# TRANSFORMER HEALTHCARE MONITORING AND CONTROLLING SYSTEM

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## ABSTRACT

*Transformers are a vital part of the transmission and distribution system. Monitoring transformers for problems before they occur can prevent faults that are costly to repair and result in a loss of service. Current systems can provide information about the state of a transformer, but are either offline or very expensive to implement. Transformers being the essential part of power transmission system are expensive, as is the cost of power interruptions. Because of the cost of scheduled and unscheduled maintenance, especially at remote sites, the utility industry has begun investing in instrumentation and monitoring of transformer. On-line transformer diagnostic using conventional technologies like carrier power line communication, Radio frequency based control system, and supervisory control and data acquiring system, Distributed control system and Internet based communication are having their own limitation. GSM is transmitting voice and data services.*

*This Project objective is to develop low cost solution for monitoring and controlling of remotely located transformer using GSM technology to failure of transformer and increasing reliability of services to the consumer. A hardware design is developed to acquire data from electrical sensing system. It consist of a sensing system , signal conditioning electronic circuit, advanced hardware for middle computing, a powerful computer network for further transmitting data various places. Any change in Parameter of Transmission is sensed to protect the entire transmission and distribution. This model developed is tested at laboratory for measuring various parameters like over load, over temperature, voltage fluctuation, oil level etc.*

**Keyword :** - *Transformer1, Microcontroller2, GSM3, and Sensor4 etc ….*

## 1. INTRODUCTION

A monitoring system can only monitor the operation state or guard against steal the power, and is not able to monitor all require data of transformer to reduce costs. The parameters if the increase in temperature rises higher than the desirable temperature, the monitoring system will protect the transformer by problems. According to the above requirements, we need a transformer real time monitoring system to detect all operating parameters operation, and send to the monitoring centre in time. It leads to online monitoring of key operational parameters of transformer which can provide useful information about the health of transformer which will help the utilizes to optimally use their transformers and keep the asset in operation for a longer period. This will help to identify problems before any serious failure which leads to a significant cost saving and greater reliability.

## 2. TRANSFORMER FAULT ANALYSIS

A power transformer consists of a set of windings around a magnetic core. The windings are insulated from each other and the core. Operational stresses can cause failure of the transformer winding, insulation, and core. The power transformer windings and magnetic core are subject to a number of different forces during operation

1. Expansion and contraction caused by thermal cycling
2. Vibration caused by flux in the core changing direction
3. Localized heating caused by eddy currents in parts of the winding, induced by magnetic flux

4. Impact forces caused by fault currents.
5. Thermal heating caused by overloading.

### 2.1 Over Load

Over current is the current flowing through the transformer resulting from faults on the power system. Fault currents that do not include ground are generally in excess of four times full-load current; fault currents that include ground can be below the full- load current depending on the system grounding method. Over current conditions are typically short in duration (less than two seconds) because protection relays usually operate to isolate the faults from the power system. Overload, by contrast, is current drawn by load, a load current in excess of the transformer name- plate rating. In summary, loading large power transformers beyond nameplate ratings can result in reduced dielectric integrity, thermal runaway condition (extreme case) of the contacts of the tap changer, and reduced mechanical strength in insulation of conductors and the transformer structure. Three factors, namely water, oxygen, and heat, determine the insulation life of a trans- former. Filters and other oil preservation systems control the water and oxygen content in the insulation, but heat is essentially a function of the ambient temperature and the load current. Current increases the hottest-spot temperature (and the oil temperature), and thereby decreases the insulation life span.

### 2.2 Over Temperature

Excessive load current alone may not result in damage to the transformer if the absolute temperature of the windings and transformer oil remains within specified limits. Transformer ratings are based on a 24-hour average ambient temperature of 30°C (86°F). Due to over voltage and over current, temp. of oil increases which causes failure of insulation of transformer winding.

### 2.3 Over Excitation

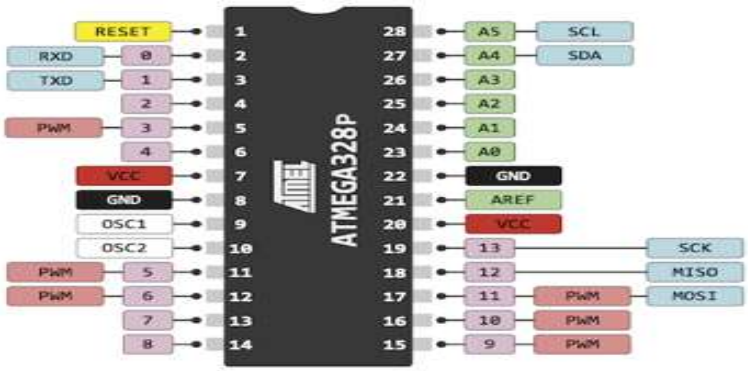
The flux in the transformer core is directly proportional to the applied voltage and inversely proportional to the frequency. Over excitation can occur when the per-unit ratio of voltage to frequency (Volts/Hz) exceeds 1.05 p.u. at full load and 1.10 p.u. at no load. An increase in transformer terminal voltage or a decrease in frequency will result in an increase in the flux. Over excitation results in excess flux, which causes transformer heating and increases exciting current, noise, and vibration.

### 2.4 Oil Level Fault

Oil mainly used in transformer for two purposes one is for cooling of transformer and another use is for insulation purpose. When temperature of transformer goes high, oil level in trans- former tank decreases due to heating effect. For normal operation of transformer oil level should maintain at required level. If oil level decreases beyond required level, it affect cooling and insulation of the transformer.

## 3. DISCRIPTION

### 3.1 Microcontroller



The Atmega328 is a very popular microcontroller chip produced by Atmel. It is an 8-bit microcontroller that has 32K of flash memory, 1K of EEPROM, and 2K of internal SRAM.

**3.2 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.

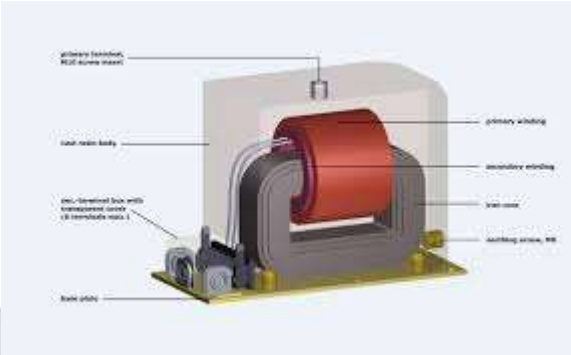
**3.3 GSM Modem**


This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

**3.3 CURRENT TRANSFORMER**

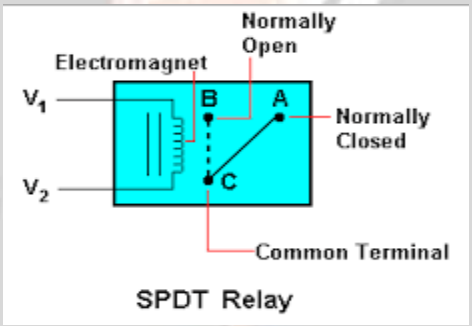
A current transformer is an instrument transformer, used along with measuring or protective devices, in which the secondary current is proportional to the primary current (under normal conditions of operation) and differs from it by an angle that is approximately zero.

**3.4 POTENTIAL TRANSFORMER**



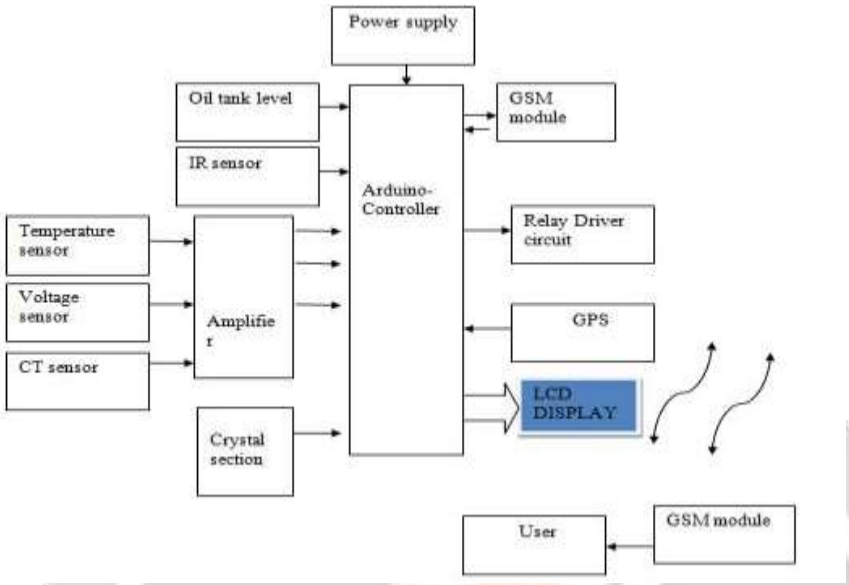
Voltage transformers (VT), also called potential transformers (PT), are a parallel connected type of instrument transformer. They are designed to present negligible load to the supply being measured and have an accurate voltage ratio and phase relationship to enable accurate secondary connected metering.

**3.5 RELAY CIRCUIT**




The Single Pole Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit "receives" current, the other one doesn't and when the coil gets energised the opposite is happening.

## 4.BLOCK DIGRAM




## 5. RESULT

In these system in abnormal condition ,At these time to monitoring the proper parameter and on the relay circuit by using various sensor .The various signal send microcontroller to GSM.

## 6. CONCLUSION

In these system we monitoring various parameter and protect the transformer at abnormal condition.

## 7. REFERENCES

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