

OVER TEMPERATURE FAULT DETECTION AND SWITCHING SYSTEM

Swapnil Bopche¹, Akshay Kadu², Akshay Gajpure³, Rushikesh Joshi⁴

Dr (Mrs).S.P.Washimkar

^{1,2,3,4}Department of Electronics and Telecommunication Engineering, Priyadarshini College of Engineering, Nagpur, India.

Abstract - The efficiency of power systems is largely determined by the effectiveness of the inbuilt power equipment. Monitoring transmission parameters for faults and quick isolation of the system from faults helps to improve the efficiency of the power systems reliability. Current conventional method has its own limitations due to the reliance on technical team to carrying out visual inspection in order to identify any fault. Technologies such as Power line carrier communication and the use of internet based communication systems have their respective demerits. In this paper the scholars Presents the study of the use of GSM technology, to provide a reliable monitoring and fault detection system. Appropriate designed specific sensors were used to monitor the changes in transmission parameters such as voltage, current, temperature and frequency. Whenever fault occurred the data acquired were transmitted to the utility mobile phone as SMS via the GSM wireless network. The system hardware was modeled using Proteus simulation tool while Mikro-C was used for the software. With this system, power transmission fault can be detected and isolated at the shortest possible time.

Keywords: Power transmission, PIC Microcontroller, GSM technology, Sensors, Efficiency, Transmission parameters.

1 Introduction

The manner in which the use of microcontroller is shaping our lives in breath taking. Today's this versatile devise can be found in a variety of control applications. A microcontroller unit uses microprocessor as its CPU and it Incorporates memory, Timing reference, I/O peripherals etc., on same chip. In our project microcontroller is used to control the three phase induction motor. Electrical machines are widely used in industries as industrial drives because of the rugged, less costly, reliable and economical. It use to

transform electrical power into mechanical power, so there are necessary need to protection of machines from faults occur. Failure of machines is the biggest problem in industries and at many other places. The faults are because of electrical and mechanical hassles. Mechanical faults caused by overload and changes of load[1]. Electrical faults are connected with power supply, electrical faults occur in motor due to over voltage, under voltage, over current, under current, temperature imbalance, single phasing, phase reversal, overheating, etc. in our project we selected some of faults from these such as over temperature imbalance.

2 Review of transmission power.

The transmission system plays significant roles in the supplying of power to the consumers uninterruptedly. Monitoring of these systems is very essential if supplying of healthy power to the consumers is to be achieved. Incorporated in the transmission system is the protective system which helps in detecting the abnormal or fault signals. The protective relays in the protective system then isolate the faulted part from the entire system, ensuring minimal equipment damage and disturbance. Fault analysis is an essential concern in power system engineering in order to isolate faults quickly and ensure power supply is restored at the shortest possible time. Power demand has resulted in higher line current loads, still bearing in mind that operators are limited by the system and line capacity. Overloading the system will lead to overheating of the system insulation which ultimately result into the system failure. Programmable Logic Controller (PLC). aids the improvement in power quality, ensuring a continuous and reliable supply of power to loads.

2.1 Short circuit fault

Basically, faults can exist in four forms: they include line-to-line fault, double line-to-ground fault, single line-to-ground fault and three phase fault, Different magnitude of fault current can result from each of these types of faults. Short circuits damage can be prevented by employing the use of circuit breakers, relays, or other protection as they help to disconnect the power in response to high current.

2.2 GSM technology

GSM stands for Global System for Mobile communications. Developed in 1990, it has become the most popular standard for mobile phones in the world. The implementation environment determines the coverage area of each cell. The boundaries of cells can overlap between adjacent cells (large cells can be converted into smaller cells). The technology uses a blend of frequency division multiplexing (FDM) and time division multiplexing (TDM). Different users at different time slot use different frequency, hence when user is ON, uses channel 900MHz for three seconds, then hop to channel 910MHz for the next three seconds and so on. Frequency Hopping is the term giving to such process. Amongst the various frequency of the GSM, 900MHz is the operational frequency. It has the ability to re-use frequencies in order to increase capacity and at the same time coverage.

2.3 Node Microcontroller ESP8266

ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet users' continuous demands for efficient power usage, compact design and reliable performance in the Internet of Things industry. With the complete and self-contained Wi-Fi networking capabilities, ESP8266EX can perform either as a standalone application or as the slave to a host MCU. When ESP8266EX hosts the application, it promptly boots up from the flash. The integrated highspeed cache helps to increase the system performance and optimize the system memory. Also, ESP8266EX can be applied to any microcontroller design as a Wi-Fi adaptor through SPI/SDIO or UART interfaces[2]. ESP8266EX integrates antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. The compact design minimizes the PCB size and requires minimal external circuitries. Besides the Wi-Fi functionalities, ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor and on-chip SRAM. It can be interfaced with external sensors and other devices through the GPIOs.

2.4 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

3 Methodology

The relay and ds1820 is connected to the ESP controller. We are programming ESP using Arduino IDE and after getting the data from ds1820 the data will be send to the cloud server using internet.

The temperature were set in the system by which the Temperature when will rise above the limit , the relay will trigger to OFF the load[3]. The programming we have to do to make this logic. All the data will be uploade on cloud server and we can see the uploaded data through accessing the cloud server by individual login.

Block Diagram:

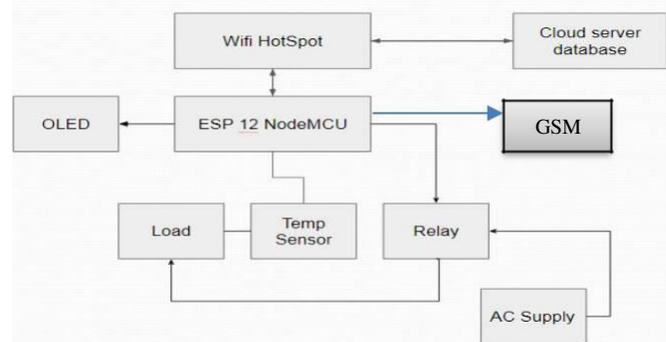


Figure 1. structured Block diagram of the Over temperature fault detection and switching system.

The system uses the controller ESP12 Node-MCU which sends the real-time data to cloud server. here we are using temperature sensors ds1820 to monitor load temperature [4]. The monitored data will send directly to the cloud server as well as user can monitor data online as is also will display on OLED display. The relays are used to switch the device if the temperature rises above the value which we have configured in the program. The device will OFF if the temperature will rise the limit and SMS will send to the respective person using GSM.

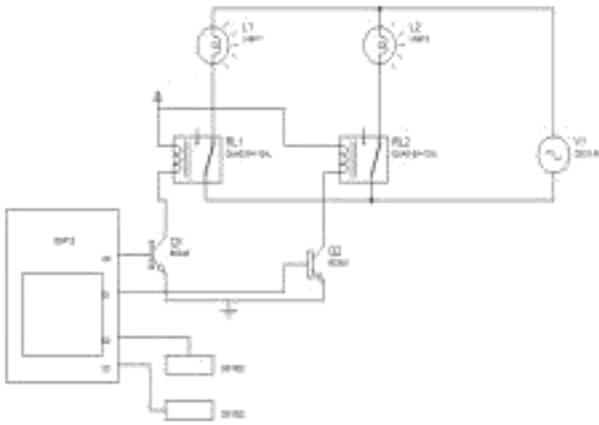


Figure 2. Complete system circuit

3.1 The communication system

The GSM modem is a wireless modem that works with a GSM wireless network. Unlike the dial-up modem, the GSM modem sends and receives data through waves. It requires a SIM card from a wireless network carrier to function. Whenever the set threshold is bridged, the system sends an instant message to the utility mobile phone, stating the existing fault and the location using the GSM modem.

3.2 Operation of the GSM

GSM Modems are controlled by the microcontroller using the AT commands. However the GSM modem supports a fixed and extended set of AT commands. Defined in the GSM standards are these extended set of AT commands which enables the following functions;

- Send SMS messages.
- Reading, writing and searching phone contacts.
- Monitor signal strength.
- Read, write and delete SMS messages.

3.3 The switching device relay

The relay acts as an electrical disconnection to isolate the

entire system on the occurrence of fault. It shut down or de-energizes other electrical equipment in the system, which will then allow work to be carried out further down the line. As an electrical device for automatic control, it is actuated by variation in the conditions of the electrical circuit.

3.3.1 Operation of the relay

The rated coil voltage of the relay used is 5V DC. This voltage is required for the relay to perform the function of opening or closing it switch. This 5V DC is fed to the relay coil terminals[5]. The magnetic field within the coil collapse whenever there is a sudden interruption in the flow of current through the relay coil as a result of the switch opening. The coil will respond by producing a sudden, large voltage across its leads, causing a large surge of current through it.

4 Results and observations

The Over temperature fault detection configuration was tested. A temperature limit of 40 C was configured in the program. when the temperature rises above the value which we have set in the program then the signal is transmitted to the SPDT relays Through ESP

The system tripped off after the short circuit fault was impose module meanwhile the same data is uploaded on the cloud server online in real time through the system. Hence confirming the test for fault detection and switching system (relay)functionalities.

4.1 Unit testing

The values of the Temperature of each power unit were observed and noted. These values were compared with threshold values and Table shows the values of the Temperature from the sensing units.

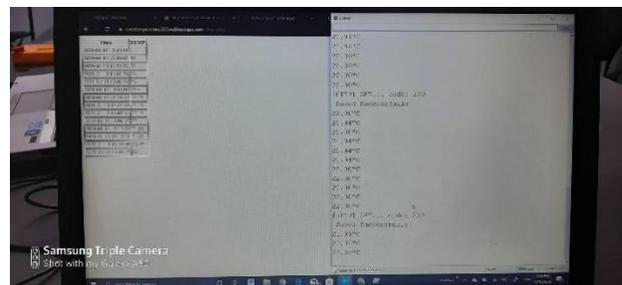
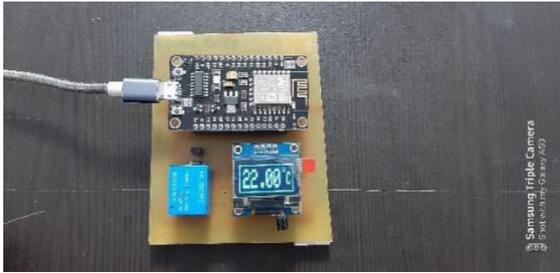


TABLE 1: showing discrete temperature readings

4.2 Result:



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5 Conclusion

A fault detection system enabled by the use of the GSM wireless network for communication was achieved.

The fundamental objectives of this research work were achieved as the system designed was able to detect Machine and transmission fault. The occurrences of faults were displayed and the message was sent through the GSM network over to the utility mobile phone. A bi-directional communication was established as the system was able to receive command from the utility phone to set a short circuit limit.

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6 References

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