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AN IMPLEMENTATION OF REAL TIME TRANSFORMER HEALTH MONITORING SYSTEM CIRCUIT BREAKER WIREMAN SAFETY SYSTEM

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Abstract: The progress and development of national economy as well as power system, reliability and safety issues of power system have been more important. Development of distribution Transformer Health Monitoring System (THMS) has been done in that reason. To design a embedded system to monitor the transformer health monitoring by using the IoT and also automatically recover the oil level in the transformer.To design circuit breaker using wireman safety system. This project presents design and implementation of a mobile embedded system to monitor load currents, over voltage, transformer oil level and oil temperature.The control (ON/OFF) of the electrical lines lies with line man. If the oil level is low, it is automatically recovered by attaching extra oil. And also if the temperature level increase to a particular value, the power transfer is controlled automatically.

Index Terms— Arduino, Transformer

1. INTRODUTION

Embedded system is a combination of hardware and software used to achieve a single task. Embedded system is computer systems that monitor, respond to, or control an external environment. Environment connected to system through sensors, actuators and other I/O devices. Embedded system must meet timing and other constrains imposed on it by environment. Sudhanshu Goel, Aparna Akula- Transformer is a very important and critical component which acts as a link between the generation, distributionand consumer end of a power network. These devices are often subjected to electrical and mechanical exploitations throughout the operation, which many a time results in catastrophic failure and drastic reduction in life cycle. The problem is further elevated by the shift of paradigm in today's complex and deregulated market, which allows higher transformer overloads, handling of unprecedented power flow patterns and increased availability while reducingtheserviceandmaintenancecostatthesametime.
Online condition monitoring and analysis techniques can be very handy for evaluation of operational condition of transformer to prevent any abrupt inconsistencies, decrease the life cycle cost and increase the reliability and availability. The thermal behavior of transformer is acrucial parameter indicating its health. This paper proposes a simple method of monitoring the health of transformer based on statistical analysis of oil and winding temperature values. The results obtained indicate a strong correlation of temperature and health oftransformer.
Ehnaish Aburaghiega, Dr. Mohamed Emad Farrag- Transformers are an important part of the electrical power system network, therefore, its fault detection is vital.Offline methods are commonly used for their

fault detection. These methods have associated costs derived from the necessity of taking the transformer out of service. The application of on- linemethodsreducestheexpectedcostsandthepossibility
of unpredicted failures. In the present study, off-line andon-
line methods are applied to the detection of short circuits in transformers, demonstrating the possibility of moving from offline to on-line methods. Short circuits between sections in a transformer winding, between winding and core and between windings have been considered. PSPICE software is used to simulate the transformer for both detection methods. A comparison of the fault indication in both techniques proves the possibility of moving from off-line to on-linemethod

2. SYSTEMANALYSIS

Electricityplaysanimportantroleinourlife.Everymoment of our life depends upon electricity. Electricity has several components and equipment helping human to transfer and regulate the distribution according to usage. The most crucial equipment of transmission and distribution of electric power is transformer. In power systems, an electrical equipment distribution transformer directly distributes power to the low-voltage users and its operation condition is an important criteria of the entire network operation. The majority of these devices have been in service for many years in different (electrical, mechanical and environmental) conditions. They are the main components and constitute a large portion of capital investment. Operation of distribution transformer under rated condition (as per specification in their nameplate) guarantees their long service life .However, their life is significantly reduced if they are subjected to overloading, heating, low or high voltage/current resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability. Abnormality in distribution transformer is accompanied with variation in different parameters like Winding temperature, Oil temperatures, Ambient temperature, Load current, Oil flow (pump motor), Moisture and dissolved gas in oil, LTC monitoring, Oil level, Bushing condition. Overloading, oil temperature, load current and ineffective cooling of transformers are themajor causes of failure in distribution transformer deficiencies. According to the above requirements, we need a distribution transformer real-time monitoring system to monitorall

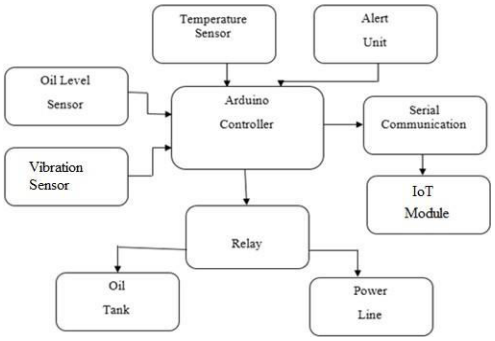

Fig.1 Transformer section

essential parameters operation, and send to the monitoring center in time. It lead to online monitoring of main functional parameters of distribution transformers which will provide necessary information about the health of distribution transformers. This will help and guide the utilities to optimally use the transformers and keep this equipment in operation for a longer period. An online- monitoring system is used to collect and analyze temperature data over time.This project gives a solution to this problem to ensure line man safety. In this proposed system the control (ON/OFF) of the electrical lines lies with line man. This project is arranged in such a way that maintenance staff or line man has to enter the password to ON/OFF the electrical line. Now if there is any fault in electrical line then line man will switch off the power supply to the line by entering password and comfortably repair the electrical line, and after coming to the substation line man switch on the supply to the particular line by entering the password. Also we monitor the

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transformer oil level.

3.ARDUINO

Follow the instructions on the Getting Started section of the Arduino web site, http://arduino.cc/en/Guide/HomePage. Go all the way through the steps to where you see the pin13 LED blinking. This is the indication that you have all software and drivers successfully installed and can start exploring with your own programs. For stand-alone operation, the board is powered by a battery ratherthan through the USB connection to the computer. While the external power can be anywhere in the range of 6 to 24 V (for example, you could use a car battery), a standard 9 V battery is convenient. While you could jam the leads of a battery snap into the Vin and Gnd connections on the board, it is better to solder the battery snap leads to a DC power plug and connect to the power jack on the board. A suitable plug is part number 28760 from www.jameco.com. Here is what this looks like. Disconnect your Arduino from the computer. Connect a 9 V battery to the Arduino power jack using the battery snap adapter. Confirm that the blinking program runs. This shows that you can power the Arduino from a battery and that the program you download runs without needing a connection to the host PC. Moving On Connect your Arduino to the computer with the USB cable. You do not need the battery for now. The green PWR LED will light. If there was already a program burned into the Arduino, it will run. Start the Arduino development environment. In Arduino-speak, programs are called “sketches”, but here we will just call them programs. In the editing window that comes up, enter the following program, paying attention to where semi-colons appear at the end of command lines.

```
void setup()
 {
Serial.begin(9600); Serial.println("Hello World");
 }
 void loop()
 {}
```

Your window will look something like this

Congratulations; you have created and run your first Arduino program!

3.1 Arduino Hardware

The power of the Arduino is not its ability to crunch code, but rather its ability to interact with the outside world through its input-output (I/O) pins. The Arduino has 14 digital I/O pins labeled 0 to 13 that can be used to turn motors and lights on and off and read the state of switches. Each digital pin can sink or source about 40 mA of current. This is more than adequate for interfacing to most devices, but does mean that interface circuits are needed to control devices other than simple LED's. In other words, you cannot run a motor directly using the current available from an Arduino pin, but rather must have the pin drive an interface circuit that in turn drives the motor. A later section of this document shows how to interface to a small motor.

To interact with the outside world, the program sets digital pins to a high or low value using C code instructions, which corresponds to +5 V or 0 V at the pin. The pin is connected to external interface electronics and then to the device being switched on and off.

4.HARDWAREDESCRIPTION

There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and otherdevices.

Apowersupplycanbybrokendownintoaseriesofblocks, each of which performs a particularfunction.

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 at room temperature and 3 4 over a full 55 to 150 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 powersupplies,

or with plus and minus supplies. As it draws only 60µA from its supply, it has very low self-heating, less than 0.1 in still air. The LM35 is rated to operate over a 55 to

150 temperature range, while the LM35is rated for a

40 to 110 range 10 with improved accuracy . TheLM35 series is available pack aged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package.

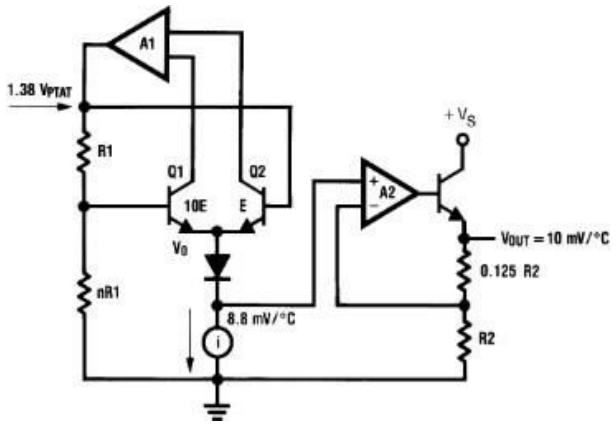

Fig .2 BLOCK DIAGRAM

IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet. The concept may also be referred to as the Internet of Everything. The internet

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of things (IoT) is the internetworking of physical devices, vehicles, buildings and other items— embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the user when tire pressure is low -- or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network

Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. IoT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all input UART data to GPRS online data. Data may be updated to specific site or a social Network by which the user can able to access thedata

Fig.3 IoT

5. SOFTWAREDESCRIPTION

Embedded C is a set of language extensions for the C Programming the C standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed point arithmetic, multiple distinct memory banks and basic input output operations. In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing. Embedded C use most of the syntax and semantics of standard C, e.g., main () function, variable definition, data typedeclaration.

6.SIMULATION RESULTS

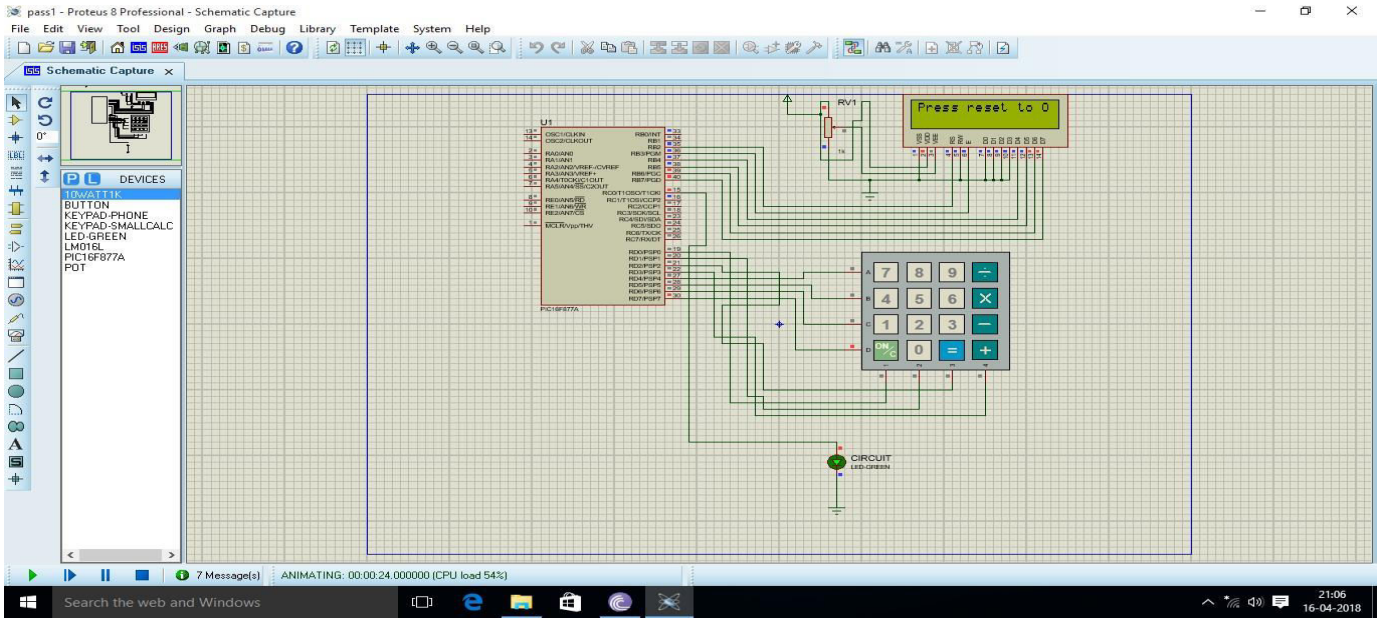

Fig 4 CIRCUIT BREAKER SECTION

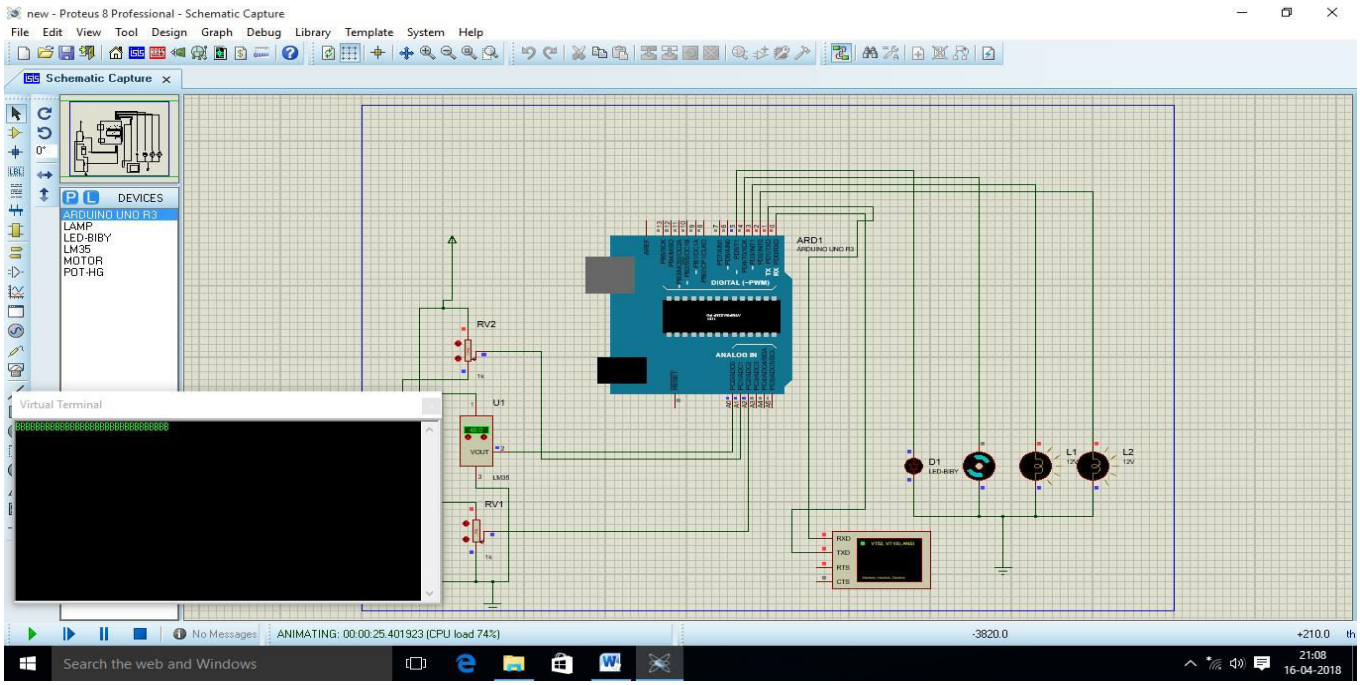

Fig 5 TRANSFORMER SECTION

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6. CONCLUSION

The final stage of Electricity distribution is the delivery of electricity from generating power plants to end users. Distribution system's network carries electricity by the transmission system and delivers its load centres. 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 IoT helps in betterway of communication which enhances the improvement stepsin this process.So, use of Arduino controller makes the system real time embedded system and aids very much in industry needs.The system hardware was constructed from the available components. The experimental results came out as expected

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