ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

Monitoring and Control of Oil Well Using Arm Processor

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ABSTRACT: In most of the oil wells, monitoring and controlling of oil pumping unit (OPU) is carried out with remote access. A separate system is used with LABVIEW software to monitor the oil field. This is the major drawback in existing system. In this project, a sensor network and web server based intelligent sensor (IS) control is proposed for power economy and efficient oil well monitoring. Sensor network plays an vital role in automation industry for sensing the parameters like temperature, oil pressure, load, angle position and voltage. They are stored in memory unit. The intelligent control systems are designed mainly for detections in oil well's data elementary processing, main fault alarm/indication, typical data storage /indication, data/status. The intelligent sensor (IS) network is interfaced with ARM 7 kit LPC2129. After the data are received they will be uploaded using cloud computing method through web server. The web server based control system is with an embedded database , Which are designed for hundreds of oil wells data storage/management, data processing, malfunction detection, malfunction alarm/indication, stroke-adjustment command transmission down to a specific IS for power economy, The malfunction is reported to the maintenance staff via global system for mobile communications (GSM) and short message service (SMS).

KEYWORDS*:* sensor network, web server,cloud computing.

I. INTRODUCTION

These papers consist of oil well monitoring and control using through the web server, which means remote control. so the Internet is an major The primary function of a web server is to store, process and deliver web pages to clients. The communication between client and server takes place using the Hypertext Transfer Protocol (HTTP). Pages delivered are most frequently HTML documents, which may include images, style sheets and scripts in addition to text content.

A user agent, commonly a web browser or web crawler, initiates communication by making a request for a specific resource using HTTP and the server responds with the content of that resource or an error message if unable to do so. The resource is typically a real file on the server's secondary storage, but this is not necessarily the case and depends on how the web server is implemented. While the primary function is to serve content, a full implementation of HTTP also includes ways of receiving content from clients.

This feature is used for submitting web forms, including uploading of files. Many generic web servers also support server-side scripting using Active Server Pages (ASP), PHP, or other scripting languages. This means that the behavior of the web server can be scripted in separate files, while the actual server software remains unchanged. Usually, this function is used to generate HTML documents dynamically ("on-the-fly") as opposed to returning static documents. The former is primarily used for retrieving and/or modifying information from databases. The latter is typically much faster and more easily cached but cannot deliver dynamic content.

Web servers are not always used for serving the World Wide Web. They can also be found embedded in devices such as printers, routers, webcams and serving only a local network. The web server may then be used as a part of a system for monitoring and/or administering the device in question. This usually means that no additional software

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has to be installed on the client computer, since only a web browser is required (which now is included with most operating systems). In this paper, a sensor network based intelligent system is proposed and applied for remote oil well health monitoring and automatic oil-pumping control. The motivation of developing this system is that

1) due to the special nature of oil exploration and oil drilling, the majority of oil pumping units (OPU1) [20] are spread over barren hills, mountains and deserts, and

2) the existing oil-pumping systems still adopt manual control. Existing manual control systems have three evident drawbacks:

1) To check the oil well pumping unit continuously for avoiding wastages and leakages.

2) Power consumption are high during the time of overload in oil pump unit and also the idle time of pumping also one of the consumption in wasting power.

3). So the admin has to check all the oil well in same time, it may causes non monitoring problems.

This proposed system consists of rectifying all those problem and monitoring over through Web server.

II.RELATED WORKS

The recent increase in transportation costs and the push for cleaner emissions demands advancements in aerospace technology. The current instrumentation used in aerospace applications is costly, and indirect measurement approaches are often employed due to the inability to locate sensors in harsh environments. Health monitoring technologies for the development of a distributed sensor network can be utilized to improve engine efficiencies and reduce emissions while maintaining safety. This paper reviews the recent advancements in silicon carbide (SiC) process technologies and demonstrations of SiC sensors and electronic circuits in hostile environments, which supports the use of SiC technology for health and performance monitoring of aerospace systems. Further development of this technology can ultimately improve the performance, reliability, and emissions of aerospace systems. However, challenges still remain for the realization of a distributed sensor network for harsh environment applications such as aerospace.

Most oil pumping units (OPUs) have been using manual control in the oilfield. This existing oil-pumping system, a high power-consuming process, has the incapability of OPU's structural health monitoring. In this paper, a sensor network based intelligent control is proposed for power economy and efficient oilwell health monitoring. The proposed sensor network consists of three-level sensors: several types of basic sensors, such as load sensor, angular sensor, voltage sensor, current sensor and oil pressure sensor, which are the first level sensors (FLS), are used for oil well data sensing; our developed intelligent sensors (IS), which belong to the second level sensor, are designed mainly for an oil well's data elementary processing, main fault alarm/indication, typical data storage/indication, data/status transmission up to the third level sensor (TLS), data/status transmission between IS, and command transmission down to the OPU motor; and our developed software-defined (SD) control centers with an embedded database, i.e., the TLS, are designed for hundreds of oil wells data storage/management, data processing, malfunction detection, malfunction alarm/indication, stroke-adjustment command transmission down to a specific IS for power economy and Experiment results at the Chinese Petroleum's Changing Oilfield demonstrate our proposed sensor network based system.

The current trend towards the use of novel materials and design concepts for aircraft structures may demand structural health monitoring (SHM) systems in the future. Wireless sensor networks (WSNs) could fulfill the required monitoring tasks concerning fatigue, damage or stress of structural parts. Autonomous sensor nodes (ASNs) are key elements for a WSN in order to allow a self-sufficient and maintenance free operation, without any complex wiring for power supply or communication purposes.

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III.METHODS

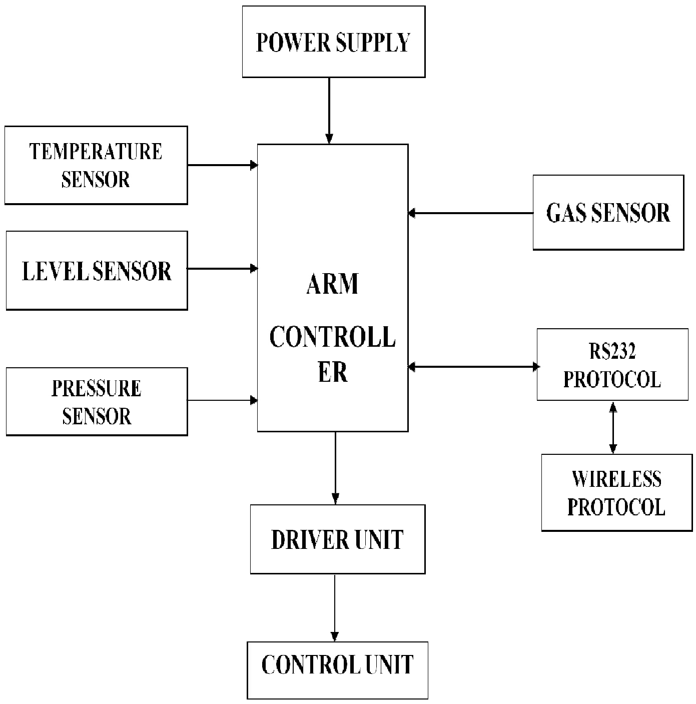

Figure 1: Block Diagram with ARM controller.

The design module consists of LPC2129 controllers, LCD display and the various sensors. This sensor includes a resistive-type humidity measurement component and an temperature measurement performance 32-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

A.1 COMMUNICATION PROCESS:

Single bus data format is used for communication and synchronization between MCU and DHT11 sensor. For each data transmission takes 4ms seconds.each data will be 0's and 1's A complete data transmission process is 40bit data and the sensor sends higher data bit first.If the data transmission is right then the check-sum should be the last 8bit of "8bit integral RH

When MCU sends a start signal, DHT11 changes from the low-power consumption mode to the running-mode, waiting for MCU completing the start signal. Then its send an acknowledgement to mcu process. 40bit data that include the relative humidity and temperature information to MCU. Clock signal will enable the MCU to get the data.

A. DHT11 SENSOR:

DHT11 is the digital humidity and temperature sensor used to monitor the ambient humidity and temperature of the plants. This DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output.

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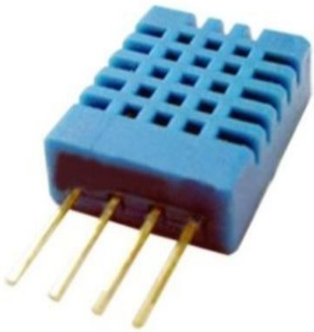

Fig 2. DHT11 Physical structure

By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive type humidity measurement component and an temperature measurement and connects to a high performance microcontroller offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

B.PRESSURE SENSOR:

In this sensor is used to measure the PSI level in oil well during the time of oil pumping period. Which it act as a transducer by converting pressure into electrical energy for getting digital value

C.LEVEL SENSOR:

This sensor is used to measure the level of oil tank. which is placed near to oil well and its capacity upto5cm distance. Most frequent method is ultrasonic has implemented in level sensor.

E.GAS SENSOR:

- Since, the concentration of gas is above the threshold value, the oil pump is shut down.
- High sensitivity to LPG, isobutene, propane.
- Small sensitivity to alcohol, smoke.
- Fast response.
- Stable and long life.
- Simple drive circuit

F.WEBSERVER:

The collected data are uploaded in the website link and accesses through username and password. This is a bidirectional communication i.e. we can monitoring the oil well and also control like an automation system. Remote accesses are a major part in this project, we can control and monitoring or setting the value in controller kit with the help of internet service.

F. COMPILER:

The figure.3 shown as programming codes were written in C language. This high level language is converted into machine understandable language using Keil µVision4 compiler i.e. a .hex file is created using this compiler. When the output of LM35 goes above 50°C, the oil pumping motor should be shut down. When the temperature lies below 50°C, the oil pumping motor keeps running., the temperature of oil well is 53.90°C. The oil level is normal, but, the temperature is above the threshold value. So, the oil pumping motor of oil well is shut down.

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Inside the oil storage tank, the normal concentration of combustible gas level is 300ppm. Under normal conditions, the oil pumping motor keeps running. When the concentration of combustible gases like natural gas, iso-butane is high, the gas sensor output is greater than 750ppm and the oil pumping motor is shut down

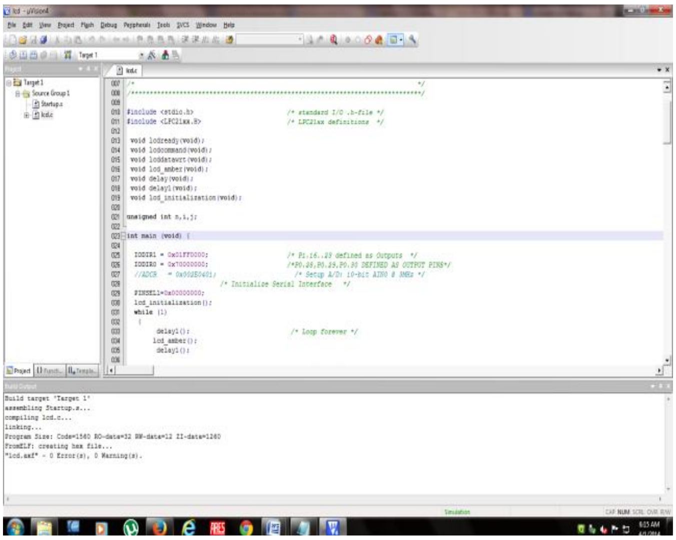

Figure 3. Compiling C-program using Keil µVision4

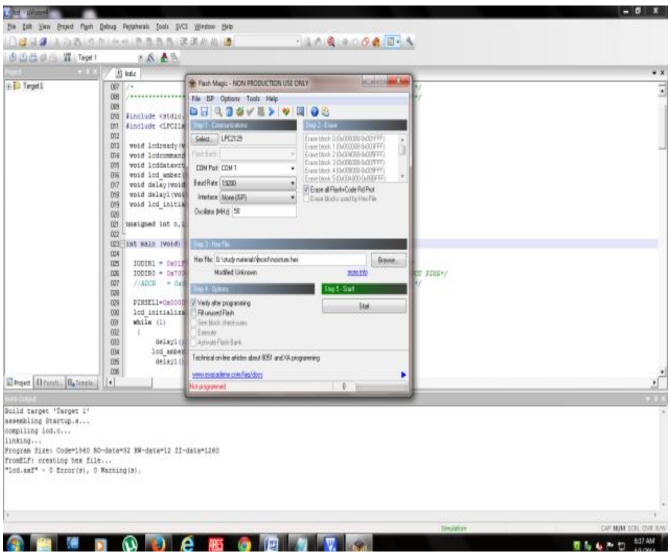

Figure 4.Flash Magic

The Figure 4 shown that created .hex file is programmed into the flash memory of LPC2129 microcontroller using the Flash magic tool. This file will be stored in specified driver such as blinky example.

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G.OIL WELL SENSOR OUTPUT:

S.NO	PRESSURE in psi	TEMPERATURE	LEVEL	GAS
1	65	35.28	22	262
2	82	24.99	23	807
3	80	35.28	36	802
4	58	66.64	37	241

IV. RESULTS

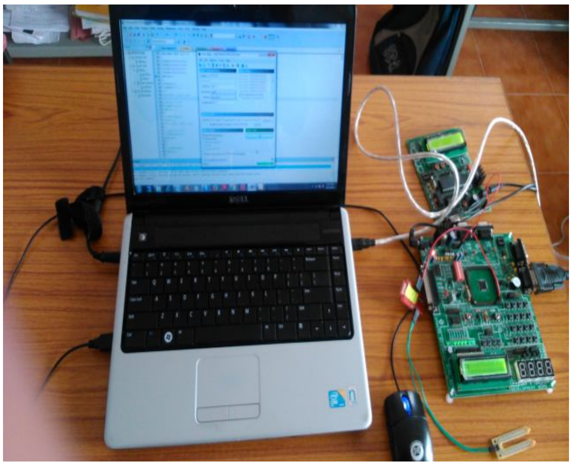

Figure 5. Sensor Implementation

The above diagram shows the interfacing of sensor with ARM7 LPC2129.This sensor implementation has shown in figure 5 ,through that interfacing ARM plays an major part in this oil well monitoring system.

V. CONCLUSION

A sensor network based oil well remote health monitoring and intelligent control system was developed for Oil Pumping Unit management in the oilfield. This system consists of level sensor, temperature sensor and gas sensor and pressure sensor for sensing the condition of the oil storage tank. The control head processes the sensor output values and controls the oil pumping motor accordingly. The control head transmits the condition of each oil well using a WIFI transmitter. An administrator can monitor the oil wells using the web link and manual monitoring in oil wells would be avoided. When the oil storage tank is almost full, the oil pumping motor is shut down and there is no wastage of power.. In the future, more number of oil wells can be monitored from a remote location and data transfer would occur with minimum power requirement.

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