situations remaining for a brief length of approximately or much less than 2 seconds as safety relays isolate the energy device.

**Over / Under voltage:** Over voltage outcomes while voltage to frequency ratio exceeds 1.05 pu at complete load and 1.10 pu in the course of no load condition.

**Temperature Rise:** Transformers are normally designed to paintings for twenty-four hours with a mean ambient temperature of three hundred C. Over voltage and over modern reasons an boom of oil temperature which set off failure of insulation of transformer winding.

**Oil stage fault:** Oil found in transformers affords cooling and insulation. Temperature should lessen the oil stage and its discount past a required stage influences cooling and insulation.

## **2 Literature Survey**

In maximum strength companies, for on-line tracking of strength transformers, use supervisory manage and statistics acquisition (SCADA) gadget, however for on-line tracking of strength transformer, the extending the SCADA gadget is a costly proposition. Power transformers are presently monitored manually, in which someone visits a transformer site, for upkeep and taking statistics purpose. But foremost drawbacks of those structures are, it cannot offer statistics approximately overloads (Voltage & Current) and overheating of transformer oil & windings. Due to these, the transformer existence is reduced.

**Monika Agarwal et al. :** This paper represents that they're designing a machine in which there exits conversation among machine and operator. For this we're the usage of Transformer, microcontroller, good judgment degree converter and GSM i.e. worldwide machine for cell conversation modem. This GSM modem allows to display transformer fitness with the aid of using sending message to the machine.

**Hongyan Mao, et al.** This paper represents a huge variety of strength distribution transformer stations and they're some distance far from city, Wi-Fi GPRS transmission offers a very good conversation strategy to supervise strength distribution transformer stations. The scheme of faraway Wi-Fi tracking gadget for strength distribution transformer station primarily based totally on GPRS wireless network became designed on this paper. A manage terminal gadget put in force became in particular given, which followed LPC2132 as principal processor, GR47 because the date conversation module. The screen terminal software program and glide chart have been additionally designed. At last, the manner of configuring the GPRS module to attach community is analyzed.

**Pathak A.K, et al.** This paper represents a layout and implementation of a cell embedded machine to screen and document key parameters of a distribution transformer like load currents, oil stage and ambient Modem, with a standalone unmarried chip microcontroller and one of a kind sensors. It is set up on the distribution transformer web page and the above parameters are recorded the usage of the analog to virtual converter (ADC) of the embedded machine. The received parameters are processed and recorded with

inside the machine memory. If any abnormality or an emergency state of affairs happens the machine sends SMS (quick message service) messages to the cell telephones containing records approximately the abnormality in step with a few predefined commands programmed with inside the microcontroller. This cell machine will assist the transformers to function easily and discover troubles earlier than any catastrophic failure.

### **3 Proposed System**

The proposed task is set obtaining actual time popularity of transformer fitness parameters. Temperature, voltage and contemporary of transformers are monitored and ship over net the stay monitoring of those parameters may be achieved the use of IOT generation from everywhere across the world. This is fee powerful in nature. Thus, the accountable authority can get right of entry to data on any strength failure or maintenance. It includes AT328 board, node MCU, voltage sensor, temperature sensor, contemporary sensor, strength supply, etc. as proven with inside the fig 1. The sensors feel the parameters and ship this to AT328. It approaches it and ship to Wi-Fi module.

It consists of AT328 board, node MCU, voltage sensor, temperature sensor, current sensor, power supply, etc. as shown in the fig 1. The sensors sense the parameters and send this to AT328. It processes it and send to Wi-Fi module.

### **4 Specifications**

Microcontroller ATMEGA328P (AT328P\_PU)

Operating voltage: 5V

Input voltage: 12V

Digital I/O: pins 14

PWM 6 out of 14 digital pins

Max. Current rating 40mA

USB mini

Ana log pins 6

Flash memory 16KB or 32KB

SRAM 1KB OR 2KB

Crystal oscillator 16MHz

#### **4.1 IoT Technology**

IOT is an interconnection of many bodily gadgets via way of means of the usage of internet. The controlling and tracking of any bodily gadgets or parameters are viable with the assist of IOT technology.

#### **4.2 Thingspeak/Thingsboard**

It is an open supply net of factors applications. This affords with a few apps that permit analyzing and visualizing the information ship via way of means of Wi-Fi module. There is a Thing Speak channel provided. These channels keep the information. The channel affords provision for sending, processing and having access to the information while needed. The grasp tool Node MCU sends the information the usage of HTTP protocol.

#### **4.3 Advantages**

- Detect of the faults in actual time primarily based totally on current, voltage, temperature and inner flux.
- Increase gadget reliability and balance via way of means of the tracking gadget.

- The gadget prevents faults and losses of the energy deliver which extensively advantages software consumers
- Overcurrent, over temperature is avoided the usage of this technique.

#### 4.4 Application

- Distribution transformer monitoring
- Smart Grid Power
- Transformer Monitoring

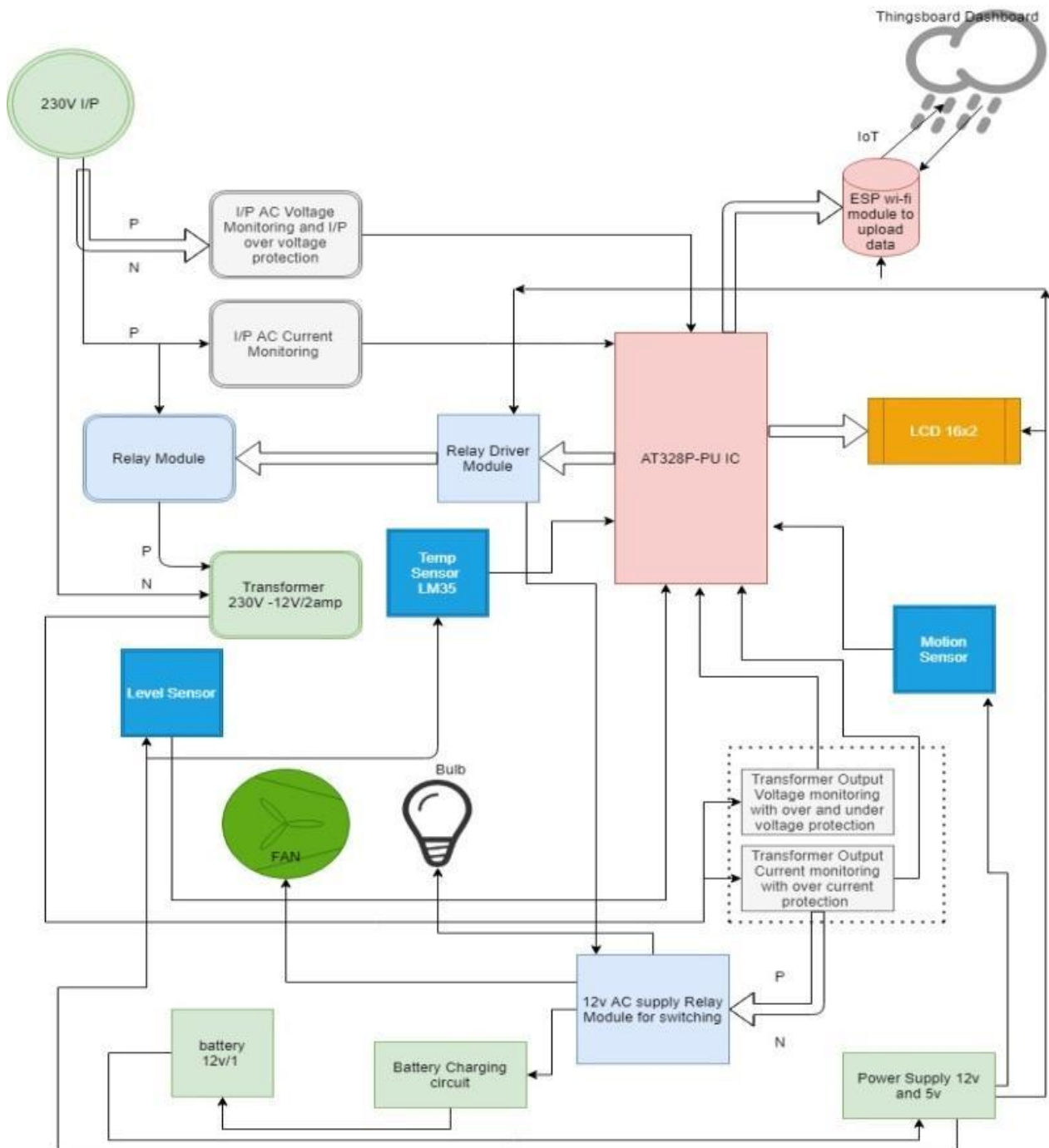


Figure 1. Block diagram of proposed system

## 5 Future Scope

In destiny paintings we will increase database of all parameters of distribution transformer that are located at distinctive places. We can get all records via way of means of setting the proposed machine modules at each transformer. We can ship the records thru Wi-Fi module and additionally thru Ethernet defend. With Ethernet defend we will make far off terminal unit as a server and shop records on website or website. A Wi-Fi module connects to close by community and sends records to tracking node.

### 5.1 Result and Observation

The machine including AT328 and sensors senses the transformer fitness parameters. The information are accrued and a node MCQ unit communicates with Thing Speak. The acquired actual time information is processed with the aid of using it. This information is ship the usage of HTTP protocol. The accessed readings may be visualized in Thing Speak platform.

## 6 Conclusion

The transformers play a critical position in distribution a part of strength device. Therefore, the tracking and safety of transformer may be very crucial. This device introduces a brand new and progressed technique of transformer fitness parameter tracking the use of IOT. The sensors integrated with inside the device accumulate the statistics of transformer fitness parameters including voltage, temperature and current. These statistics are ship to an IOT platform, Thing Speak the use of. These statistics may be dispatched and accessed the use of HTTP protocol. Thus, the actual time statistics collection, garage and tracking of the transformer fitness parameters are feasible with the device.

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