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GSM BASED SUBSTATION SCADA IMPLEMENTATION USING MICROCONTROLLER

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ABSTRACT:

The purpose of this project is to acquire the remote electrical parameters like Voltage, Current and Frequency and send these real time values over GSM network using GSM Modem/phone along with temperature at power station. This project is also designed to protect the electrical circuitry by operating an Electromagnetic Relay. This Relay gets activated whenever the electrical parameters exceed the predefined values. The Relay can be used to operate a Circuit Breaker to switch off the main electrical supply. This project is also designed to protect the electrical circuitry by operating a spdt relay. This relay gets activated whenever the electrical parameters exceed the predefined values. The relay can be used to switch off the main electrical supply. User can send commands in the form of sms messages to read the remote electrical parameters. This system also can automatically send the real time electrical parameters periodically (based on time settings) in the form of sms. This system can be designed to send sms alerts whenever the relay trips or whenever the voltage or current exceeds the predefined limits.

Keywords: PSO, PMU, Voltage, power consumption, power flow.

1. INTRODUCTION

The distance between the generators and load may be in terms of hundreds of miles hence the amount of huge power exchange over long distances has turned out as a result of the lack of quality of the electric power. During the earlier development stages the issues on quality of power were not frequently reported. Demanding the quality of power being delivered at the user side has raised the alarm due to the increase in demand of electricity in the customer side. A huge amount of power is lost during the transportation of the general power which leads to the reduction in the quality of power received at substation. The purpose of this project is to acquire the remote electrical parameters like Voltage, Current and Frequency and send these real time values over GSM Technology using GSM Modem along with temperature at power station. This project is also designed to protect the electrical circuitry by operating an Electromagnetic Relay. This Relay gets activated whenever the electrical parameters exceed the predefined values. The Relay can be used to operate a Circuit Breaker to switch off the main electrical supply. This system automatically send the real time electrical parameters periodically (based on time settings) into predefined website. User can monitor these parameters on the internet. This system can be designed to send SMS alerts whenever the Circuit Breaker trips or whenever the Voltage or Current exceeds the predefined limits.

OVER VIEW:

A power system consists of components such as generators, lines, transformers, loads, switches and compensators. However, a widely dispersed power sources and loads are the general configuration of modern power systems [3]. Electric power systems can be divided into two sub-systems, namely, transmission

systems and distribution systems. The main process of a transmission system is to transfer electric power from electric generators to customer area, whereas a distribution system provides an ultimate link between high voltage transmission systems and consumer services. In other words, the power is distributed to different customers from the distribution system through feeders, distributors and service mains. Supplying electricity to consumers necessitates power generation, transmission, and distribution. Initially electric power is generated by using electric generators such as: nuclear power generators, thermal power generators and hydraulic power generators and then transmitted through transmission systems using high voltage. Power departs from the generator and enters into a transmission substation, where huge transformers convert the generator's voltage to extremely high voltages (155kV to 765 kV) for long-distance (up to about 300 miles) transmission

2. RELATED STUDY

The distance between the Generators and loads may be in terms of hundreds of miles. Hence, the amount of huge power exchanges over long distances has turned out as a result of the lack of quality of the electric power. During the earlier development stages the issues on quality of power were not frequently reported. Quality of supply is a mixture of both voltage quality and the non-technical features of the interaction from the power network to its customers. Demanding the quantity of power being delivered at the user side has raised the alarm due to the increase in demand of electricity in the customers side. The power generated at the main stations is transported hundreds of miles using transmission lines before they reach the substations. A huge amount of power is lost during the transportation

of the generated power which leads to the reduction in the quantity of power received at the substations. Also the electric lines users have identified that the number of drawbacks caused by electrical power quality variations are increasing rapidly. These variations have already existed on electrical systems, but recently they are causing serious problems [6]. Therefore, measurements must be acquired either from one end or from both the ends of a faulted line. Only manager recorded data is available at limited substation locations in certain systems. When a fault occurs in such systems, only a few (two or three) recording devices are triggered. The most likely case is that the measurements could not be obtained at either or both ends of the faulted transmission line leads to drop in the quality of the power. During the past years a number of researches were undergone with the help of microprocessors and controllers for continuous monitoring of sample concentrations, the behavior of analysts at different time intervals, monitoring the voltage, current and temperature fluctuations in the distribution transformers at the substations. The level of current and voltage at the substations may vary drastically due to the increase in temperature at the distribution transformers. Due to this the quality of power being delivered to the user might be insufficient. Hence monitoring the current, voltage and additionally.

3. PROPOSED SYSTEM

The process of rebuilding in the field of electricity industry results in a need of innovative techniques for representing a huge quantity of system data. Over bye and Weber have presented a summary on various visualization techniques that might fairly be helpful for the representation of the data. The techniques such as: 1.) contouring, 2.) animation, 3.) data aggregation and, 4.) virtual environments must prove to be quite

useful. Yet, important challenges remain. The major challenges are: 1.) the problem of visualizing not just the state of a existing system but also the potentially huge number of incident states, and, 2.) the problem of visualizing not just the impact required parameters at the distribution side can aid in developing both the output generated at the main station and the quality of power being delivered at the customer side. It is also capable of recognizing the break downs caused due to overload, high temperature and over voltage. If the increase in temperature rises higher than the desirable temperature, the monitoring system will protect the distribution transformer by shutting down the unit. As discussed earlier, maintenance of a transformer is one of the biggest problems in the Electricity Board (EB). During strange events for some reasons the transformer is burned out due to the over load and short circuit in their winding. Also the oil temperature is increased due to the increase in the level of current flowing through their internal windings. This results in an unexpected raise in voltage, current or temperature in the distribution transformer. Therefore, we are proposing the automation of the distribution transformer from the EB substation. In the automation, we consider the voltage, current and temperature as the parameters to be monitored as the transformer shows its peak sensitivity for the same. Hence, we design an automation system based on microcontroller which continuously monitors the transformer. Because of the microcontroller operation, the transformer present in the substation which is turned off in the main station.

The parameters monitored at the distribution transformer are compared with the rated values of the transformer. Additionally the breakdowns caused due to the

overload and high voltage are sensed and the signals are transmitted to the main station using ADC communication. The software in the PC compares the received values with the rated measurements of the distribution transformer and shuts down the transformer so that it can be prevented from damages and Performances can be enhanced quiet to a remarkable level. The controller consists of a sensing unit which collects the essential parameters such as current, voltage and the oil temperature within the distribution transformer. The digital display connected to the processing unit displays corresponding parameter values at the substation for any technical operations. The controller also senses the overload and high current flow conditions in the internal windings that may lead to breakdown of the corresponding unit. The microcontroller is programmed in such a manner so as to continuously scan the transformer and update the parameters at a particular time interval. The parameter values sensed by the microcontroller are transmitted through the ADC transmitter connected.

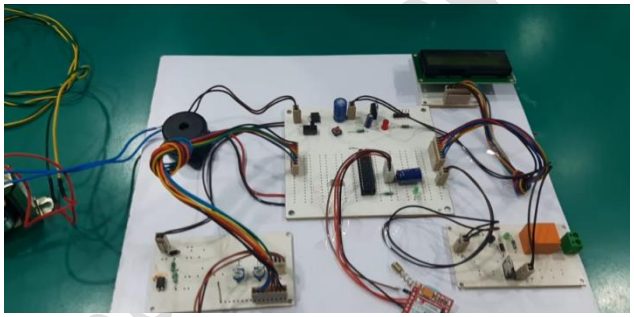

Fig.4.1. Hardware kit image.

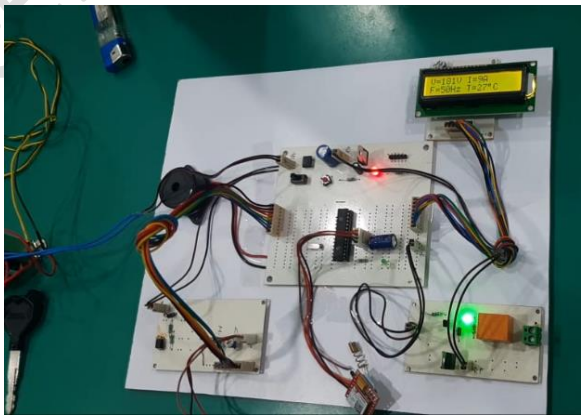

Fig.4.2. Voltage and current measurement in LCD.

4. CONCLUSION

The project GSM Based SCADA Monitoring and Control System Substation Equipment was designed such that the devices can be

monitored and also controlled from anywhere in the world using GSM modem connected to mobile phone. Also real time monitoring of different parameters is done which can provide safety to the substation and its equipments. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

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