



Security Management System for Oilfield Using GSM & Zigbee Communication

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ABSTRACT: This paper presents the use of GSM and Zigbee for security management system for oilfield industries. Today oil is very important concern because most of the vehicles and machines depend on oil. In oil industries, during the night times at the oil field, checking for the oil level, power failure, Gas leakage, maintaining temperature of oil, Check quality of oil is critical task for people to preserve the security. In the present days automated systems have less manual operations in terms of flexibility, reliability and accurate. Due to this increase in demand every field prefers to automate control systems. This scenario implies to industries where so many parameters need to look after. Automation based on advanced electronic technologies giving fruitful results in every aspect. The combination of technologies in various areas and embedding into one system can be very useful to automate a particular scenario. This paper aims to develop the security for oilfield industries using zigbee communication. In this project, ZigBee transmitter is placed at the site location and another ZigBee receiver is placed at the control panel. Information received at the receiver will be sent to the PC. The security people will take an appropriate action according to the problem failure like power failure, fire generated, oil overflow etc. and the acknowledgement will be received by the receiver at the control unit after rectification of the above problems.

KEYWORDS: AT commands, GSM, Zigbee, Sensors.

I. INTRODUCTION

The international price of petroleum has been kept at a high level in recent years, so production efficiency on domestic oilfield is urgently needed to be improved, new requirements for oilfield information construction is raised. Construction of information and digitalization become development direction for oilfield. The distribution state of working environment in oilfield is very special. As the price of petroleum is very high, oilfield requires the strong security management system. So many problems can occur at the site location or oilfield such as power failure, level of oil, leakage of gas, rise in temperature of oil. So to overcome these problems, we are proposing a very cost effective system. It is a perfect scheme where remote wireless monitoring system is established.

II. PROPOSED SYSTEM

Proposed system consists of integration of different technologies to enhance the oilfield security. This system also opens a new horizon for remotely communicating with the oilfield.

A. Various Sensors

1. Level Sensor: It is a magnetic switch or reed switch. It has no contact with water and it is shock proof. It can be used to detect any liquid level. The float of level sensor is a free movement. When float is free, output will be Open NO. When the float is in up with liquid, output will be Closed NC.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 7, July 2015

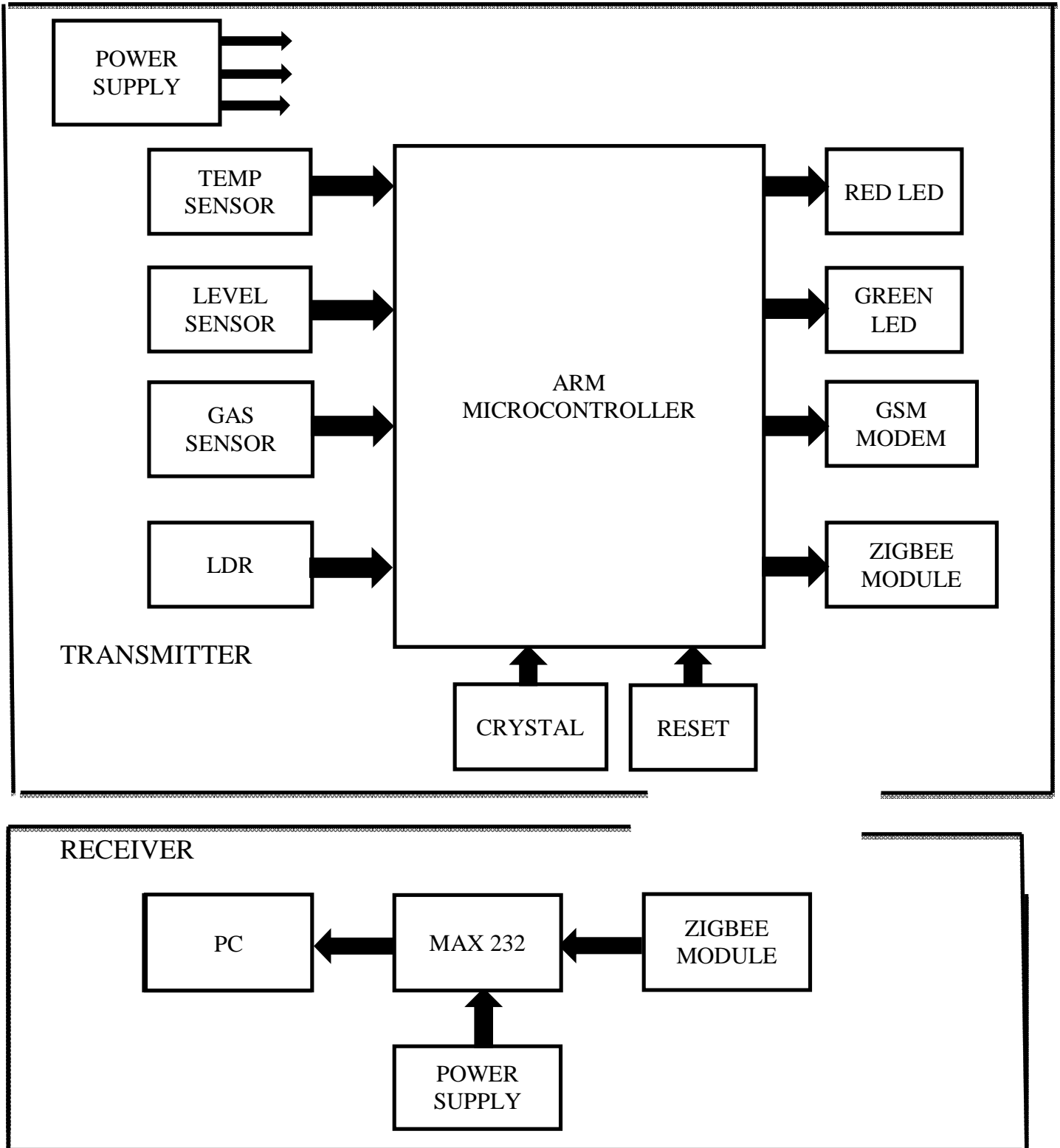


Fig.1.Block diagram of the proposed system



International Journal of Innovative Research in Computer and Communication Engineering

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Vol. 3, Issue 7, July 2015

2. Temperature Sensor LM35: The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 mA from its supply, it has very low self-heating, less than 0.1 ° C in still air. The LM35 is rated to operate over a -55 °C to +150 °C temperature.

3. Gas Sensor MQ6: MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas. It has good sensitivity to Combustible gas in wide range. The sensor could be used to detect different combustible gas, especially methane. Sensitive material of gas sensor is tin dioxide (SnO₂), which has lower conductivity in clean air. When the target combustible gas exist, the sensor's conductivity is more high along with the gas concentration rising.

4. Light Dependent Resistor: LDRs or Light dependent resistors are very useful especially in light/dark sensor circuits. Normally the resistance of LDR is very high. Sometimes it is as high as 1,000,000(1M) ohms. But when they are illuminated with the light, resistance drops dramatically. Photo resistor or LDR or photo cell is light control variable resistor. The resistance of the photo resistor decrease with increasing incident light intensity; it exhibits photoconductivity. Photo resistor is made up of high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as a few mega ohms. While in the light, a photo resistor can have a resistance as low as a few hundred ohms.

B. MICROCONTROLLER UNIT

Microcontroller unit forms the heart of the system. This unit is responsible for accepting the inputs from the sensors. It has inbuilt ADC. The inputs from various sensors are given to this ADC, where analog inputs are converted into the digital outputs. Then these outputs are provided to the zigbee transmitter and at the same are sent to the security guard's cell phone number via SMS by using GSM module. In the control panel, it is now possible to remotely communicate with the oilfield.

C. GSM UNIT

GSM module forms the basic unit to remotely communicate with the oilfield. GSM module receives input from the microcontroller and sends the SMS to the security guard's cell phone.

Command	Response	Description
AT+CMGF=	OK	Specifies the input and output format of the short messages. 0 for PDU mode and 1 for text mode.
AT+CMGS=*		Sends a message. * is the number of the cell phone.
AT+CSCS=		Specifies character selection. GSM for alphanumeric text.
AT+CBST=		Specifies Baud Rate. 7 for standard baud rate 9600.

Fig.2. AT commands used for GSM module

D. ZIGBEE UNIT

Zigbee is a wireless network technology. It is guided by IEEE 802.15.4 Personal Area Network standard. It is primarily designed for the wide ranging controlling applications and to replace the existing non-standard technologies. This system assists security people to great extent to monitor and inspect the entire site. The wireless receiver is designed using ZigBee technology. It can improve the level of oilfield' security. In this paper, a ZigBee transmitter is placed at the site location and another ZigBee receiver is placed at the control panel. Information received at the receiver will be sent to the PC. The security people will take appropriate action according to the problem failure like fire generated, oil

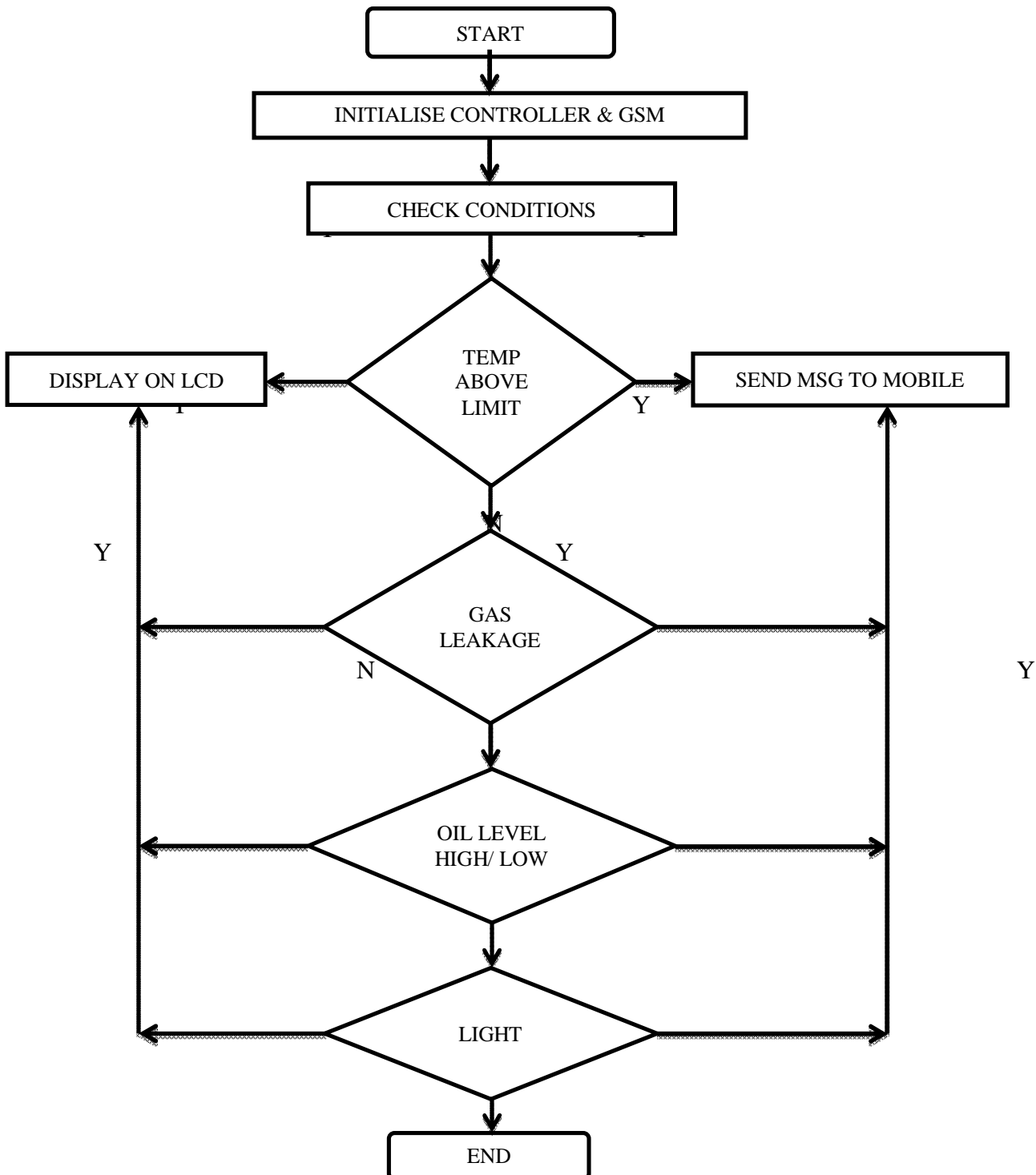
International Journal of Innovative Research in Computer and Communication Engineering

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overflow, temperature of oil exceeded and the acknowledgement will be received by the receiver at the control unit after rectification of the above problems.

III. FLOWCHART OF PROPOSED SYSTEM



International Journal of Innovative Research in Computer and Communication Engineering

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Below images show the actual working of our system. The system will consists of two modules one is present at the remote location and other will be placed at the control room which is connected to the PC. The zigbee and GSM module present at the remote location are used to detect various problems in this paper.

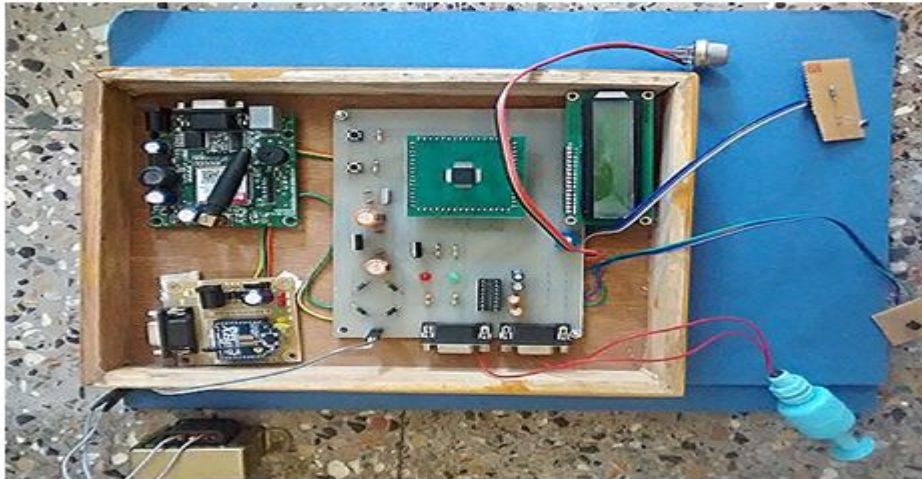


Fig a

To connect the ZigBee module to a host PC via an RS232 serial cable, we have used a simulated terminal. There are many tools available. A most widely used one is X-CTU configuration software.

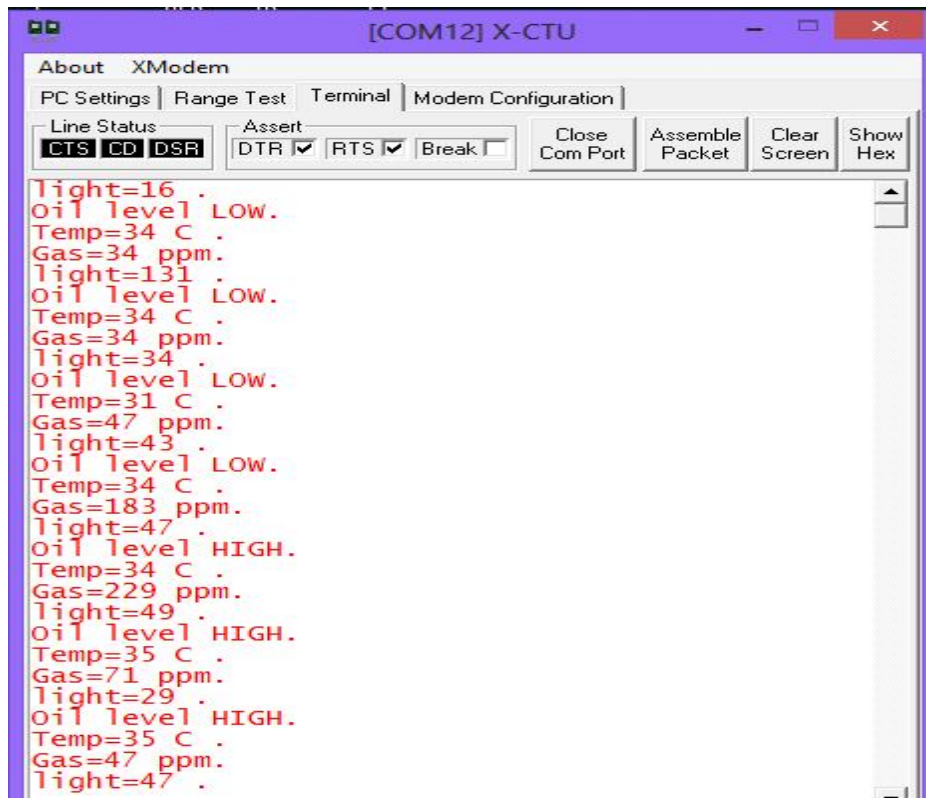


Fig b

Fig.9. Figure showing the result of proposed system



International Journal of Innovative Research in Computer and Communication Engineering

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Table I-Result Description

FIGURES	DESCRIPTION
Fig a	Overall System Board
Fig b	Output result on X-CTU configuration Software

V.CONCLUSION

This approach described here presents a technique of security system for oilfield industries using GSM and Zigbee. Presence of every module is reasoned out and placed carefully, thus contributing to the best working of the unit. The system is able to receive all the oil parameters like the current oil level, temperature of oil, leakage of gas. We have proposed a low-cost solution to enhance the oil field industries. It is secure, robust and low-power consuming. It can operate on multiple channels so as to avoid interference with other wireless device or equipment in the industry.

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