International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

Freighter Fuel Level detection and Overload Alarming System with Safety Notification via GSM

[1]M.Raj Kiran& [2]Y.Raghuram Prasad
[1]M.Tech., Department Of Ece,Sree Shiridi Sai Institute Of Science And Engineering Anantapur
[2]Associate Professor,Hod, Department Of Ece,Sree Shiridi Sai Institute Of Science And Engineering Anantapur.

ABSTRACT

Freighter is a cardinal part for the transport, especially for the inland, inshore and seaward navigation system. It provides a better alternative to other modes of transport by being energy efficient and reliable since it can carry large number of people and goods at the same time. Especially for the lower land and populated countries like Bangladesh, India, Maldives, Indonesia etc; it becomes an inevitable part for the transport system. By carrying goods inside and outside the country it is contributing a lot to the economy. So it is a major concern to make the freighter based transportation 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 and in US around 651 people have been died in the year 2012. A case study reveals that about 80 per cent of the accidents occurring at water body were the result of human errors.

A LPC-2148 microcontroller based digital electronic system has been designed to monitor the fuel level and total amount of load on the freighter and generate scan report for the captain of the freighter. The system is designed for three different freighter load levels; no load, optimal load and over load. 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 communication between the vessel and main control tower is done by GSM module to ensure long distance reliable communication. For amenity, freighter fuel level is monitored in both analogue and digital scale. The system is implemented by PIC midrange microcontroller based hardware and low cost GSM module which makes it more economic, reliable and efficient.

1 INTRODUCTION

Microcontrollers are "embedded" inside some other device (often a consumer product) so that they can control the features or actions of the product. Another name for a microcontroller, therefore, is "embedded controller". Microcontrollers are dedicated to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change.

Microcontrollers are often low-power devices and has a dedicated input device and often (but not always) has a small LED or LCD display for output. A microcontroller also takes input from the device it is controlling and controls the device by sending signals to different components in the device. For example, the microcontroller inside a TV takes input from the remote control and displays output on the TV screen. The controller controls the channel selector, the speaker system and certain adjustments on the picture tube electronics such as tint and brightness. The engine controller in a car takes input from sensors such as the oxygen and knock sensors and controls things like fuel mix and spark plug timing. A microwave oven controller takes input from a keypad, displays output on an LCD display and controls a relay that turns the microwave generator on and off. A microcontroller is often small and low cost.

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

The components are chosen to minimize size and to be as inexpensive as possible.

The microcontroller controlling a car's engine, for example, has to work in temperature extremes that a normal computer generally cannot handle. A car's microcontroller in Alaska has to work fine in -30 degree F (-34 C) weather, while the same microcontroller in Nevada might be operating at 120 degrees F (49 C). When you add the heat naturally generated by the engine, the temperature can go as high as 150 or 180 degrees F (65-80 C) in the engine compartment. On the other hand, a microcontroller embedded inside a VCR hasn't been ruggedized at all. The actual processor used to implement a microcontroller can vary widely.

The Intel 8051 is Harvard architecture, single chip microcontroller (µC) which was developed by Intel in 1980 for use in embedded systems. The official designation for the 8051 family is **MCS 51**. Intel's original versions were popular in the 1980s and early 1990s, but has today largely been superseded by a vast range of faster and/or functionally enhanced 8051-compatible devices manufactured by more than 20 independent manufacturers including Atmel, Infineon. Technologies (formerly Siemensag), NXP (formerly Philips Semiconductor),Nuvoton(formerly Winbond), ST Microelectronics, Silicon Laboratories (formerly Cygnal), Texas Instruments and Cypress Semiconductor.

Intel's original 8051 family was developed using NMOS technology, but later versions, identified by a letter C in their name (e.g., 80C51) used CMOS technology and were less power-hungry than their NMOS predecessors. This made them more suitable for battery-powered devices

1.2Memory Architecture

The 8051 has four distinct types of memory - internal RAM, special function registers, program memory, and external data memory.Internal RAM (IRAM) is located from address 0 to address 0xFF. IRAM from 0x00 to 0x7F can be accessed directly, and the bytes from 0x20 to 0x2F are also bit-addressable. IRAM from 0x80 to 0xFF must be accessed indirectly, using the @R0 or @R1 syntax, with the address to access loaded in R0 or R1.

Special function registers (SFR) are located from address 0x80 to 0xFF, and are accessed directly using the same instructions as for the lower half of IRAM. Some of the SFR's are also bit-addressable.

External data memory (XRAM) also starts at address 0. It can also be on- or off-chip; what makes it "external" is that it must be accessed using the MOVX (Move external) instruction. Many variants of the 8051 include the standard 256 bytes of IRAM plus a few KB of XRAM on the chip. If more XRAM is required by an application, the internal XRAM can be disabled, and all MOVX instructions will fetch from the external bus.

1.3DESCRIPTION OF MICRO CONTROLLER AT89S52

The AT89S52 is a low-power; high-performance CMOS 8-bit microcontroller with 8Kbytes of in-system programmable flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications flash memory. The device is manufactured using Atmel’s high-density non volatile memory technology and is compatible with the industry

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system The AT89S52 provides the following standard features: 8K bytes of flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes..

BLOCKDIAGRAM

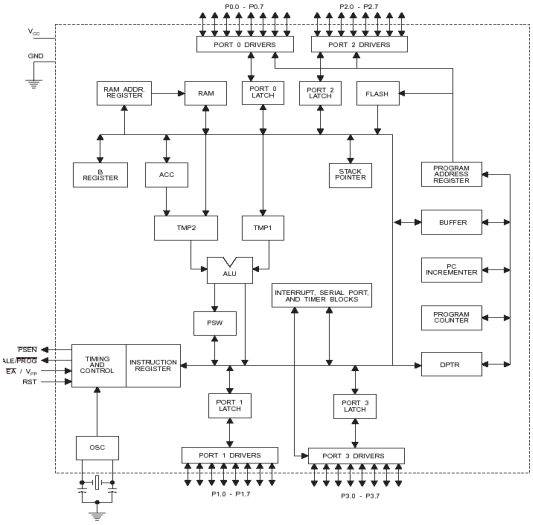


Fig 1.1:Architectureof AT89S52

2.HARDWARE DESCRIPTION

2.1 OSCILLATOR CHARACTERISTICS

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator, as shown in Figure3.3. Either a quartz crystal or ceramic resonator may be used.

To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven as shown in Figure 2. There are no requirements on the duty cycle of the external clock signal, since the input to the internal clocking circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed.

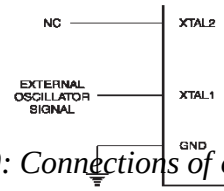


Fig 2.0: Connections of oscillator

2.1.0 AT89S52: Types of memory

The 89S52 as three very general types of memory the memory types are On-Chip Memory, External Code Memory, and External RAM

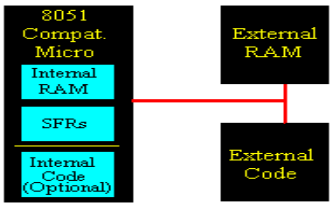


Fig 2.1: Diagram for types of memory

2.1.1External code memory

Is code (or program) memory that resides off-chip? This is often in the form of an external EPROM.

2.1.2 External ram

Is RAM memory that resides off-chip? This is often in the form of standard static RAM or flash RAM.

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

2.1.3 Code memory

Code memory is the memory that holds the actual 89S52 program that is to be run. This memory is limited to 64K and comes in many shapes and sizes: Code memory may be found on-chip, either burned into the microcontroller as ROM or EPROM. Code may also be stored completely off-chip in an external ROM or, more commonly, an external EPROM. Flash RAM is also another popular method of storing a program. Various combinations of these memory types may also be used that is to say, it is possible to have 4K of code memory on-chip and 64k of code memory off chip in an EPROM.

When the program is stored on-chip the 64K maximum is often reduced to 4k, 8k, or 16k. This varies depending on the version of the chip that is being used. Each version offers specific capabilities and one of the distinguishing factors from chip to chip is how much ROM/EPROM space the chip has.

2.1.4 External RAM

As an obvious opposite of Internal RAM, the 89S52 also supports what is called External RAM.As the name suggests, External RAM is any random access memory which is found off-chip. Since the memory is off-chip it is not as flexible in terms of accessing, and is also slower. For example, to increment an Internal RAM location by 1 requires only 1 instruction and 1 instruction cycle. To increment a 1-byte value stored in External RAM requires 4 instructions and 7 instruction cycles. In this case, external memory is 7 times slower! What External RAM loses in speed and flexibility it gains in quantity? While Internal RAM is limited to 128 bytes (256 bytes with an 8052), the 89S52supports External RAM up to 64K.

2.1.5 On-chip memory

As mentioned, the 89S52 includes a certain amount of on-chip memory. On-chip memory is really one of two types: Internal RAM and Special Function Register (SFR) memory. The layout of the 89c52's internal memory is presented in the following memory map.

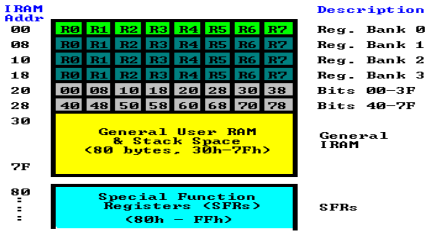


Fig 2.2: On chip memory diagram

As is illustrated in above map, the 89S52 has a bank of 128 bytes of Internal RAM. This Internal RAM is found on-chip on the 89S52 so it is the fastest RAM available, and it is also the most flexible in terms of reading, writing, and modifying its contents. Internal RAM is volatile, so when the 89S52 is reset this memory is cleared. Power supply:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A dc power supply which maintains the output voltage constant irrespective of ac mains fluctuations or load variations is known as “Regulated D.C Power Supply”

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

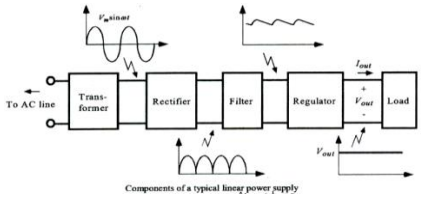


Fig 2.3: Block Diagram of Power Supply

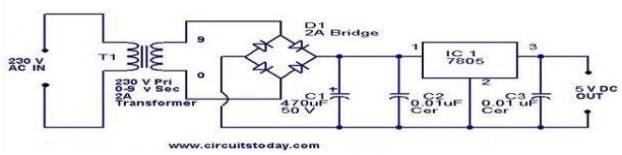


Fig 2.4: Schematic Diagram of Power Supply

2.2 TRANSFORMER

A transformer is an electrical device which is used to convert electrical power from one Electrical circuit to another without change in frequency. When AC is applied to the primary winding of the power transformer it can either be stepped down or up depending on the value of DC needed. In our circuit the transformer of 230v/15-0-15v is used to perform the step down operation where a 230V AC appears as 15V AC across the secondary winding. One alteration of input causes the top of the transformer to be positive and the bottom negative.

The next alteration will temporarily cause the reverse. The current rating of the transformer used in our project is 2A. Apart from stepping down AC voltages, it gives isolation between the power source and power supply circuitries.

Fig 3.5: Electrical Transformers

Turns ratio = Vp/ VS = Np/NS

Power Out= Power In

VS X IS=VP X I

Vp = primary (input) voltage

Np = number of turns on primary coil

Ip = primary (input) current

2.3 RECTIFIER

A circuit which is used to convert ac to dc is known as RECTIFIER. The process of conversion ac to dc is called "rectification.

3.PROPOSED SYSETEM

Freighter is a cardinal part for the transport, especially for the inland, inshore and seaward navigation system. It provides a better alternative to other modes of transport by being energy efficient and reliable since it can carry large number of people and goods at the same time. Especially for the lower land and populated countries like Bangladesh, India, Maldives, Indonesia etc; it becomes an inevitable part for the transport system. By carrying goods inside and outside the country it is contributing a lot to the economy. So it is a major concern to make the freighter based transportation 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 and in US around 651 people have been died in the year 2012. A case study reveals that about 80 per cent of the accidents occurring at water body were the result of human errors.

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

A LPC-2148 microcontroller based digital electronic system has been designed to monitor the fuel level and total amount of load on the freighter and generate scan report for the captain of the freighter. The system is designed for three different freighter load levels; no load, optimal load and over load. 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 communication between the vessel and main control tower is done by GSM module to ensure long distance reliable communication. For amenity, freighter fuel level is monitored in both analogue and digital scale. The system is implemented by PIC midrange microcontroller based hardware and low cost GSM module which makes it more economic, reliable and efficient.

3.1 WORKING

This project is implemented by PIC midrange microcontroller based hardware and low cost GSM module which makes it more economic, reliable and efficient. Firstly the GSM module circuit is switched ON and then we need to trigger the power supply of main microcontroller module. Thereafter vary the load values in load sensing unit or fuel value levels in fuel monitoring unit

Gently vary the load value by holding the notch of load sensor from loosely to tightly. The load values are designated by three ranges namely (1) no load condition, (2) Optimum condition and (3) heavy load condition .The load values are from 0 to 20 are marked as no load condition due to sensitivity of the load sensor used in this project,as more the sensitivity more will be the accuracy. Values from 21 to 70 are marked as Optimum load condition and above the value of 70 are processed as heavy load. After getting the range bared on the vehicle, the obtained value is converted into according digital value by ADC(analog to digital converter), the same value is processed to the micro controller and then given to LCD display thereafter the SMS alert will be sent by the GSM module.

For detection of Fighter fuel level we used three colored wires for ranging three fuel levels. They are black, white, red and blue wires. The black wire is grounded and the white is for high .The blue is for medium and the red indicates for low. If we join all three wires , we will get a fuel is high and is displayed on the LCD module . If we join the remaining wires expect white then on the LCD screen it displays fuel is medium .In the next case if we join the red and black it indicates low fuel level and the obtained values is processed by the micro controller and then displayed on the LCD display and SMS alert will be send by GSM module.

AT89C52 microcontroller has the feature of In-System programming. Due to this it do not require any separate hardware programmer to get program. It includes an inbuilt boot program, which helps it in programming, erasing and in-application programming. The object code formed by the assembler or cross compiler is loaded into the software called IN-System programmer. Flash magic in system programmer. This window based programmer communicates with the microcontroller boot program through serial port.

If we apply heavy load beyond the optimal values, then on the LCD display it indicates as high and the buzzer starts alarming and the information is sent to mobile using GSM modem and also if there is low fuel level, on LCD display it indicates as fuel is low and the buzzer starts

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

alarming and the information is sent to mobile using GSM modem.

BLOCK DIAGRAM

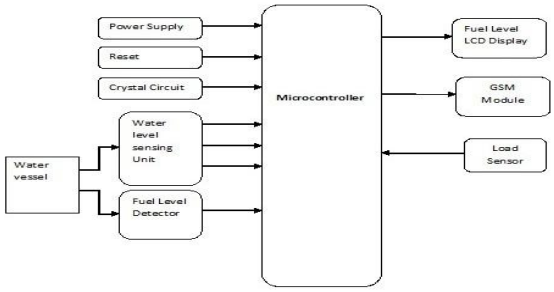


Fig 3.0 Block Diagram

3.3BLOCK DIAGRAM DESCRIPTION

3.3.1 Power supply

The microcontroller and other devices get power supply from AC to Dc adapter through voltage regulator. The adapter output voltage will be 12V DC none regulated. The 7805 voltage regulators are used to convert 12 V to 5VDC.

3.3.2Micro controller-AT89S52

The AT89S2 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry- standard 80C51 instruction set and pin out.

3.3.3 Fuel level sensors

The requirement of fitting fuel level detection system for detecting water ingress in the cargo holds and other spaces of bulk carriers in accordance with SOLAS XII Regulation 12 is applicable regardless of date of build of the bulk carrier. The detectors are to be provided as follows:

- In each cargo hold, giving audible and visual alarms, one when the fuel level above the inner bottom in any hold reaches a height of 0.5 m and another at a height not less than 15% of the depth of the cargo hold but not more than 2.0 m. The water level detectors are to be fitted in the aft end of the cargo holds. For cargo holds which are used for water ballast, an alarm overriding device may be installed. The visual alarms are to clearly discriminate between the two different water levels detected in each hold;
- In any ballast tank forward of the collision bulkhead required by SOLAS regulation II-1/11, giving an audible and visual alarm when the liquid in the tank reaches a level not exceeding 10% of the tank capacity.
- In any dry or void space other than a chain cable locker, any part of which extends forward of the foremost cargo hold, giving an audible and visual alarm at a water level of 0.1 m above the deck. Such alarms need not be provided in enclosed spaces the volume of which does not exceed 0.1% of the ship's maximum displacement volume.

The requirement of fitting water level detection system for detecting water ingress in the cargo hold on single hold cargo ships other than bulk carriers in accordance with SOLAS II-1 Regulation 25 is applicable regardless of date of build to ships having a load line length (LLL) of less than 80 m, or 100 m if constructed before 1st July 1998, and having

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

- A single cargo hold below the freeboard deck, or,

- Cargo holds below the freeboard deck which are not separated by at least one bulkhead made watertight up to that deck.

The water level detectors required need not be fitted in ships already complying with SOLAS XII Regulation 12, or in ships having watertight side compartments each side of the cargo hold length extending vertically at least from inner bottom to freeboard deck. The detectors are to:

- give an audible and visual alarm when the water level above the inner bottom in the cargo hold reaches a height of not less than 0.3 m, and another when such level reaches not more than 15% of the mean depth of the cargo hold; and
- be fitted at the aft end of the hold, or above its lowest part where the inner bottom is not parallel to the designed waterline. Where webs or partial watertight bulkheads are fitted above the inner bottom, IRS may require the fitting of additional detectors.

LCD

The primary function of the display will be to show the direction in which way the mechanism is moving and to know its working when it encounter the obstacle.

GSM Modem:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

A SIM card contains the following information:

- Subscriber telephone number (MSISDN)
- International subscriber number (**IMSI, International Mobile Subscriber Identity)**
- State of the SIM card
- Service code (operator)
- Authentication key
- PIN (Personal Identification Code)
- PUK (Personal Unlock Code)

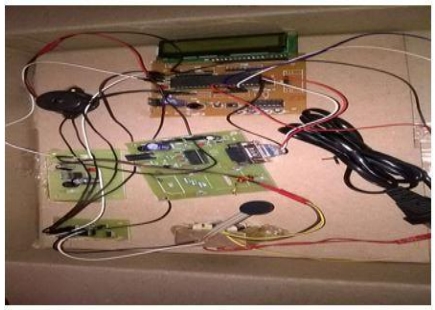
4.EXPERIMENTAL RESULTS

4.1 RESULT

Results include the successful operation of the “Freighter Fuel Level detection and Overload alarming system with safety notification via GSM module”. We successfully implemented the new possible credentials to monitor the fuel and load by giving necessary intimations when man made errors happened during transportation as shown in

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

below snapshot.



ADVANTAGES

More efficient,
Less waiting time,
Efficient operation during emergency cases,
Designed system has simple architecture,
Fast response time,
User friendliness,
Scope for further expansion.

4.2 APPLICATIONS

1.It is majorly used in advanced vehicle system to monitor the fuel and load .

2.It can be used in heavy transportation vehicles used in either on road or water ways.

5.CONCLUSION

In this project we have studied the new monitoring capabilities for fuel and overload with safety alarming indications through global system for mobile communication. The basic block diagram of this system and schematic diagram shows the complete circuit diagram of microcontroller board. By using this system configuration we can reduce the possibilities of human errors made during transportation and we have successfully gets the results.

FUTURE SCOPE

In future this system can be used to implement in various real time transportation vehicles to monitor the load and fuel.The communication between the vessel and main control tower is done by GSM module to ensure long distance reliable communication. For amenity, freighter fuel level is monitored in both analogue and digital scale. The system is implemented by PIC midrange microcontroller based hardware and low cost GSM module which makes it more economic, reliable and efficient.

It would also be sensible that the proposed automated scheme for monitoring and reporting violations during transportation should be realized in practice. Furthermore, extended application of the proposed scheme providing the capability to similarly monitor and/or record events occurring in the transport vehicle in the future.

6.BIBILOGRAPHY

[1]Microprocessor Architecture, Programming & Applications by Ramesh S. Gaonkar

[2] Fundamentals Of Microprocessors and Microcomputers by Ram

[3]Electronic components by D.V. Prasad

[4] Wireless communication by Theodore S. Rappaport

[5]Mobile Tele Communications by William C.Y. Lee

[6] The 8051 Micro controller and Embedded Systems by Muhammad Ali Mazidi.

[7] The 8051 Micro controller Architecture, Programming & Applications by Kenneth J