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Transformer Monitoring System Using GSM Module

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Abstract: The aim of the project work is to protect the distribution transformer or any other power transformer, burning due to the overload. Normally most of the transformers are burning because of over load; hence by incorporating monitoring and control circuits, life of the transformer can be increased. In this project we designed a system in such a way that it will monitor the load of the transformer continuously and that information is transferred to the smart phone. These parameters are displayed on the phone. In the display unit we can view the continuous information of transformer i.e. due to what reason the transformer has failed, when the power is restored etc.,. With the help of this kind of system, the maintenance staff of the department can have a continuous vigilance over the transformer.

Keywords: Transformer, GSM.

I.INTRODUCTION

In power systems, distribution transformer is electrical equipment which distributes power to the low-voltage users directly, and its operation condition is an important component of the entire distribution network operation. Operation of distribution transformer under rated condition (as per specification in their nameplate) guarantees their long life. However, their life is significantly reduced if they are subjected to overloading, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability. Overloading and ineffective cooling of transformers are the major causes of failure in distribution transformers [2]-[4]. The monitoring devices or systems which are presently used for monitoring distribution transformer have some problems and deficiencies. Few of them are mentioned below.

(1) Ordinary transformer measurement system generally detects a single transformer parameter, such as power, current, voltage, and phase. While some ways could detect multi-parameter, the time of acquisition and operation parameters is too long, and testing speed is not fast enough.

(2) Detection system itself is not reliable. The main performance is the device itself instability, poor anti-jamming capability, low measurement accuracy of the data, or even state monitoring system should is no effect.

(3) Timely detection data will not be sent to monitoring centres in time, which cannot judge distribution transformers three-phase equilibrium.

(4) A monitoring system can only monitor the operation state or guard against steal the power, and is not able to monitor all useful data of distribution transformers to reduce costs.

(5) Many monitoring systems use power carrier communication to send data, but the power carrier communication has some disadvantages: serious frequency interference, with the increase in distance the signal attenuation serious, load changes brought about large electrical noise. So if use power carrier communication to send data, the real-time data transmission, reliability cannot be guaranteed.

According to the above requirements, we need a distribution 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 distribution transformers which can provide useful information about the health of transformers which will help the utilities 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 savings and greater reliability. Widespread use of mobile networks and GSM devices such GSM modems and their decreasing costs have made them an attractive option not only for voice media but for other wide area network applications.

II. EXISTING METHODOLOGY

- For decades, fuse, circuit breakers and electromechanical relays were used for the protection of power systems. But they have proved to be unreliable.
- Commercially, transformers are currently monitored manually where a person periodically visits a transformer site for maintenance and records parameter of importance.
- This type of monitoring cannot provide information about occasional overloads and overheating of

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transformer oil and windings. All these factors can significantly reduce transformer life.

Fig1.Lines men is trying to measure the various parameters of the transformer.

III.VOLTAGE SENSING

- An auto transformer is used to simulate a distribution transformer. The output voltage range of the said transformer is between 0-260V.
- A step down transformer of 12-0-12V rating is used who's output varies with supply input and maximum of around 14V was observed.
- The input ac voltage is rectified using bridge rectifier
- The rectified output is the limited to the voltage which is permissible as input to the microcontroller.
- The setup is made in such a way that with change in the voltage from auto transformer, the output of the sensing circuit changes proportionally.
- The output is given to an A/D pin of the PIC microcontroller.
- The controller is so coded that if there is a nearly zero input, an error message will display on the LCD.

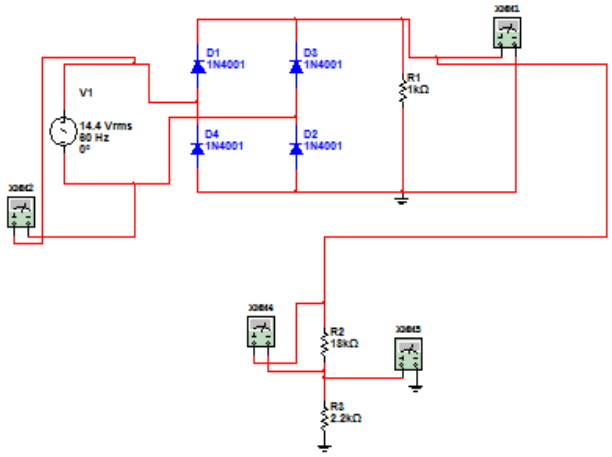

Fig2.Voltage Sensing Circuit

IV.TEMPERATURE SENSING

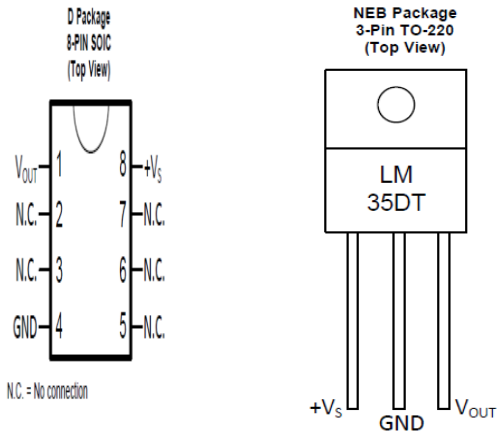

Fig3. Pin configuration and Package of LM 35

- The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature.
- The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling.
- The low output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy.
- The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range.
- The output of the temperature sensor is given to the microcontroller and the microcontroller is programmed in such a way that whenever the temperature increases above the threshold, the gsm module sends a text message to the concerned linesman.

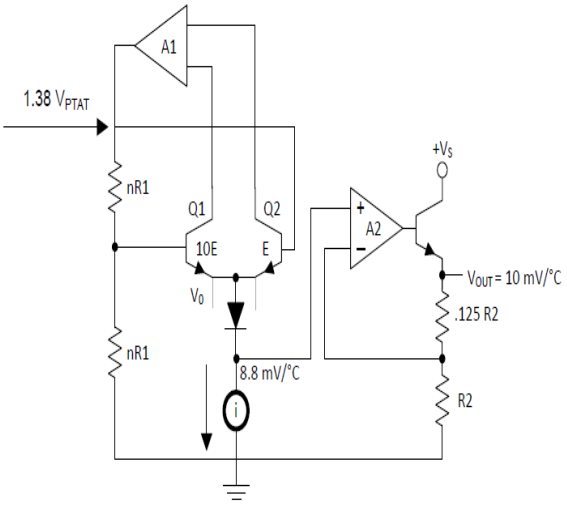

Fig4. Functional block diagram of LM35

V. CONCLUSION

The system provides effective and efficient protection than the traditional methods which are currently in use. The

benefits of this system over the traditional methods are that it has fast response, better isolation and accurate detection of the fault. With the help of this system, the maintenance staff of the Electricity Power authority department can have a continuous vigilance over the transformer through a personal computer and rectify the problem from the computer without the need of lines men.

VI. FUTURE RECOMMENDATIONS

- As of now, the transformer maintenance is done manually onsite. By implementing our project the concerned personnel can take preventive measures by sending a relay signal from the central grid which shuts down the system.
- Development of complex algorithm and software which takes corrective actions when any fatal abnormality arises. More inclusive way of taking corrective measures is by equipping the microcontroller to receive instructions via a secured server from the central grid and the microcontroller should interpret the instructions and take necessary actions to rectify the abnormality.
- By using the anti-theft module, master software and GSM means of communication, distribution transformer monitoring system can automatically analyze and identify abnormal data characteristics. If the monitoring measurement anomaly, it will be alarm in the master.

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