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SUBSTATION MONITORING AND CONTROLLING BASED ON MICROCONTROLLER BY USING GSM MODEM

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Abstract-*The aim of this project is to acquire remote electrical parameters such as voltage, current and frequency and to submit these real-time values over the GSM network using GSM modem / phone along with the power station temperature. This project is also planned by running an Electromagnetic Relay to secure the electrical circuits. Whenever the electrical parameters exceed the predefined values, this Relay is triggered. Users can send SMS messaging commands to read the electrical parameters remotely. This was done on time setting) in SMS format. This onboard computer is able to interact effectively with the various sensors used. That internal memory is given to the controller to hold the code. Use this memory to dump some set of assembly instructions into the controller. And the controller's functionality depends on certain assembly instructions. The controller is designed using the language Embedded C.*

1.INTRODUCTION

Electricity is a useful and extremely convenient form of energy. It plays an ever-increasing role in our industrialized capitalist society.The power systems are strongly non-linear, extremely large and dynamic networks. Such electric power systems are unified for cost-effective benefits, increased reliability and operational benefits. They are one of the most significant elements of both national and global infrastructure, and it contributes to substantial direct and indirect impacts on the economy and national security when these structures collapse. Components such as generators, pipes, transformers, loads, switches and compensators are used in a power network. However, the general design of modern power systems is a widely distributed energy sources and charges. Electrical power systems can be divided into two sub-systems, i.e. transmission and distribution.

A transmission system's key function is to move electricity from electric generators to the customer location, while a distribution network provides the ultimate link between high voltage transmission systems and consumer services. The voltage level is then decreased using transformers, and power is transmitted to consumers via distribution systems for electric power. Power starts from the transmission grid at distribution substations where the voltage is stepped down (typically to less than 10kV) and supplied to business, residential, and industrial users by smaller distribution lines.

A large number of distributed, autonomously operated, capital-intensive assets consist of new electrical power systems like power transmission and distribution grids. Such assets include:

1.) power plants, 2.) transmission lines, 3.) transformers and 4.) equipment for protection.

Substations for electric utilities are used in both the transmission and distribution system and work separately to produce the electricity. Hundreds of miles of the power generated at the main stations is transported using transmission lines until they enter the substations.

With the support of micro processors and controllers for continuous monitoring of sample concentrations, the actions of analysts at different time intervals, monitoring of voltage, current and temperature variations in distribution transformers at substations, number of work have been carried out over the past few years.

Due to the increase in temperature at the distribution transformers, the current and voltage levels at the substations can vary drastically. The standard of power supplied to the customer can be inadequate because of this.

Therefore monitoring the current, voltage and additionally necessary parameters on the distribution side will help to improve both the output produced at the main station as well as the quality of power supplied on the customer side. It can also identify the break downs caused by heat, high temperature and overvoltage. If the temperature increase increases above the target temperature, then the control device can protect the distribution transformer by shutting down the machine. As discussed earlier, one of the biggest issues in the Electricity Board (EB) is the repair of a transformer. The transformer is burned out during odd events due to the overload and short circuit in their winding, for certain reasons. The temperature of the oil is also increased due to the change in the amount of current flowing through its internal windings. This results in the distribution transformer experiencing an sudden change in voltage, current or temperature. Hence we are suggesting the automation of the EB substation delivery transformer. We consider voltage, current and temperature in automation as the parameters to be tracked as the transformer displays its peak sensitivity for the same. Hence, we build a microcontroller-based automation system that controls the transformer continuously. The transformer present in the substation which is turned off at the main station due to the microcontroller operation.

2.BLOCK DIAGRAM

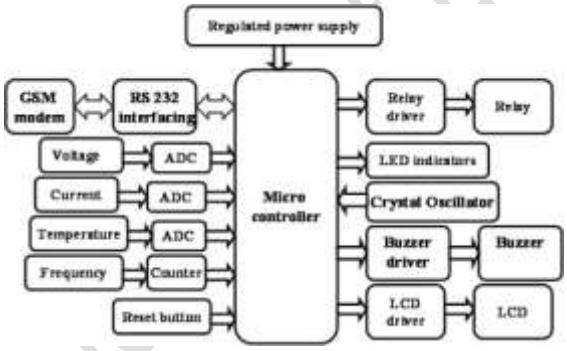

Fig. 1.1Block Diagram of Substation Monitoring and Controlling

3. SUBSTATION MONITORING BY USING GSM MODEM

The process of reconstruction in the electricity sector leads to the need for creative techniques to display a huge amount of device data. Over bye and Weber have provided a description of different visualization techniques that could be relatively helpful in representing the data. Techniques like

1) contouring,

2) animation,

3) aggregation of data and

4) virtual environments.

A monitoring system designed to detect, classify and measure disturbances on electrical power systems. The transient meter, wavelet-based techniques for automated signal classification and characterization, and a smart trigger circuit for disturbance detection using CORBA architecture as communication interface.

Power quality monitoring systems are able to detect disturbances very quickly with the help of Mathematical Morphology (MM). Yet, noise often corrupts the signal under review, and the MM's output will be greatly degraded. In order to detect the transient disturbances in a noisy environment, Sen Ouyang and Jianhua Wang implemented a fast method. In this approach, the correct morphological structure element, suitable erosion mixture, and morphological dilation operators that improve MM's capability. Additionally the Wavelet Transform (WT)-based soft-threshold denoising technique was used for comparison purposes. Hence, MM's functionality can be restored.

This technique has the following merits: 1) great calculation speed, 2) simple hardware implementation and 3) better utilization efficiency.

The propagation of nonlinear and time-varying loads leads to a copious amount of disruptions on the electrical network, from an extremely severe distortion of both currents and voltages, to transient disruptions on the supply voltage. In this respect, the electrical network serves as a "safe carrier" of disruptions, such that a single-customer-generated disruption can be transmitted to other customers, causing potential harm to their devices.

Consequently, assessing the efficiency of the electricity present in a network segment becomes an impelling necessity, especially in a deregulated electricity sector, where each participant may be responsible for the injection of disturbances. However, there are many dimensions of the calculation of power-quality, both from the

analytical and functional point of view, which have yet to be addressed and need to be carefully studied.

4. HARDWARE IMPLEMENTATION

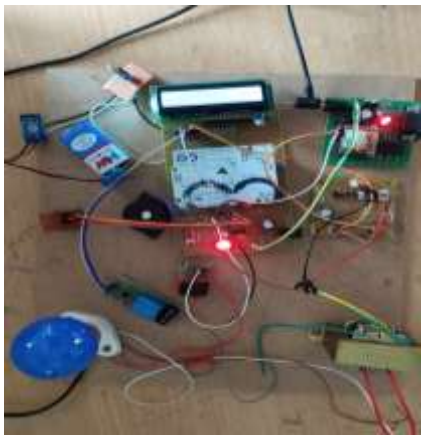

Fig. 1.2 Hardware of Proposed system

MAIN PARTS FOR IMPLEMENTATI- ON OF HARDWARE

4.1 GSM Modem

Fig. 1.3 GSM Modem

A GSM modem is a specialized modem type that accepts a SIM card, and functions like a cell phone over a subscription to a mobile operator. From the viewpoint of mobile operators, a GSM maodem just looks like a cell phone.

4.2 Relay

Fig. 1.4 Relay

Relays are the switches which work both electronically and electromechanically to close and open the circuits. It regulates opening and closing of electronic circuit contacts. When the relay link is open (NO), with the open link, the relay is not energising.

4.3 Buzzer

Fig. 1.5 Buzzer

A buzzer or beeper is a mechanical, electromechanical, or piezoelectric (piezo for short) audio signalling device. Typical applications of buzzers and beepers include warning systems, clocks, and user input validation, including a mouse click or keystroke.

4.4 Voltage Sensor

Fig. 1.6 Voltage Sensor

A voltage sensor is a sensor used for measuring and monitoring the voltage level in an object. The voltage sensors will calculate either the AC voltage or the degree of DC voltage. The voltage may be the input of this sensor while the output is the switches, the analog voltage signal, the present signal, the audible signal etc.

4.5 Current Sensor

Fig. 1.7 Current Sensor

A current sensor is a device capable of detecting electrical current in a wire and generating a signal proportional to that current. The signal produced can be analog or current voltage, or even a digital output.

5. RESULT

The "SUBSTATION MONITORING AND CONTROLLING BASED ON MICRO CONTROLLER BY USING GSM MODEM" project was designed to allow devices to be monitored and controlled from anywhere in the world using mobile phone-connected GSM modem.

6. CONCLUSION

It established the integration of features of all of the hardware components used. The existence of each module was reasoned out and carefully positioned, thereby leading to the unit's best functioning. Secondly, the project was successfully realized using highly advanced IC's with the help of growing technology. Thus the project was planned and tested successfully.

7. FUTURE SCOPE

Microcontroller-based substation monitoring and control system with gsm modem is primarily designed to operate devices such as fans, lights, motors etc. via a cell phone based on GSM. The network has a GSM modem, temperature, current, voltage sensors, and devices to be controlled by switches such as Relay that are interfaced with the micro controller; The micro controller is designed in such a way that if a specific fixed format of sms is sent from the cell phone to GSM modem, it is fed to the micro controller running the appropriate devices as input. A return feedback message is sent from GSM modem to the cell phone. A return feedback message is sent from GSM modem to the cell phone. The temperature can be identified at the place where devices are being run. The monitoring and managing of the systems can be done from the personal computer, and so many things can be managed by us.

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