

Freighter Fuel Level Detection and Overload Alarming System Using Wireless Sensor Network Using GSM

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Abstract:

The main theme of this application is to detect the fuel level in large scale industries. In this project for detection purpose level sensors are used and it will automatically detect the fuel level and further operation will be implemented. This application is implemented by using embedded technology. In this application total three load levels are implemented. By default, at initial level it remains in no load status, when load increases and still remain in optimal level then the system notify crews to initiate voyage. If the load increases to over load level then the system gives alarm and sends alert message to the main control tower for necessary initiative. The message will be transmitted to the authorized person by using GSM MODEM through ARM7(LPC 2148) processor and simultaneously the buzzer also gets activated using driver circuit.

Index Terms:

Sensor, LPC2148,GSM.

I.INTRODUCTION:

A major concern to make the freighter based industry system more safe and reliable. But some hazardous incidents in recent years have instigated the researcher to make the system more reliable. In a report it has been seen that only in Bangladesh around 3869 people have been died since 1976 by water vessel hazard [1] and in US around 651 people have been died in the year 2012 [2]. A case study reveals that about 80 per cent of the accidents occurring at factories were the result of human errors. Most of the overloading of fuel cases indicate that the vessels were loaded as many as times of their capacity. On the other hand, maximum workers are not concerned about freighter loading condition and fuel level.

Most of these level sensing are analogue or a personnel is engaged to monitor loading and fuel level. Besides, it's a boring and difficult task to check the fuel level frequently in running condition. Sometimes if the bilge pump seems to be working overtime it may result vessel to be filling with water and seems to feel heavy. So in this research, the soul idea and motivation is to design a system to avoid freighter hazard due to overloading and lacking fuel level surveillance. Since the system is digital, it requires no personnel to monitor fuel level and water level again and again on running condition. The system will work automatically according to the load and in any hazard condition it will give alert alarm and send notification message to the central monitoring unit for necessary initiative. Moreover, for overloading, high pressure falls on engine which may cause degradation of engine performance. Overloading alert can save this degradation.

Alarm system purpose:

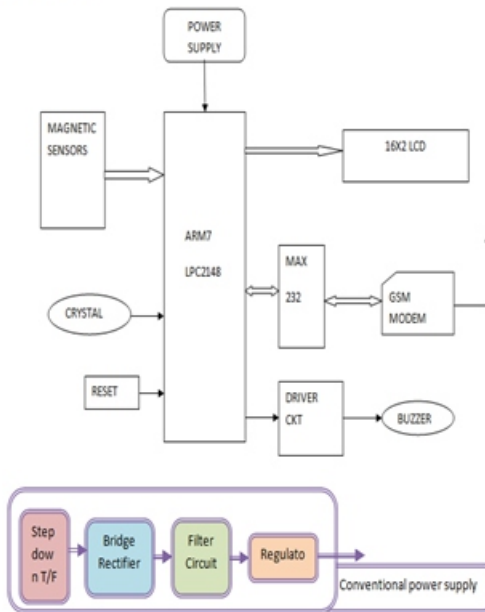
An alarm system is a basic operator support system for managing abnormal situations and it has the following two functions: The primary function of the alarm system is to warn the operator about a situation that is not normal. The warning function helps the operator control the future behaviour of a complex plant by attracting attention to undesired process conditions. The system should inform the operator about plant conditions that require timely assessment and possibly corrective action in order to maintain plant goals in terms of safety, productivity, environment and efficiency. Each alarm should alert, inform and guide the operator.

Alarms should:

- Be relevant to the operator's role at the time
- Indicate what response is required

- Be presented at a rate that the operator can deal with
- Be easy to understand.

BLOCK DIAGRAM:



This project uses two power supplies, one is regulated 5V for modules and other one is 3.3V for microcontroller. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full Wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

II.HARDWARE DESIGN:

A.Global System for Mobile Communication (GSM)

Definition:

GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.

TABLE I. SOME COMMANDS USED IN GSM DATA TRANSFER MODULE OF THE SYSTEM

AT Command	Meaning
+CMGI	Module ok
+CMGS	Send message
+CMGW	Write message to memory
+CMGD	Delete message
+CMGC	Send command
+CMSS	Send message from storage

GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.



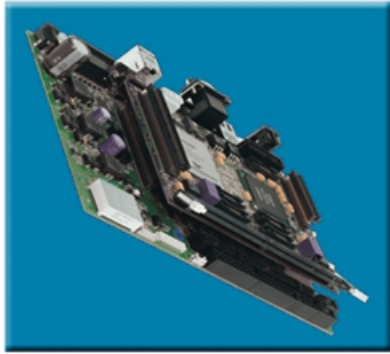
Modem specifications:

The SIM300 is a complete Tri-band GSM solution in a compact plug-in module. Featuring an industry-standard interface, the SIM300 delivers GSM/GPRS900/1800/1900Mhz performance for voice, SMS, data and Fax in a small form factor and with low power consumption.

B.LPC2148 controller:

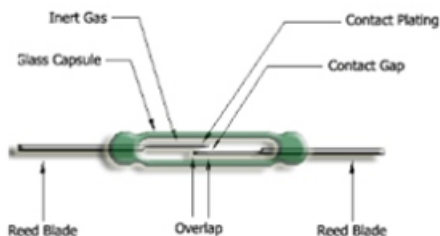
The LPC2148 are based on a 16/32 bit ARM7TDMI-STMTM CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT, PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale.

With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.



C. Magnetic Sensors:

The reed switch is an electrical switch operated by an applied magnetic field. It was invented at Bell Telephone Laboratories in 1936 by W. B. Ellwood. It consists of a pair of contacts on ferrous metal reeds in a hermetically sealed glass envelope. The contacts may be normally open, closing when a magnetic field is present, or normally closed and opening when a magnetic field is applied. The switch may be actuated by a coil, making a reed relay, or by bringing a magnet near to the switch. Once the magnet is pulled away from the switch, the reed switch will go back to its original position. An example of a reed switch's application is to detect the opening of a door, when used as a proximity switch for a burglar alarm. The reed switch contains a pair (or more) of magnetizable, flexible, metal reeds whose end portions are separated by a small gap when the switch is open. The reeds are hermetically sealed in opposite ends of a tubular glass envelope.

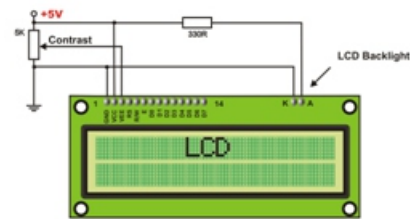


D. LCD:

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining prices of LCDs.
2. The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
4. Ease of programming for characters and graphics.

These components are “specialized” for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.



A. Keil compiler:

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

B. Proload:

Proload is a software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller placed in the programmer kit and this is done by the Proload. Programmer kit contains a microcontroller on it other than the one which is to be programmed.

This microcontroller has a program in it written in such a way that it accepts the hex file from the keil compiler and dumps this hex file into the microcontroller which is to be programmed.

IV. ADVANTAGES:

Device can be implemented with low cost, easy maintenance, loss of life or any accident can be avoided and human effort is reduced.

V. CONCLUSION:

The proposed system works very effectively until it is physically damaged within a certain GSM coverage network area. Cheap electronic equipment are used to make the system economical. It works automatically without any sophisticated operating command, so it is very user friendly to freighter worker or crew.

VI. REFERENCES:

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