International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 02 | Feb 2019 www.irjet.net p-ISSN: 2395-0072

Transformer Wireless Inspection and Regulation

Miss. Ashiwini A. Patil[1], Miss. Urmila B. Patil[2], Miss. Sarita S. Shelake[3], Prof. G.R. Desai[4]

At – post-Shimpe, Tal-shahuwadi, Dist-Kolhapur Pin-416214
At -Chafodi, Post -Savarde, Tal-Karveer, Dist- Kolhapur Pin 416001
Dept of Electronic and Telecommunication Engineering, Sanjeevan Engineering and Technology Institute, Panhala

---

Abstract:- *Distribution transformer is an important component of an electricity distribution system. The distribution transformer distributes electrical energy to low voltage users directly. This project presents monitoring system of distribution transformer. Which is an embedded system used to monitor and regulate different parameters that directly affects transformer. Different sensors are used for monitoring current, voltage and temperature. According to the interpretation of these sensors microcontroller takes action to maintain constant operating conditions of transformers. Proposed system is low cost and easy to use capable of monitoring and displaying data using MATLAB.*

Key Words: Transformer, sensors, microcontroller, RF Module, MATLAB.

1. INTRODUCTION

Transformers are vital part of electrical distribution system. Monitoring of transformers is necessary to avoid transformer failure. In India during summer transformer failure rate increases, overloading and overheating are the main reasons of transformer failure. Reliability and life of transformer units depends on monitoring of functional parameters. Since Distribution transformers are directly connected to load therefore sudden variations in loads also causes fault occurrence. The present method of monitoring is manual which are time consuming and requires lot of labour work, which does not gives current value of some parameters such as overload current and overheating of transformer. This can reduce transformer life. This paper deals with wireless monitoring system that protects transformer from failure.

2. Objective

Distribution transformer is an important component of an electricity distribution system. The distribution transformer distributes electrical energy to low voltage users directly. This project presents monitoring system of distribution transformer. Which is an embedded system used to monitor and regulate different parameters that directly affects transformer. Different sensors are used for monitoring current, voltage and temperature. According to the interpretation of these sensors microcontroller takes action to maintain constant operating conditions of transformers. Proposed system is low cost and easy to use capable of monitoring and displaying data using MATLAB.Reliability and life of transformer units depends on monitoring of functional parameters.

3. Problem Definition:

In India during summer transformer failure rate increases, overloading and overheating are the main reasons of transformer failure. Reliability and life of transformer units depends on monitoring of functional parameters. Since Distribution transformers are directly connected to load therefore sudden variations in loads also causes fault occurrence. The present method of monitoring is manual which are time consuming and requires lot of labour work, which does not gives current value of some parameters such as overload current and overheating of transformer.

Relevance:

In this system is based on microcontroller that monitors the voltage, current and temperature of a distribution transformer. These monitored parameters of distribution transformer will be display on pc using matlab Simulink which is high performance language and combines computation, visualization and programming at one platform. Monitored parameters are compared with the rated values of the transformer and microcontroller is programmed in such a way when the monitored values exceed the rated values it takes immediate action and displays the value on pc. The microcontroller is programmed in such a manner so as to continuously scan the transformer and update the parameters values at a exact time interval. In which various sensors are used for monitoring of parameters of transformer.

4. Proposed system:

Initially the idea of this project is to monitor and control the parameters of transformer the idea of this project is to reduce transformer failure such as overload current, increased temperature and overheating of transformer. This prototype transformer monitoring and controlling system is built by combining four sensor, microcontroller system and wireless control system using RF Module also used as ADC Converter.

5. REVIEW OF LITERACTURE SURVEY-

Survey of The Possible Development Approaches: Distribution transformer is an important component of an electricity distribution system. The distribution transformer distributes electrical energy to low voltage users directly. This project presents monitoring system of distribution transformer. Which is an embedded system used to monitor and regulate different parameters that directly affects transformer. Different sensors are used for monitoring current, voltage and temperature.

Literature review:

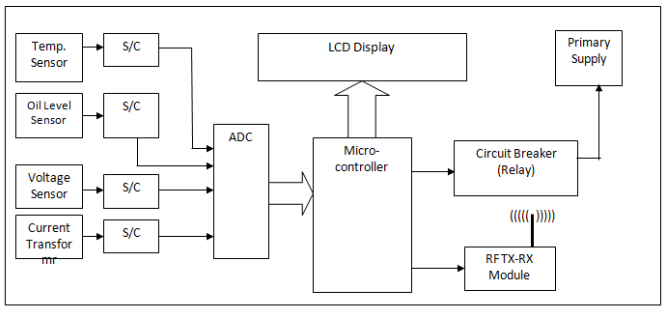
[1] Sashank Shekhar Somvanshi & DR. Deependra Pandey

"A simulink based system to monitor parameters of transformer". The environment condition specific to substation (high electromagnetic field special for load switching on and switching off, voltage level, a multitude of protection, signaling, control and measuring equipment and circuits),are the enemy of any transformer. This cannot be eliminated but we can control some condition.

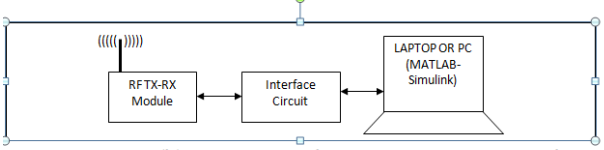
[2] Ms. V. A. Patil, Ms. Namrata S. Kumbhar, Ms. Shital S. Patil,

"Transformer health monitoring and controlling with Gsm based system".Reguler monitoring health condition transformer not only is economical also adds to increase reliability. The GSM based monitoring of distribution transformer is useful as compared to manual monitoring & also reliable.

6. Block Diagram:



(a) Distribution Transformer Site



(b) Power Distribution Company Control-room

Working:

The proposed system is based on microcontroller that monitors the voltage, current and temperature of a distribution transformer. These monitored parameters of distribution transformer will be display on pc using matlab Simulink which is high performance language and combines computation, visualization and programming at one platform. Monitored parameters are compared with the rated values of the transformer and microcontroller is programmed in such a way when the monitored values exceed the rated values it takes immediate action and displays the value on pc. The microcontroller is programmed in such a manner so as to continuously scan the transformer and update the parameters values at a particular time interval**.** In the block diagram of proposed system for monitoring of transformer parameters. In which various sensors are used for monitoring of parameters of transformer. The parameters such as voltage, current and temperature of transformers are sensed by sensors, such as voltage sensor, current sensor & temperature sensor respectively. Voltage and current from transformer are step down and rectified by voltage transformer and current transformer. Temperature of atmosphere and oil are sensed by temperature sensor LM 35. These values are given as inputs to Microcontroller accordingly microcontroller takes desired action. If voltage and current values are increased beyond rated values (overloading) microcontroller will switch off power supply of distribution transformer. If temperature of transformer increases beyond rated values (overheating) microcontroller will switch on cooling fan, which shown in flowchart. The microcontroller is programmed in such a manner so as to continuously scan the transformer and update the parameters at a exact time interval.

5V Power supply using LM7805 voltage regulator with Design:

In most of our electronic products or projects we need a power supply for converting mains AC voltage to a regulated DC voltage. For making a power supply designing f each and every component is essential. Here we are going to discuss the designing of regulated 5v power supply.

7. Component List:

- Step down transformer
- Voltage Regulator
- Capacitor
- Diodes

Let's get into details of rating of the devices:

Voltage Regulator:

As we require a 5v we need LM7805 Voltage Regulator IC.

7805 IC Ratings:

- Input Voltage range 7v- 35v

- Current Rating Ic=1A
- Output Voltage range Vmax= 5.2v Vmin= 4.8v

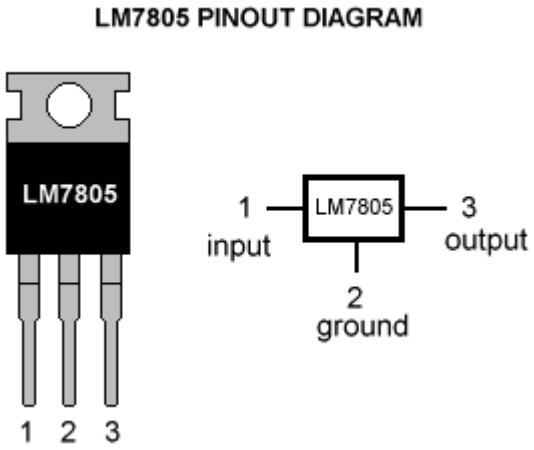


Fig. LM7805

LM7805- Pin Diagram

Transformer:

Selecting a suitable transformer is of great importance. The current rating and the secondary voltage of transformer is a crucial factor.

- The current rating of the transformer depends upon the current required for the load to be driven.
- The input voltage to the 7805 IC should be at least 2V greater than the required 2V output, therefore it requires an input voltage at least close to 7V.
- So I choose a 9-0-9 transformer with current rating 750mA (Since $6*\sqrt{2}$ =8.4V)

Rectifying Circuit:

The best is using a half wave rectifier

- It's advantage is DC saturation is less as in both cycles diodes conduct.
- Higher Transformer Utilization Factor (TUF)
- 1N4007 Diodes are used as it is capable of withstanding a higher reverse voltage of 1000V whereas 1N4001 is 50V.

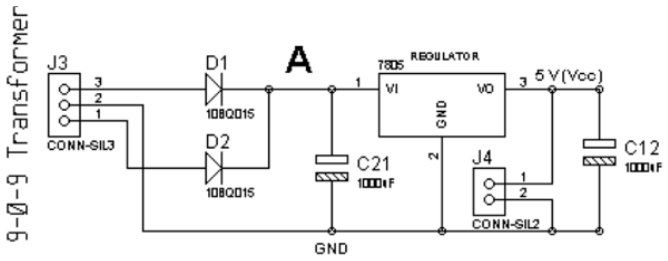
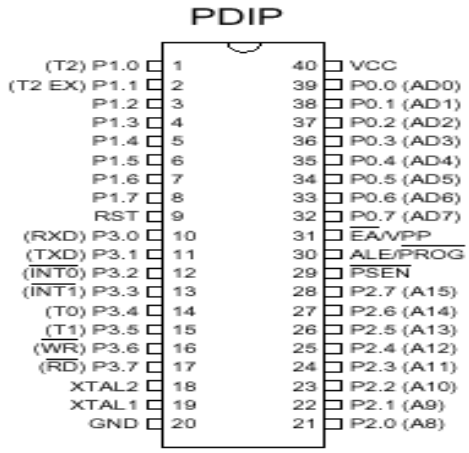


Fig 4.3: Half Wave Rectifier

8. COMPONENT DESCRIPTION

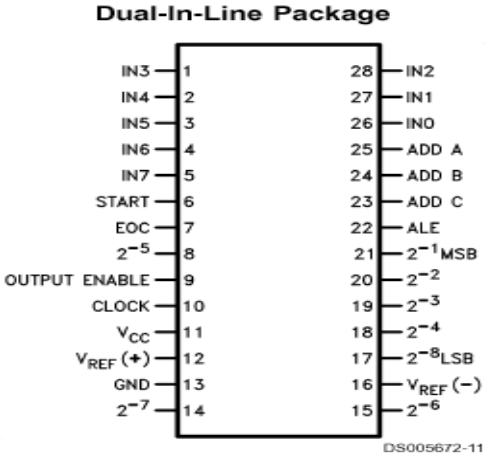
1. Microcontroller 89c52

The AT89c52 is low power, high performance CMOS 8-bit microcomputer with 8k bytes of flash programmable & erasable read only memory. These device manufactured using Atmel high density non volatile memory technology & is compatible



2. ADC 0808

This device eliminates the need for external zero & full-scale adjustment .Easy to interfacing to microprocessor is provided by the latched & decoded multiplexer address inputs & latched TTL TRI-STATE outputs.



3. Voltage sensor

It is used to measure voltage in electrical power system. When voltage is too large to be conveniently used by an instrument it can be scaled downed to standardized low value. A voltage sensor is a device which detects the voltage in a wire, and generates signal proportional to it. The generated signal could be analog voltage or current or even digital output. It can be then utilized to display the measured voltage in a voltmeter or can be stored for further analysis.

4. **Current sensor**

Current sensor provides economical and precise solution for current sensing in industrial, commercial and communication systems. Typical applications include motor control, load detection and management, over-current fault detection and any intelligent power management system etc. A current sensor is a device that detects electric current in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output. It can be then utilized to display the measured current in an ammeter.

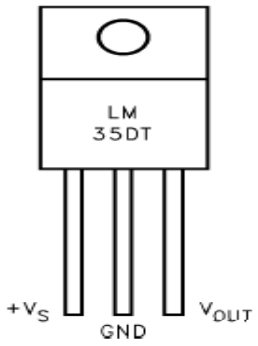
Ring Core CT's:

- Capacity: There are available for measuring currents from 50 to 5000 amps

- Size: with windows (power conductor opening size) from 1″ to 8″ diameter.

5. Temperature sensor

Temperature Sensors measure the amount of heat energy or even coldness that is generated by an object or system, allowing us to "sense" or detect any physical change to that temperature producing either an analogue or digital output. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1/4°C at room temperature and ±3/4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies.



6. Oil Level Sensor

The oil level is monitoring the engine oil level, the engine oil level symbol light red to indicate oil pressure to low or yellow to indicate oil level too low.

7. RF Tx-Rx Module

It is transreceiver module which provides easy to use RF communication at 2.4GHz. It can be used to transmit & receive data at 9600 baud rates from any standard CMOS /TTL source. It works in half duplex mode.

9. ADVANTAGES

- Easy to monitor and control transformer parameter.
- Time and money save.
- Reduce labour work.
- Reduce transformer failure.
- Maintain constant operaing conditions of transformer.

10. CONCLUSION

In this project, the distribution transformer key parameters like voltage, current, oil level and temperature are monitored using Microcontroller. Monitored parameters are transferred from the Microcontroller to the PC using wireless technology. The environment conditions can affect normal operation of transformer. These cannot be eliminated but we can control some condition. This project does not provide the overall solution for transformer failure but it can control some major parameter so that it can be a good solution for transformer protection.

REFERENCES

1. Sashank Shekhar Somvanshi & DR. Deependra Pandey, "A simulink based system to monitor parameters of transformer",(IJIRSET), Vol.6, Special issue 9, May 2017.

2. Ms. V. A. Patil, Ms. Namrata S. Kumbhar, Ms. Shital S. Patil, "Transformer health monitoring and controlling with Gsm based system", International research journal of engineering and technology (IRJET), e-ISSN: 2395-0056, p-ISSN: 2395-0072, Volume.04, Issue: 03, March2017.

3. Vadirajacharya. K, Ashish Kharche, Harish Kulkarni, Vivek Landage, "Transformer health condition monitoring through gsm technology", International journal of scientific and engineering research, Vol.3 ,Issue:12,Dec-2012.

4. DR. J. Jaykumar, J. Hephjiba Jose Queen, Thanu James, G. Hemlata, Neetu lonappan, "Distribution transformer monitoring using gprs", International journal of scientific and engineering research, ISSN 2229-5518, Vol.4, Issue 6,June 2013.

5. M. Banupriya, R. Punitha, B. Vijayalakshmi & C. Ramkumar "Power transmission monitoring system using zigbee", Global Journal of researches in electrical and electronic engineering, Vol.13, Issue 16,Version1.0, Year 2013.

6. Pathak A. K, Kolhe A. N, Gagare J. T, Khemnar S. M "Gsm based distribution transformer monitoring and controlling", IJARITE- ISSN(0)-2395-4396, Vol.2, Issue 2, 2016.

7. MRS. S. Sivarajani, S. Lokesh, M. Vignesh, N. Vijayragavan, S. Goutham, " IOT based distribution transformer monitoring system", (IJCTER) e-ISSN 2455-1392, Vol.3, Issue 3,March 2017.