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Design and implementation of smart wireless SCADA for lab view with inbuilt SMS alert

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Abstract— The main aim of the project is to process the real time data acquisition wirelessly under supervisory control for large scale remote industrial environment. In large industrial establishments many processes go on, therefore it is essential to monitor all the processes and control the factors affecting them. Adapting a technology like WIRELESS SCADA (Supervisory Control and Data Acquisition) one can achieve the above mentioned objective effectively, and thus saving a lot of manpower. We are using wireless modem and GPS (Global Positioning System) for transmitting information from remote area through PC and phone. The hardware components making up the device are relatively unsophisticated, yet the custom written software makes it re-programmable over the air and able to provide a given SCADA application with the ability to send and receive control and data signals at any non predetermined time. Much of the price in some expensive SCADA applications is a result of using specialized communication infrastructure. The properly designed SCADA system saves time and money by eliminating the need of service personal to visit each site for inspection, data collection /logging or make adjustments.

Keywords—GPS, SCADA, Remote monitoring system, Sensors, Microcontroller.

I. INTRODUCTION

Supervisory Control and Data Acquisition (SCADA) is a process control system that enables a site operator to monitor and control processes that are distributed among various remote sites. A properly designed SCADA system saves time and money by eliminating the need for service personnel to visit each site for inspection, data collection/logging or make adjustments. Supervisory control and data acquisition is used to describe a system where both data acquisition and supervisory control are performed. Mobile Supervisory Control and Data Acquisition (referred to as Mobile SCADA) is the use of SCADA with the mobile phone network being used as the underlying communication medium. GSM is a wireless communication technology; most popular today for transmitting data anywhere in the world through SMS with the help of mobile phones. Typically SCADA systems include the following components:

1. Operating equipment such as pumps, valves,conveyors and substation breakers that can be controlled by energizing actuators or relays. Instruments in the field or in a facility that sense conditions such as pH, temperature, pressure, power level and flow rate.
2. Local processors that communicate with the site's instruments and operating equipment. This includes the Programmable Logic Controller (PLC), Remote Terminal Unit (RTU), Intelligent Electronic Device (IED) and Process Automation Controller (PAC). A single local processor may be responsible for dozens of inputs from instruments and outputs to operating equipment.
3. Short range communications between the local processors and the instruments and operating equipment. These relatively short cables or wireless connections carry analog and discrete signals using electrical characteristics such as voltage and current, or using other established industrial communications protocols.
4. Host computers that act as the central point of monitoring and control. The host computer is where a human operator can supervise the process; receive alarms, review data and exercise control.
5. Long range communications between the local processors and host computers. This communication typically covers miles using methods such as leased phone lines, satellite, microwave, frame relay and cellular packet data.

A. SENSORS: RTD Basics

1. Resistance temperature detectors (RTDs) are made of coils or films of metals (usually platinum). When heated, the resistance of the metal increases; when cooled, the resistance decreases.
2. Resistance varies with Temperature
3. Platinum 100 Ohm at 0°C
4. Very accurate
5. Very stable

B. Characterstic of RTD

$R = R_0(1+\alpha T_0)$
Where R_0= Resistance at 0^0
α= Temperature coefficient of resistance
T_0= Temperature in Degree Centigrade.

C. PIEZORESISTIVE (PIEZO) SENSOR

piezoresistive effect of bonded or formed strain gauges to

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detect strain due to applied pressure, resistance increasing as pressure deforms the material. Common technology types are Silicon (Monocrystalline), Polysilicon Thin Film, Bonded Metal Foil, Thick Film, and Sputtered Thin Film. Generally, the strain gauges are connected to form a Wheatstone bridge circuit to maximize the output of the sensor and to reduce sensitivity to errors. This is the most commonly employed sensing technology for general purpose pressure measurement.

D. ULTRASONIC FLOWMETERS

Ultrasonic Doppler flow meters that clamp onto the outside of a pipe operate non-invasively, without moving parts. They cause no pressure drop, risk no damage from the process liquid and entail little maintenance. An ultrasonic cousin of the Doppler flow meter, the transit-time flow meter measures a signal traveling between two transducers, one upstream and one downstream.

II. SOFTWARE

LAB VIEW:

NI Lab VIEW software is used for a wide variety of applications and industries. Lab VIEW itself is a software development environment that contains numerous components, several of which are required for any type of test, measurement, or control application.

G Programming Language

- Intuitive, flowchart-like dataflow programming model
- Shorter learning curve than traditional text-based programming
- Naturally represents data-driven applications with timing and parallelism

The G programming language is central to LabVIEW; using it, you can quickly tie together data acquisition, analysis, and logical operations and understand how data is being modified. From a technical standpoint, G is a graphical dataflow language in which nodes (operations or functions) operate on data as soon as it becomes available, rather than in the sequential line-by-line manner that most programming languages employ.

III. WIRELESS TECHNOLOGY

Wireless communication is the transfer of information without the use of wires.The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio communications). The term is often shortened to "wireless". It encompasses various types of fixed, mobile, and portable two-way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of wireless technology include GPS units, garage door openers and or garage doors, wireless computer mice, keyboards and headsets,satellite television and cordless telephones. A modem router is a small device that enables you to connect multiple devices to one network connection. You can buy a wireless modem router or a Wi-fi modem router and enjoy network access in all the Internet enabled devices present in the vicinity.

A. GPS:

The **Global Positioning System** (**GPS**) is a space-based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The accuracy of the position your GPS reports is influenced by a number of factors, such as the positions of the satellites in the sky, atmospheric effects, satellite clock errors and ephemeris errors etc. GPS units often show on the screen accuracy. The satellites transmit the exact time the signals are sent. By subtracting the time the signal was transmitted from the time it was received, the **GPS** can tell how far it is from each satellite. The **GPS** receiver also knows the exact position in the sky of the satellites, at the moment they sent their signals.

IV. IMPLEMENTATION

The proposed implementation the system that solves the problem of continuous monitoring of data acquisition system with the help of cheap wireless communication. The basic components of remote monitoring system designed in this paper include sensors, Signal conditioning device, 16F877A microcontroller, PC and mobile phone. sensors such as RTD is used to measure remote area temperature, pressure is determined by means of using piezoresistive (piezo) sensor and flow can be known by means of using ultrasonic flow meters **.** Then obtained parameters are conditioned by means of using signal conditioning unit then it sends the signal to the microcontroller which is been given with a power supply of (0-5)v for operation. Microcontroller obtains the parameter and sends the signal to the GPS or Wireless modem which is been enabled. We can choose between GPS or wireless modem. Depending on it transfers the parameter. If incase of PC monitoring we use lab view software to show the changes that are been happened. Whereas in GPS system a message is sent to the phone regarding the change of parameter. When the set point is either below or above a message is been sent. By means of manual changing we control the relay unit by means of microcontroller which sends the command signal and depending on it we can control the entire operation.

V. CONCLUSION AND FUTURE SCOPE

Our objective is to work on the "Remote site Safety & security Application by using Controller" to achieve to produce an input data file for each of the Data Logger, build a Controller Area network ,Collect & manage data in the Control Area Network and Send message to a monitoring centered . Wireless based solutions have universally accepted, familiar and user friendly system. Real-time logging would allow warnings to be flagged to the relevant personnel and allow corrective action to be taken before the quality and value of the catch is degraded. GSM communication

performed almost flawlessly data transfer from sensor at remote area was executed Without incidents. Since all communication between data logger and user are wireless based, this translates into lowest cost compared to all others system. It can be further extended for various area of application like health monitoring system, Home security system, Vehicle Security system etc.

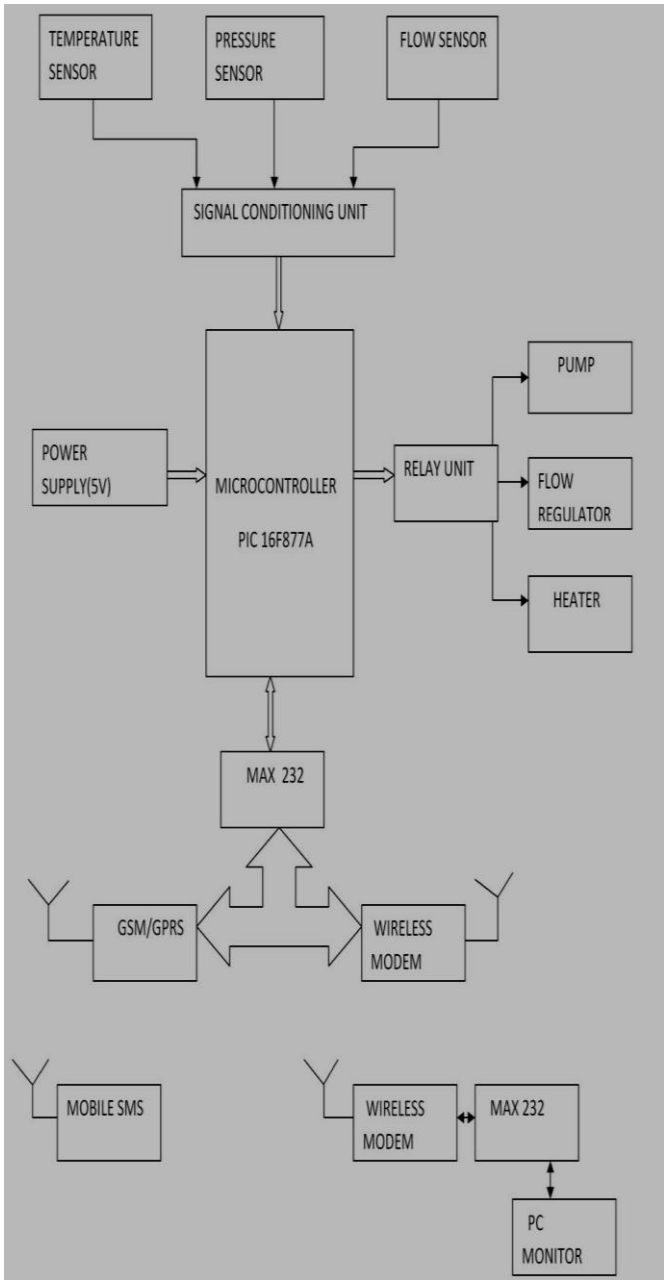

FIGURE 1: Block diagram of wireless SCADA

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