

Distribution Transformer Health Monitoring, Electric Line Break Detection, And OTP Based Line Man Protection System

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Abstract: Transformers are the main building block in a power system. Any damages in transformers adversely affect the balance of a power system. The damages are mainly occurring due to overloading and inefficient cooling. The main objective of the project is the real time monitoring of the health conditions of the distribution transformer. The parameters such as temperature, voltage and oil level of a transformer are monitored. KSEB facing a big problem in accidents due to faulty lines and line breaks. We are proposing a new low cost system for detecting line breaks and faulty line. The system can isolate the broken line from the feeder and inform the authority. Main advantage of this system is a single device can monitor entire output area of a distribution transformer. Also OTP based lineman protection is enabled. Our device is a microcontroller based intelligent monitoring device with transmitter receiver pair, the transmitter section continuously monitoring line end voltages and reporting the master device using wireless signal, the master device analyze the data from the transmitter and report the authority if any action needed via GSM technology. The master device is using a SMART (Self monitoring analyzing and reporting technology for accident prevention).

INTRODUCTION

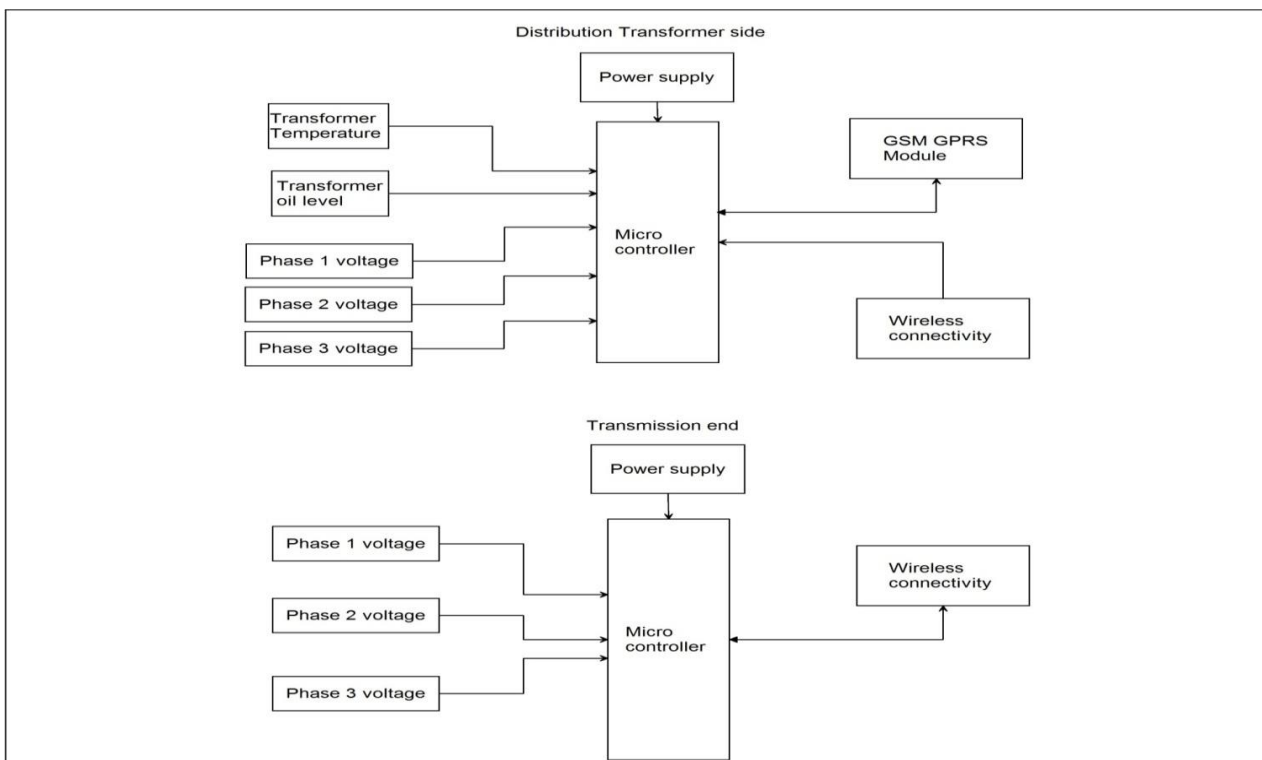
In our country the power line fault is a serious issue and we detect and locate those faults manually. When fault is appears in the transmission line, the users should inform the authorities and they have to disconnect the power immediately. There are many technologies that are proposed by various engineers but almost all of them are not practical especially in very high voltage lines as well as junctions. Power transmission lines run through several natural conditions those results in various electrical faults caused by lightning, bird, tree and so on. Since these faults are possible to fail the power supply quality, they should found out and rectified appropriately. Fault detection is essential to the safe operation of electric power transmission and distribution system. Without some sort of fault detection the automated removal of short circuits from a transmission system is impossible. As a result these faults might persist until essential electrical equipment is damaged or destroyed. A variety of methods of detecting and locating faults on power transmission lines exist. Most of these methods utilize the measurements from voltage and current transformers at substations or switching stations to perform their analyses. This examines the effectiveness of using magnetic field sensing coils as alternative measurement devices for the purpose of fault detection and location. Most analysis methods rely on the values of either current or voltage phases measured by means of current or voltage transformers at substations or switching stations. In power transmission systems, the majority of voltage and current signal distortions are caused by faults. Faults that occur in power transmission lines can cause an interruption of power supply. This will ensure a shorter response time for technical crew to rectify these faults and thus help save transformers from damage and disasters. This will ensure a shorter response time for technical crew to rectify these faults and thus help save transformers from damage and disasters. A line man, power line technician is a tradesperson who constructs and maintains electric power transmission, telecommunication lines (a cable, internet and phone) and distribution lines. Because of this hazardous nature of electricity the security for line man must be provided to ensure his safety. A line worker generally does outdoor installations and maintenance jobs. Those who install and maintain electrical wiring inside buildings are electricians. Safety is the prime concern in our day to day life. Everyone needs to be securing as much as possible. There are many electrical accidents happened and still happening due to lack of security provided to the lineman. The electric line man safety system is designed to control a circuit breaker by using a password for the safety of electric man. Nowadays, electrical accidents to the line man are increasing, while repairing the electrical lines due to the lack of communication between the electrical substation and maintenance staff. This work gives a solution to

this problem to ensure line man safety. In this system the control (ON/OFF) of the electrical lines lies with line man. The main objective of this work is to save life of line man by making such a protective system controlled through SMS. In this proposed system if there is any fault in line, the lineman sends the password due to which main line is switched off, and then he works on line to repair and again resends SMS to switch on the electrical line. Components which are used in our model reduces the time which is required for the line man for repairing and are easily available in the market. The main concept of our project is to save time of working for the line man and also to safeguard his life. The main part of our project is the GSM module which is required for sending a SMS.

II.PROPOSED SYSTEM

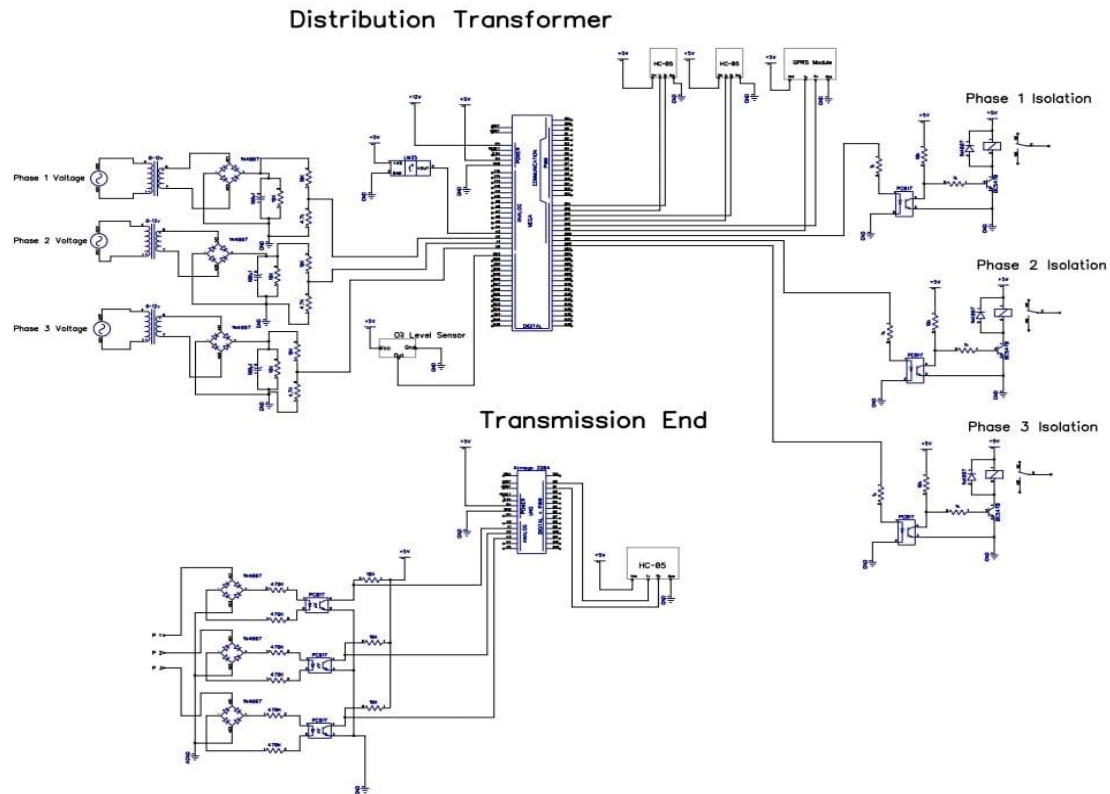
In this system we are detecting faults in the transmission lines, as the system automatically and accurately provide accurate fault location information. This will ensure a shorter response time for technical crew to rectify these faults and thus help save transformers from damage and disasters. A smart GSM based fault detection and location system was used to adequately and accurately indicate and locate the fault had occurred. The electric line man safety system is designed to control a circuit breaker by using a password for the safety of electric man. Nowadays, electrical accidents to the line man are increasing, while repairing the electrical lines due to the lack of communication between the electrical substation and maintenance staff. This work gives a solution to this problem to ensure line man safety. In this system the control of the electrical lines lies with line man.

III.BLOCK DIAGRAM



IV.CIRCUIT DIAGRAM

There is three phase networks in transmission end and distribution side. We want to calculate each three phase voltages using arduino uno. Maximum input voltage detected by the microcontroller is 5v, so the 230v coming through the 3 phase network must be reduced to the detectable voltage of microcontroller. In the first section, at distribution end, a step down transformer is used to reduce the 230v signal to the 12v and this is an AC signal. Next we want to rectify this AC signal to DC signal. So the output signal from the step down transformer is given to a rectifier to rectify the signal. The output from the rectifier is a 12v DC signal and given to a RC circuit. RC circuit removes the noises and fluctuations from the signal and given to a voltage divider. The voltage divider divides the input signal and the output of the voltage divider is a 5v DC signal. This detectable 5v signal is given to the analog pin of the microcontroller. Then the microcontroller reads the value of the voltage coming through the 3 phase network. Next, here we are using a temperature sensor LM35 for sensing the temperature of the transformer.



Section 1: At distribution transformer end

There are 3 pins for the temperature sensor, one connected to the Vcc and one connected to the ground and one is Vout, this Vout pin is connected to the analog pin of microcontroller to read the value of temperature. Next, here we are using a oil level sensor to detect the oil level of the transformer. Here there are 3 pins, one for Vcc and one for ground and one is the output pin that connects to the digital pin of the microcontroller. There is a wireless connectivity and a GSM/GPRS module for transfer information's. Wireless connectivity used for the communication between the distribution side and transmission end. GPRS module is used to send data's or the alert signal to the authorities or the line man. They have four pins, one four Vcc and one four ground and other two are transmitter and receiver pins. The transmitter pin is connected to the receiver pin of the microcontroller and vice versa. Because the transmitted data from the wireless connectivity or the GPRS module want to receive by the microcontroller and vice versa.

Section 2: At transmission end

The transmission end will detect that whether the voltage is present or not that is readed by the distribution end. The voltage from the 3 phase line will pass through the rectifier to rectify the AC signal to the DC signal. And then pass through the optocoupler. The opto coupler has a light emitting diode and a photo transistor. When the voltage is pass through the LED the light emits from it and then photo transistor is on. When it is on, the 5v will pass through the analog pin of the microcontroller. If, when there is no voltage in the any of the phase line, the voltage will not pass through the LED so, it will not emits light and the photo transistor will be in off condition. So, the 5v will not pass through the analog input of the microcontroller. That means something happens between the transmission and distribution end. Then it will send the alert signal to the distribution end through the wireless connectivity. When distribution end gets the alert signal it will send the information through the GPRS module to the authorities.

V.PROS AND CONS

It has low maintenance cost and is able to detect any defects and variations in electrical supply line and transformer. It can be fastly rectified than the conventional method of fault detection. So we can ensure safety of transformer, public and lineman but it has high initial cost.

VI.CONCLUSION

This system effectively detects faults by implanting a set of units on various points on power distribution line and measuring the instantaneous values continuously. The fault can easily be detected, identified and located using this arrangement. This system can help the authorities to maintain the power line easily and can avoid line fault induced accidents up to a limit. Distribution system's network carries electricity by the transmission system and delivers its load centers. Thus, it is very essential to have high efficiency, high reliability and high service quality in a distribution system. This study gives remedies from the difficulties of determining fault occurring causes in transformer and it overcomes the drawbacks of previous working methods. The project focuses mainly on the efficiency of monitoring process of the transformer by using wireless communication that eliminates the use of large cables which are of high cost, low reliability and maintenance. The GSM networking helps in better way of communication which enhances the improvement steps in this process.

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