GSM Based Fuel Theft Detection, Over Speed Indicator and Temperature Alert System in a Petroleum Transportation Vehicle

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Abstract - **Petroleum is a conveyance by rail cars, automobiles, tanker containers, and through cylindrical pipelines. Which technique is used to move this oil be determined by the amount that is being relocated and its destination. The greatest difficulties with moving this oil are transportation with safety. With the increasing usage of oil and gas properties, there are quiet more difficulties to be solved in oil and gas storing and transport process, for example, oil and gas storing and transportation pipelines are certainly corroded, how to stop fire hazards in oil and gas storage and transportation method, how to decrease evaporation losses by real means because of its simply evaporating feature in oil gas storage and transportation procedure, which are the main issues that standing in oil and gas transportation systems wanted to attract sufficient attention. Through detailed analysis and study of the practical issues, appropriate results should be made to ensure the security and environmental security of oil and gas storage and transportation systems in the oil and gas storing and transportation procedure. Our research topic "GSM based fuel theft detection, temperature alert system and over speed indicator in petroleum vehicle" are focused on a transportation issue and how to solve them. We use several devices like GSM, Arduino and Atmega328 controller as a processing unit and sensors like float sensors, temperature sensors, and speed sensors as a primary unit to safe and secure transportation of petroleum and gas.**

Index Terms - **GSM, Arduino, Sensors, LCD, controller etc.**

I.INTRODUCTION

To handle any form of system, automation is required. Embedded design, which combines both a computer and a mechanical system, typically with real-time computing limitations, makes it conceivable. Automation is commonly used to operate most devices in today's environment since it specialize by decreasing product size and cost while increasing reliability and performance. Microcontroller-based embedded systems have a wide range of applications, from small handheld devices to huge installations and even massive complicated systems. Internal communications network with specialized requirements for vehicle control, such as message delivery assurance of non-conflicting messages. It is highly typical for transportation systems to be impacted by a variety of factors such as gasoline theft, premature dry out, fuel leakage, inappropriate fuel usage in engines, and fueling disputes. These problems result in a significant drop in fuel levels, putting the authorities in serious danger.

1.1 Fuel theft detection:

Because gasoline theft is a huge concern for owners and drivers, it has a significant influence on the authorities. It is a local error that occurs in the conveyed vehicle because fuel theft allows unauthorized individuals to benefit. Because it causes investors to lose a lot of money, but it also makes it easier for people to engage in illicit activities. The proposed technology looks to see how much fuel has been stowed away. It investigates all areas of gasoline theft and alerts authorities via text messaging. This methodical approach, combined with new tools, will help to effectively curb fuel theft, which will be a gift to our community.

1.2 Over speed indicator:

Many road accidents occur as a result of rash driving around the world. In India, a total of 4, 73,084 road accidents were reported in 2001. Because there are no mechanisms to manage or monitor the speed of automobiles on Indian roads, the traffic population has expanded significantly. This method has shown to be

quite successful in detecting excessive speeding. It is not necessary that such incidents occur as a result of driving while inebriated, as even someone who has not drank alcohol can drive recklessly. To address this issue and reduce the number of people killed in car accidents, new and innovative speed enforcement technology is required.

1.3 Temperature alert system in vehicle :

Transportation of a petroleum product from one place to other is very tough task. Petroleum products are highly flammable in nature. Because of this property of a petroleum products the temperature inside the tank should be constant and under the control position. As the solution of that we should have a device to continuously major and real time data of temperature to the authority so that we can detect and manage the various situations according to the data we receive.

II. LITERATURE SURVEY

Vishal Pande et.al [1] has suggested a framework for independent speed management of overspeeding automobiles that uses radio frequency to construct a controller to control vehicle speed and a display to monitor the regions that can run on an embedded system boards.

Monika Jain [2] showed a device that detects reckless driving and notifies traffic authorities if a violation occurs. This frame of reference aims to create a system that detects and alerts vehicles driving behaviours that are associated to rash driving at an early stage. Speed limit is set by the cops at each area that employs the system, which is adjusted according to traffic. For the management of speed violations, this gadget provides reports, displays, and a data base system.

Ni Hlaaing et.al [3] built a system that detects automobile speed on roads, major main roads, and other locations where vehicles surpass the speed limit. If the car exceeds the speed limit, the information is delivered to a PC (Personal Computer), which activates the camera and records the vehicle.

Amarnarayan et.al [4] An important subject that has recently gotten a lot of attention is the development of a strong and reliable speed estimating system that notifies drivers about driving situations and helps them avoid being stuck in traffic blockages.

Nehal Kassem et.al [5] unveiled an unique RF-based car motion and speed finding system that can detect car motion and estimate car speed in normal streets with a 90% accuracy and detect motion with a 100% accuracy.

Rajesh Kannan Megalingam et.al [6] created a wireless sensor system that not only conducts effective traffic directing but also keeps track of speeding vehicles, resulting in a smart traffic controller. MicaZ motes from Crossbow (MRP2400, a 2.4 GHz IEEE 802.15.4, TWMS (Tiny Wireless Measurement System)) are used for this. A gateway and DAC are used to acquire, send, and receive data (Data Acquisition Card). The Over Speed Detection Unit is made up of a microcontroller that generates interrupts and simulates a speedometer.

Muhammad Tahir Qadri et.al [7] For security control of a highly limited region such as military zones or areas around important government offices such as Parliament, Supreme Court, and others, a system that detects and recognises the number plate has been created and placed at the entry. The devised system first detects the car before taking a picture of it. The Vehicle number plate is extracted from an image using image segmentation.

Navod et al [8] Vehicle tracking, monitoring, and control, as well as vehicle status, were created and executed. A cell phone is used to monitor and manage the vehicle door, parking lights, and side mirrors in this system.

III. PROBLEM FORMULATION

1. If there is any fuel theft or if the vehicle is accessed by an unauthorized individual, the following procedure will be followed. The amount of fuel that will be stolen, as well as the unlawful entry to the vehicle, will be communicated to the auditing program as notifications.

2. Urban local streets, collectors, minor arterials, and principle arterials with stated speed restrictions of less than or equal to 64 km/h are considered low-speed urban streets (40 mph). Low-speed urban roadways are intended to allow both access and mobility to a variety of road users, including bikes and walkers. To perform the intended function and improve overall safety, these facilities should operate at lower speeds.

3. Temperature inside the fuel tank may affects with various reasons like atmospheric temperature, vehicle overheating, fuel overheating and others to finding reasons and solving it is very difficult task.

IV. METHODOLOGY

1. FUEL THEFT DETECTION

A circuit diagram is displayed. The ATMEGA328 microcontroller was utilised. The LCD16x2 is connected to the microcontroller and displays the fuel and gear levels. We used a GSM modem to convey a warning about fuel theft. A buzzer is used to alert people. The limit switch is used to turn on the ignition at first. Following ignition, the LCD will show the current fuel level and gear level. By pressing the start button, the car will start and consume some of the fuel in the tank. We must alter the vehicle's gear level in order for it to run properly, and this changeable gear level is also displayed on the LCD. After a short period of time, the car will come to a halt, and the current fuel level will be saved in the microcontroller's memory. When gasoline theft happens, the fuel level drops, and a message is sent to the owner through GSM modem. The buzzer will go off at that point. We will learn that fuel theft has occurred as a result of this.
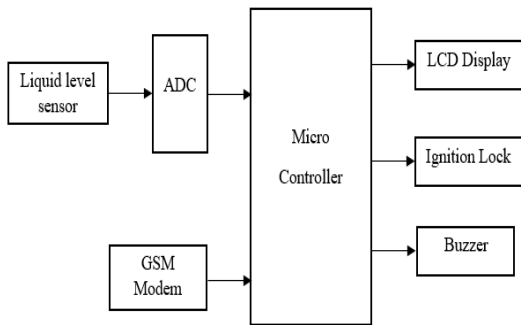

Fig1. Block Diagram

1. OVER SPEED INDICATOR :

Figure 2 depicts the proposed system's block diagram. It comprises of an Arduino Mega-based controller that monitors the vehicle's location and speed using a GPRS+GPS Quad band Module (SIM908), GSM antenna, GPS antenna, and SIM card. If the vehicle enters one of the defined regions, the controller checks the vehicle's speed to the area's maximum permissible speed. An active buzzer used in this system generates a buzzer sound if over speeding is detected, alerting the driver that he is exceeding the speed limit. The following subsections outline the functionality and features of the various building pieces used in our system.
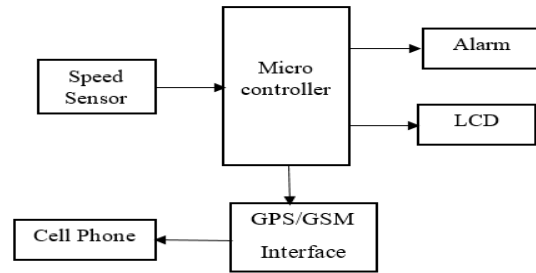

Fig2. Block Diagram

2. TEMPERATURE ALERT SYSTEM :

LM35 Sensor is used to check the temperature inside the tank. The LM35 sensor has three pins; its power supply is 3.3 volts, and its GND pin is connected to the Arduino's GND pin, while its Digital pin is attached to the Arduino's Digital pin.
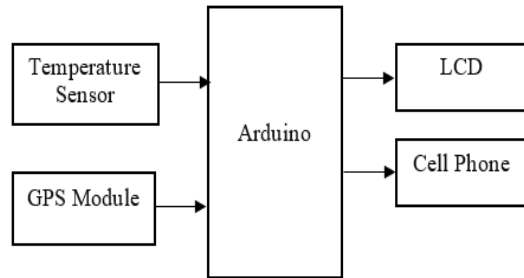

Fig3. Block Diagram

V. RESULT AND DISCUSSION

1. FUEL THEFT DETECTION:

Fluid level is used for in a petroleum tank. This level sensor send continues data to ATMEGA 328 micro-controller connected with Arduino. Level of fuel is display in a LCD screen. All simulation is done in proteus 8 Software. The Proteus Design Set is a Windows tool that permits you to record schematics, simulate them, and create PCB layouts. It comes in a variation of forms, dependent on the size of the designs being shaped and the microcontroller simulation requirements. If the fuel level falls below a certain level, the system sends an alert to the authorities.
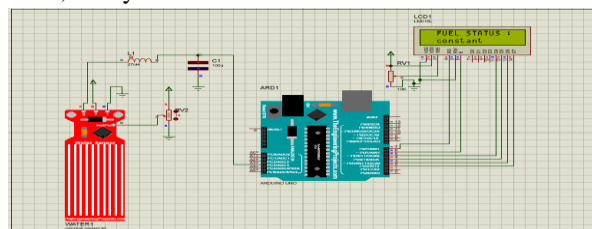
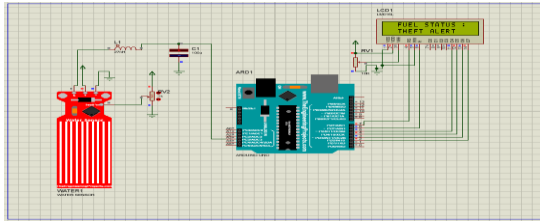Fig5. If level of fuel inside the tank is constant

Fig6. If level of fuel inside the tank is decreasing

Table.1 Fuel status alert

S.N.	Fuel tank Status	LCD Alert
1.	Safe	Constant
2.	Not safe	Theft alert

2. OVER SPEED INDICATOR :

Two IR Sensor are used for measuring the Speed of vehicle. If vehicle exceeded the speed limit Controller send data to the micro- controller and microcontroller send an alert to the Authority and display on LCD and also turn on the buzzer to alert a driver.
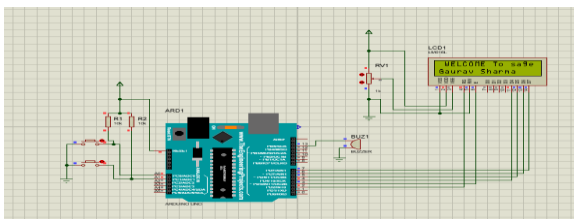

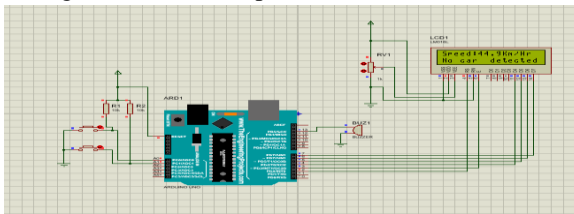Fig7. Vehicle over speed Indication Simulation

Fig8. Vehicle speed is up to the limit

Table2. Vehicle Speed detection

S.N.	Speed of vehicle	LCD Alert
1.	Under 80 kmph	Speed
2.	Above 80 kmph	Over Speed Alert

3. TEMPERATURE ALERT SYSTEM :

LM35 is used in a petroleum tank for continuously measuring and alert of temperature inside the tank. If temperature exceeded the limit it alert the authority. Three LED are also used for safety. If the temperature inside the tank is up to 28^OC than green LED is on. If the temperature inside the tank is in between 28^OC to 40^OC than yellow LED is on and if the temperature inside the tank is above 40^OC than red LED is on.
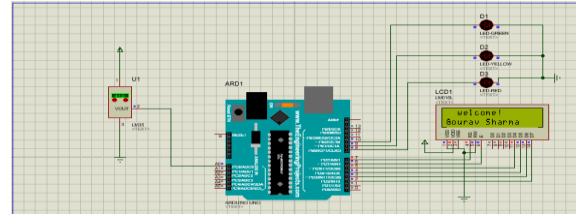

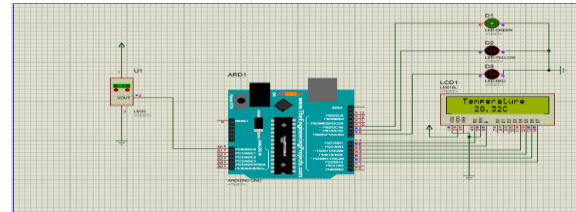Fig9. Vehicle temperature alert system

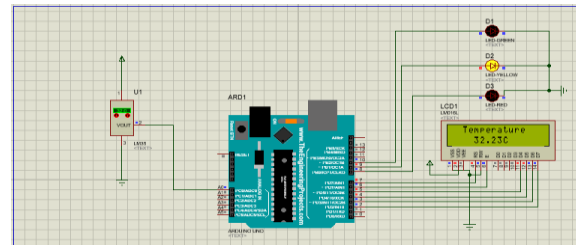Fig10. If temp. of fuel tank is normal (Green LED Blink)

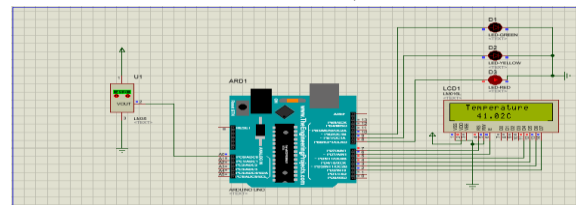Fig11. If temp. of fuel tank is little high (Yellow LED Blink)

Fig12. If temp. of tank is much higher (Red LED Blink)

Table3. Temp. Alert System

S.No.	Temp. inside tank	LCD Alert	LED Alert
1.	Up to 28^0C	Showing Temp. Value	Green LED Blink
2.	Between 28^0C to 40^0C	Showing Temp. Value	Yellow LED Blink
3.	Above 40^0C	Showing Temp. Alert	Red LED Blink

VI. CONCLUSION

We All know very well that transportation of petroleum products like petrol, diesel and natural gases from one place to other place is very difficult task. There are so many things we must have to

consider and must be aware about this like speed of transport vehicle, temperature inside the tank, monitoring of fuel.

In this paper we gives all solution through mechatronics and wireless communication. This all solution is very important and necessary parts for protecting this highly flammable product. Because one simple mistake or hazard is through us in a danger situation.

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