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Transformer Monitoring and Control Using Iot

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Abstract :Distribution Transformers Is One Of The Most Important Element Of Electrical Power System.Transformer Is A Device Which Is Continuously Working In Order To Improve The Efficiency Of The Transmission System.The Present Paper Proposes Continuous Online Monitoring Of Distribution Transformer Using IOT(Internet Of Things). The Internet Of Things Connects The Unconnected Things.Previously The Things That Weren't Accessible Have Been Made Accessible Because Of It.The Transformer Is Subjected To Various Faults Such As Over-Voltage,Over-Current,Increase In Temperature,Oil-Level,Humidity Etc.All These Faults Are Persistently Monitored Throughout By The Arduino Which Regularly Sends The Health Information Of The Transformer Via The Wifi Module.This Data Can Be Accessed From Anywhere In The World By A Android Application.So The Maintainence Of The Distribution Transformer Can Be Successfully Implemented By The Use Of This Project Ideology.
Keywords *- Online Monitoring Distribution Transformers, Arduino, IOT,Android Application,.*

I. Introduction

The Life Of Distribution Transformer Can Be Significantally Increased By Operating It At A Rated Suitable Condition As Per Specification.However If Overloaded Their Life Is Essentially Decreased Because Of Unexpected Failures And Loss Of Supply To A Great Number Of Customers. The Main Reason For Failure In Distribution Transformers Is Over Loading And Non Efficient Cooling.

Supervisory Control And Data Acquisition(SCADA) Is Being Used By Many Power Companies For Web Based Monitoring Of Power Transformers However Amplifying The SCADA System For Online Monitoring Of Distribution Transformers Is A Costly Implementation

1) Distribution Transformers Are Monitored Physically Where A Man Visits The Transformer Site And Analyses The Parameters.Incidental Overload And Overheating Of Transformer Oil And Windings If Not Monitored Properly These Parameters Can Decrease The Transformer Life Which Is Unachievable By The Current Operation System.
2) A Single Transformer Parameter Is Generally Detected By A Normal Transformer Eg; Control Current Voltage While Some Ways Could Recognize Multiparameter, It Takes Too Long For The Parameter Operation And Testing Pace Is Dull.
3) A Monitoring System Is Not Able To Monitor All Useful Data Of Distribution Transformer To Reduce Costs, But Can Only Monitor The Operating State.
4) Auspicious Detection Data Will Not Be Sent To Observing Centers In Time Which Cannot Judge Distribution Transformer Three Phase Equilibrium
5) Detection System Is Not Reliable. The Main Principle Execution Is The Devoice Itself Instability, Poor Anti Jamming Capability, Low Measurement Accuracy Of Data.

In [1] Has Done Research Using GSM Technology Which Is Not Reliable,Cheap And Compact As Compared To The Proposed Methodology.In [2] States An Innovative Design To Develop A System Which Is Based On AVR Microcontroller That Is Used For Logging The Voltage, Current And Temperature Of A Power Transformer In A Substation And To Protect The System From Any Uncertainty Conditions.In Et Al [3] M. V. Ramesh This Design Incorporates Effective Solutions For Problems Faced By India˝S Electricity Distribution System Such As Power Theft And Transmission Line Faultand Various Other Faults.In [4] Stated Above Right Away Monitoring Of Distribution Transformer By The Use Of Internet.In [5] Helps To Understand Various Transformer Faults And The Parameters Affecting It.

The Growth Of The Incipient Faults And Other Faults Can Be Kept In Check Instantaneously.So Which Will Help The Utilities To Optimally Use Their Transformers And Keep Them In Operation In Longer Period. This Will Also Identify Problems Before Any Catastrophic Failure, Which Can Result In A Significant Cost Savings And Greater Reliability.

II. Methodology

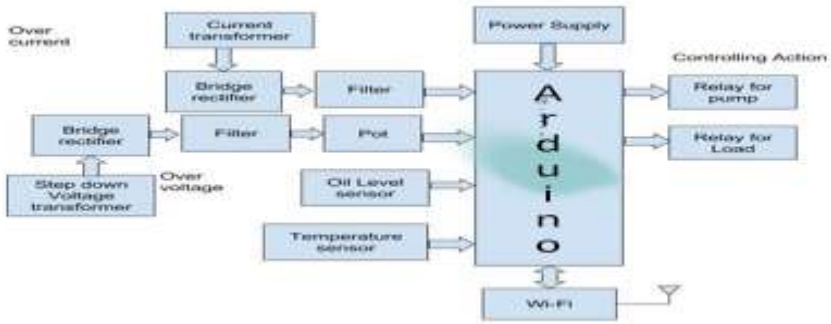
For This Proposed Real-Time Framework We Take A Voltage Transformer , A Current Transformer And A LM35 Temperature Sensor For Monitoring Voltage,Current,Temperature,Respectively Data Of The Transformer And Then Send Them To A Desired Location Anywhere In The World. These Three Analog Values Are Taken In Multiplexing Mode Connected To A Programmable Microcontroller Arduino. Then The Values Are Then Sent Directly Through An 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/Mobile For Display .The Real Time Data Is Also Seen At The Sending End Upon A Android App Interfaced To The Microcontroller.

The Supply Of Power Is Given Through Step Down Transformer 230/12V, Which Steps Down The Voltage To 12V AC. This Is Converted To DC Using A Bridge Rectifier And It Is Then Regulated To +5V Using A Voltage Regulator 7805 Which Is Required For The Operation Of The Arduino , 3.3 Volt For The Wi-Fi Unit And Other Component.

1. **Over Voltage Protection :** Over Voltage Is Generated Using Pot, That Input Is Monitored By Microcontroller And Regarding Operation Is Taken.
2. **Over Current :** Whenever The The Overcurrent Condition Is Observed The Relay Goes Off, Overcurrent Is Detected Using Current Transformer.
3. **Fault In The Oil Level** Can Be Monitored As Follows,

- The Float Level Sensor Is Used To Detect The Oil Level In The Tank.
- When Low Is Detected By The Microcontroller And Using The Data The Microcontroller Starts The Relay And Fills The Tank Automatically

4. **Temperature Rise Fault** Can Be Detected Using LM35 Same Can Be Sent To The Microcontroller. Thus Can Be Determined Using The Microcontroller And The Fan Can Be Operated Using The Relay According To Temperature Sensor Input.
5. All This Can Be Monitored Using Android Phone Which Is Connected Via Wifi Module To The Microcontroller.
6. If Overvoltage And Overcurrent Happens Then Microcontroller Will Send An Alert Message To An Android App. And The Android App User Will Get The Alert Message In Text.
7.



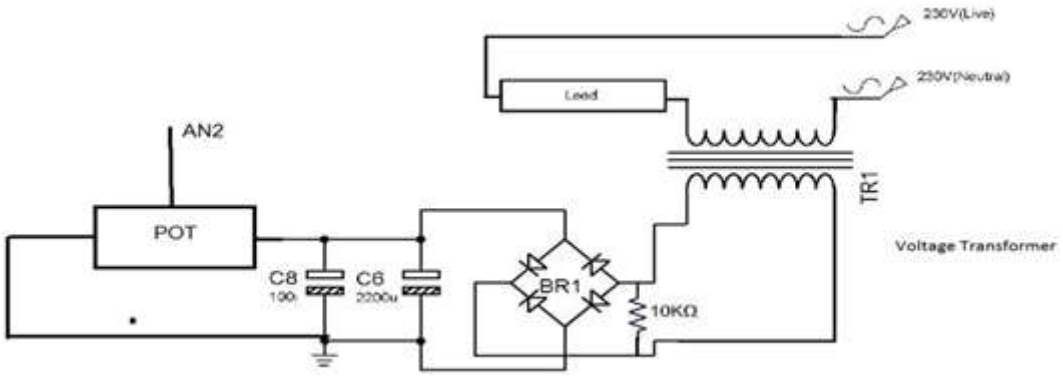
Transformer Monitoring Controlling Using IOT

III. Why We Need IOT Based Monitoring

- No Wires Involved In The Proposed System. Hence We Can Avoid Power And Data Loss.
- It Can Able To Detect The Faults Due To Over Current, Over Voltage, Increased Temperature At Real Time.
- Monitoring Multiple Transformers Sitting In An Office Is Possible.
- Prefault Condition Is Easily Detected And Cleared At Same Time To Avoid System Failure. Fault Monitoring Requires Less Time Also Use Of Wifi Gives Most Accurate ,Fast Response.
- This Type Of Monitoring Protects Transformer And Overall System So System Reliability And Stability Increases.
- This Type Of Monitoring Provide Significant Benefits For Utility Consumers As Ideal Power Supply Can Be Possible Which Is Free From Fault And Losses.
- Overcurrent,Overvoltage,Overtemperature These Main Faults Are Prevented Using This Technique .

IV. Components

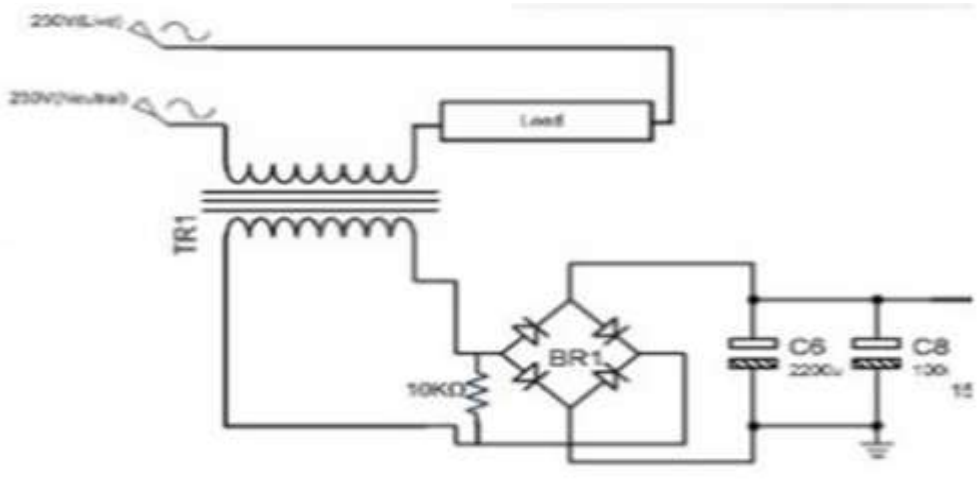
Voltage Sensing



Above Figure Consist Of Input Supply Of 230V. As Arduino Can Operate Up To Or Less Than 5V. Therefore, Stepdown Transformer Is Used To Stepdown Supply From 230V To 5V .Rectifier Is Used To Rectify 5V AC To 5V DC . Voltage Regulator Is Used To Obtain Regulated 5V DC Supply. So That The Arduino Can Read The Input Side Of Main Transformer .

Current Sensing

Above Figure Consist Of Stepdown Transformer Which Is Used To Stepdown Supply From 230V To 5V .Rectifier Is Used To Rectify 5V AC To 5V DC . Voltage Regulator Is Used To Obtain Regulated 5V DC Supply. So That The Arduino Can Read The Input Side Of Main Transformer



Microcontroller Interfacing With Power Supply

The Input Signals From Voltage Sensing And Current Sensing Circuits Are Sent To The Arduino Uno At Analog Input Pins 1 And 2. It Is A 16 Bit Microcontroller [4]. This Microcontroller Contains Inbuilt ADC (Analog To Digital Converter). The Input From Voltage And Current Sensing Circuit Are Fed In Analog Values And Are Converted To Digital Value Using ADC.

Relay

A Relay Is An Electrical Switch That Uses An Electromagnet To Move The Switch From The Off To On Position Instead Of A Person Moving The Switch. It Takes A Relatively Small Amount Of Power To Turn On A Relay But The Relay Can Control Something That Draws Much More Power. A Relay Is Used To Control The Air Conditioner In Your Home. The AC Unit Probably Runs Off Of 220VAC At Around 30A. That's 6600 Watts. The Coil That Controls The Relay May Only Need A Few Watts To Pull The Contacts Together.

Rectifier

A Rectifier Circuit Is Made Up Of Diodes Connected In Such Way That It Converts AC Input Signal To DC Output Signal. Rectifier Circuits Are Of Two Types Namely Half Wave Rectifier And Full Wave Rectifier Depending Upon DC Signal Generated.

V. Conclusion:

An IOT Based Transformer Monitoring System For Power Transformer Has Been Designed, Implemented And Tested. It Is Quite Useful As Compared To Manual Monitoring And Also It Is Reliable As It Is Not Possible To Monitor The Oil-Level,Oil Temperature Rise,Ambient Temperature Rise,Load Current Manually Always.

An Android Application That Is Linked With The Arduino With The Help Of Wifi Can Be Installed To This

System To Timely Receive And Store Transformer Parameters Information About All The Power Transformers And Prepare A Database. After Receiving Message On Any Abnormality We Can Take Immediate Action To Prevent Any Catastrophic Failures Of Power Transformers. We Need Not Have To Check All Power Transformers And Corresponding Phase Currents And Voltages And Thus We Can Recover The System In Less Time And Faults Before Any Uncertain Failures Thus Resulting In Significant Cost Saving As Well As Improving System Reliability.

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