Smart Monitoring System For Bore Well Vehicle

T.Gunasekar, C.Gobinath, N.Manoj, A.D.Naveena, T.Nandhini

Abstract: India being the agrarian nation mostly depends on groundwater which is taken by bore wells and used for agriculture, industrial and domestic purpose. Majority of the total deep tube wells which irrigate 12.68 million hectares of land are located in India. The vehicle used for drilling tube wells is available in maximum number in western region of Tamil Nadu. This paper aims to safeguard the bore well vehicle from unnecessary damage that appears due to the certain abnormal conditions which arise during the drilling process. With the advanced technologies of arduino and GSM, the data are transmitted and displayed for the convenience of the driller for protecting the vehicle and also ease to the labors. . The main part of the proposed system is transmitting and receiving unit which takes place with the help of GSM and arduino. This set up is made on both sides (i.e. compressor and driller side) of the vehicle. This reduces the risk of the bore well vehicle from getting damaged by keeping the parameters such as engine temperature, oil level, RPM and condition of radiator fan (ON/OFF) under surveillance. This automation protects the machine as well as it reduces the human error which paves the way or proper operation of both drilling and compressor vehicle. This paper paves the easy way for manual verification during bore well drilling. Accurate parameter values are obtained which helps in deciding whether to operate the bore well vehicle or not. Reduces the repairing cost as well as avoids the damage of the equipment due to the rise in temperature.

Keywords: Vehicle, Bore well, Compressor, Engine, arduino, etc

1 INTRODUCTION

Water is one of the vital resources that have been gifted to the mankind. India is the land of farmers who depend on bore well for the water source. In that case there is frequent usage of bore well machines. The vehicle used for drilling bore wells is available in maximum number in western region of Tamil Nadu. When the bore hole is dug if the depth goes on rising, the RPM of the engine goes on increasing which in turn results in the rise of temperature. On the other hand oil pressure of the engine coolant should also be maintained. For the proper and safe working of the bore well system the driller has to monitor the parameters such as rpm, temperature, oil pressure which is responsible for the proper operation and maintenance of the complete bore well machine. Firstly, lack of proper monitoring of temperature make the engine to get ceased. It may also lead to the fire and the complete bore well vehicle may get burned. Secondly, in order to maintain the internal cooling as well as to maintain the pressure there is need to keep an eye on the oil pressure. Finally monitoring the RPM of the engine helps to know about to the external cooling of the water which circulates around the engine. If radiator fan failed to run the temperature of water will be increased. This constrain is important for fuel efficiency. This is the importance relying in monitoring these parameters which in turn makes the operators to observe and take necessary action.

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2 LITERATURE REVIEW

This monitoring duty is possible if both the compressor and driller are nearby and apart are shown in Figure 1. But the situation had got changed due to the vast increase in population. There is a lack of proper space for driller and compressor vehicle to stand nearby. Due to the increase in population there comes a compulsion for the vehicles to stand far apart. In this case keeping the track of those parameters is quite difficult. Even though this is possible the results will not be accurate in the existing manual operating system. This is because not all the times manual monitoring is easy and accurate.

***Fig. 1**. Driller and compressor vehicle standing near and apart*

3 PROPOSED SYSTEM

The main objective of this paper is to monitor the temperature, RPM, oil pressure and condition of the radiator fan which fortifies the bore well vehicle from getting ruined. The arduino is interfaced with the sensor and meter via voltage divider which is already available in the bore well vehicle. The GSM which transmits and receives signals with arduino is given a 5Volt supply with the help of voltage regulator. Compressor side manages the above mentioned process. On the other hand, in the driller side both GSM and arduino is fed with the same inputs which is similar to the compressor side. From the GSM, the data such as engine temperature, oil pressure and RPM get transmitted to the arduino which is displayed serially in the master side. Also it displays the condition whether radiator fan is in ON or OFF state. By monitoring these parameters we can protect the engine from getting ceased.

4 BLOCK DIAGRAM

The block diagram of the proposed system is shown in Figure 2. The proposed system mainly consists of compressor side (transmitting unit) and master side (receiving unit). Both sides are equipped with arduino and GSM 800A which helps in performing the transmitting and receiving operations.

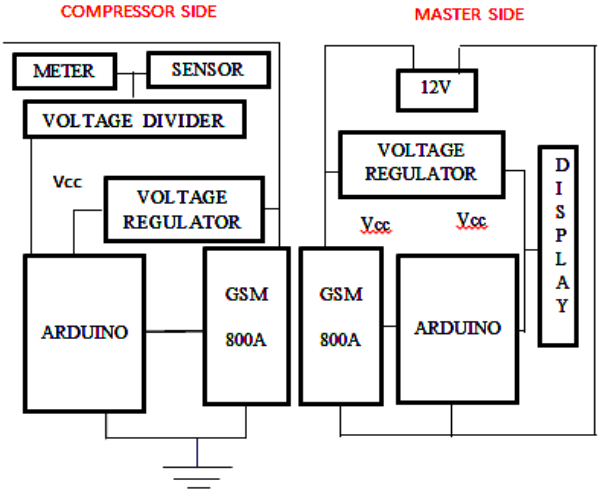

***Fig. 2**. Block diagram of the proposed method*

5 EQUIPMENTS AND ITS PURPOSE

5.1 Arduino

Arduino UNO is a micro controller board which consists of 6 analog inputs and 14 pins which can either be digital input or digital output as shown in Figure 3. This arduino operates with 5V. Arduino helps in communicating with a computer, another arduino board or another micro controller. The pins Tx and Rx is meant for transmitting and receiving data of requirement which makes these 2 pins for lead role of serial communication.

***Fig. 3**. Arduino UNO*

PURPOSE

The arduino is supplied with the input from sensor which is inbuilt in compressor side via the voltage divider as shown in Fig.4 which helps in limiting the voltage equal to or less than 5V which serves as the safe operating voltage. The meter connected in the machine operates between 0 and 24 volt. So the output voltage from the sensor acts like variable resistance. This variable voltage cannot be directly interfaced to the arduino. So by using the voltage divider the voltage is maintained and reduced below the 5V and this output is given as an analog input to the arduino board. The commands for interfacing voltage divider is shown in table 1

***TABLE 1** Commands for interfacing with arduino UNO*

COMMANDS	DESCRIPTION
Input = Analog read (A0)/(A1)	Reads the varying analog voltage (<5V) from the voltage divider
Vout = (input*5.0)/1023	Used to find the exact analog voltage in the pin A0/A1
Vin = (Vout*60000)/100000	Used to find the exact voltage across the voltage divider to determine the sensor value
Oil pressure = (Vin*100)/24	Used to find the exact meter deflection
Temp=(Vin*125)/24	Used to find the exact meter deflection

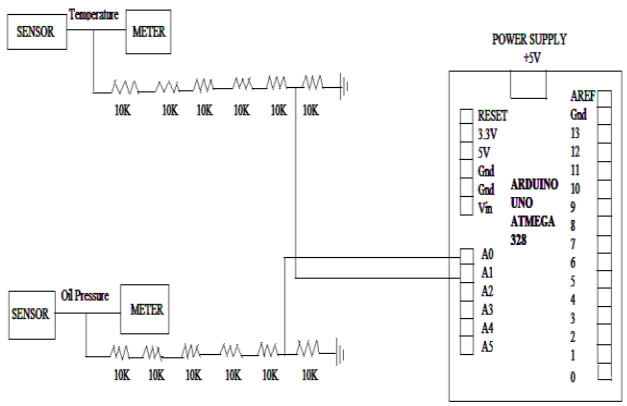

***Fig. 4**. Voltage Divider Connections*

5.2 GSM 800A

GSM 800A is a device which helps which operates over a range of 850Hz. It requires a SIM card for performing the transmission and receiving operations. The Tx pin of the GSM connected to the Rx pin of the arduino and similarly Rx pin of the GSM is connected with Tx pin of the arduino board. GSM 800A is shown in Figure 5.

***Fig. 5**. Global system for mobile communication (GSM 800A)*

PURPOSE

In order to take the data from the compressor side to master side, GSM is used. It receives the input from the arduino as shown in Figure 6 and transmits the details regarding temperature, oil pressure and RPM to master side which provides convenience for the operator with the help of AT commands shown in table 2.

***Table 2** Commands for Interfacing with Arduino UNO*

COMMANDS	DESCRIPTION
Serial.print ("\r");	Checking communication
Serial.Print("AT+CMGF=1\R");	To set the modem in SMS sending mode
Serial.Print("AT+CMGS=\XXXX"\A);	For sending SMS to the number
Serial.Print (oil pressure); Serial.Print (Temperature); Serial.Print (Rpm);	Message to Send
Serial.Print(0*1A);	End command for SMS a^z ASCII Code 26

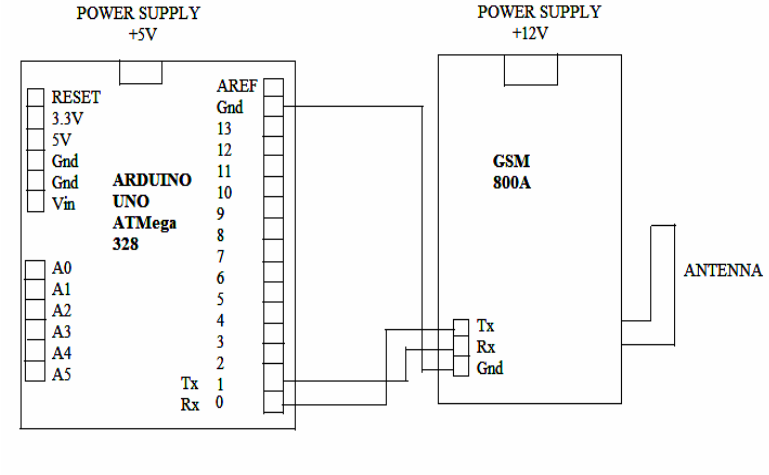

***Fig. 6**. Arduino Interfacing with GSM*

5.3 Voltage regulator

Any fluctuations in the voltage sources available in the circuit is corrected and fixed with the constant value with the help of voltage regulator. In this paper the following two integrated circuits are used as shown in Figure 7.

1. 7805 IC
2. 7812 IC

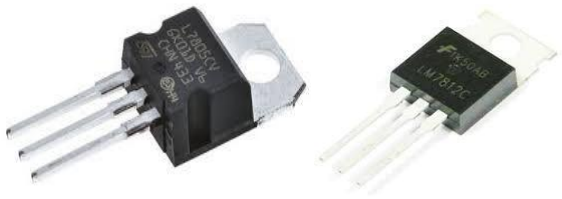

***Fig. 7**. Voltage Regulator 7805 and 7812*

PURPOSE

Voltage from the vehicle battery is 24V. It is regulated with the help of voltage regulator 7812 shown in Figure 9 which is given as an input to the GSM 800A.

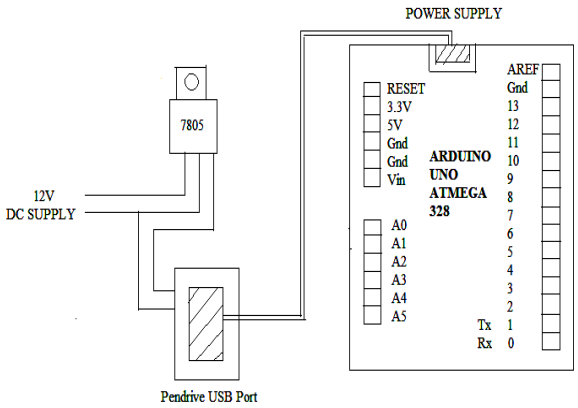

***Fig. 8**. Voltage Regulator 7805 with Arduino*

Also it is regulated with the help of voltage regulator 7805 shown in Figure 9. The voltage is regulated to 5V which is given as input to the arduino.

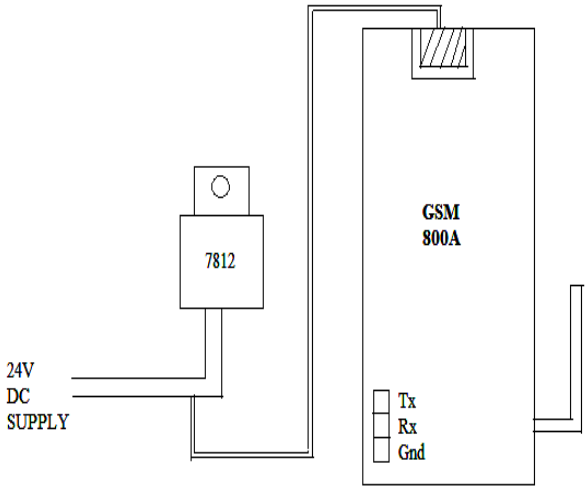

***Fig. 9**. Voltage Regulator 7812 with Arduino*

5.4 IR Sensor

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitter and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitter by an object and detecting motion. Infrared sensor module is shown in Figure 10.

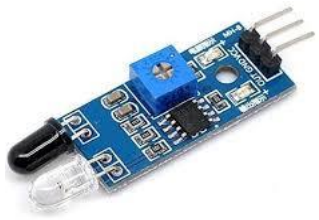

***Fig. 10**. Infrared sensor module*

PURPOSE

Due to presence of undesired noise in the alternator frequency, it was difficult to interface with arduino. So IR sensor is preferred. Vin of IR sensor is connected to 5V. Vout of IR sensor is connected to digital pin 2 of arduino. By counting high and low pulse from the IR sensor the data related to RPM is obtained. The connections of arduino with IR sensor are shown in Figure 11.

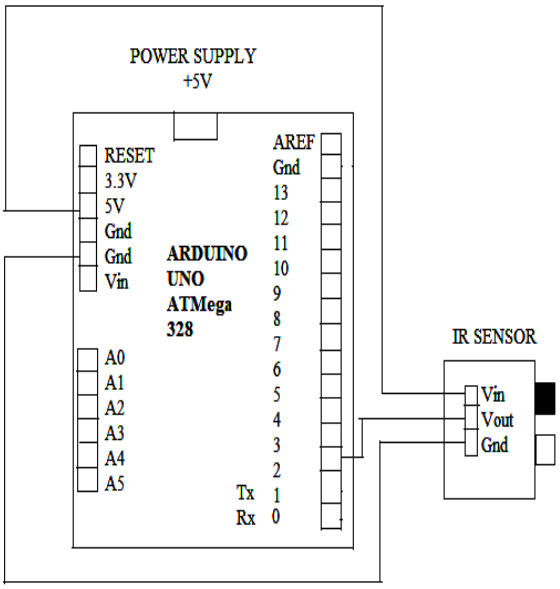

***Fig. 11**. IR Sensor and Arduino interfacing*

6 PROPOSED MODEL

The hardware setup for the transmitter and receiver unit is shown below in the Figure 12 and Figure 13. The former one is transmitter unit and the latter one is receiver unit which is sealed with metal sheet of 2mm thickness.

***Fig. 12.** Completed hardware setup of transmitter unit along with its dimension*

The length of the transmitter box is 7.5 inch, breadth of the box is 6 inch and depth of the box is 4.5 inch. So it requires less space to fit in the vehicle. The box is also provided with water proofing so it requires less safety in rainy days. Due to 2mm thickness sheet it is mechanically strong.

***Fig. 13**. Completed hardware setup of receiver unit along with its dimension*

The length of receiver box is 12 inch, breadth is 8 inch and depth is 5 inch. The receiver box is provided with ON/OFF button. Whenever the driller needs he/she can ON/OFF the receiver unit. The varying potentiometer is provided to adjust the contrast of LCD display. Water proofing technique is used in this unit. The same thickness used in this unit so the mechanical strength of the box is also high. This unit also requires less space and can be easily fixed in the operating zone.

7 SURVEY TAKEN

The survey is taken based on the rpm and depth which is shown in Table 3. It indicates that rpm increases with increase in depth due to presence of hard rock.

***TABLE 3** Survey based on the RPM and depth*

S.NO	RPM	DEPTH (feet)
1.	1852 (IDLE)	-
2	1758	300
3.	1638	480

8 CONCLUSION

This paper has investigated the problems which are involved in monitoring and transmitting the parameters while digging the bore well and presented a novel solution to the problem. The design incorporates the following innovations:

1. Make the monitoring work get easier even in populated areas
2. Safeguard the engine of the compressor machine from getting ceased

This design successfully utilizes arduino and GSM topology from other applications to create a unique contribution to the bore well vehicle. The varying outputs obtained from the LCD helps in providing proper protection. This paper reduces the risk of the bore well vehicle from getting damaged by keeping the parameters such as engine temperature, oil pressure, RPM and condition of radiator fan (ON/OFF) under surveillance. Accurate parameter values are obtained which helps in deciding whether to operate the bore well vehicle or not. Reduces the repairing cost as well as avoids the damage of the equipment.

9 FUTURE SCOPES

In future the paper can be extended in following manners.

- The depth of the bore well being drilled can be identified.
- The location of the vehicle can be traced and send to the owners with the help of GPS tracking system.
- The pH of the bore water can be checked.
- The fuel in the fuel tank can also be monitored and send to the owners.
- Warning signal can be issued regarding the cap at the end of the completion of work on a particular day

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