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Implementation Of Fuel Level Indicator By Using Ultrasonic Sensor For The Automobile Vehicle

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SYNOPSIS

The project we completed was titled **"FUEL LEVEL MEASURE INDICATOR."** Our project's primary focus is on keeping an eye on the fuel level in IC engines. The fuel level is not precisely determined while using the IC engines for bridge construction or other applications. Based on a basic calculation, they fill the fuel tank. Only a skilled individual should be able to determine the level at that point. This idea also allows an untrained worker to determine the tank's fuel level. We employ electric energy as the power source to check the fuel level in the IC engines in order to prevent time delays. It is designed primarily for stationary engines. Our project's primary benefit is the ability to track the fuel level in the IC engine, which will be utilized to build bridges and piling foundations in isolated locations. By altering or modifying specific technology, this can likewise be used to mobile engines.

1. Fuel supply system :

The fuel supply system's duties include
(i) Storing fuel
(ii) Supplying the engine with the necessary amount of fuel in the right condition
(iii) Alerting the driver to the fuel tank's level.

1.1 Fuel supply system of a petrol engine:

The fuel feed system of a petrol engine consists of the following components:
(i) Fuel Tank
(ii) Fuel Pump
(iii) Fuel Filter
(iv) Carburetor
(v) Intake manifold and
(vi) Fuel Gauge

2. Level measurement :

2.1 Ultrasonic level measurement

Sound waves, or ultrasonic (U/S) energy, are electromagnetic phenomena that exist in the range of sound above the audible range. When electromagnetic waves come into contact with a medium denser than air, they all have the same characteristic of reflecting back toward their source. An interface is the boundary that separates two media, such as water and air. Naturally, the level of the liquid being measured is represented by this interface.

2.2 Ultrasonic level system

The accuracy of ultrasonic systems is within around 30 feet. Typically, there are two components to an installation:

- A transducer, which consists of a receiver and a transmitter. The "head" transmits ultrasonic radiation in the direction of the liquid surface. The ultrasonic waves are reflected back to the receiver in the head when they make contact with the surface.
- Electronics, which generate, regulate, and time the ultrasonic pulses that the head sends and receives. Additionally, the electronics send control signals to distant monitoring equipment such process control systems and displays.

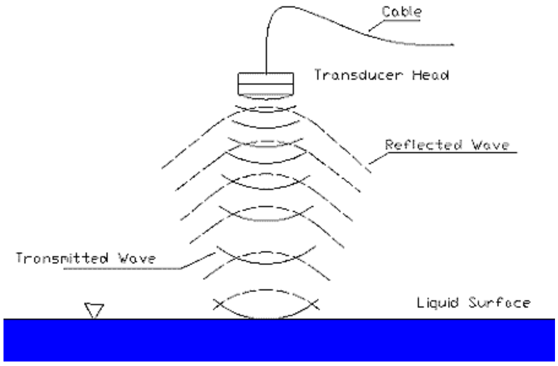

Figure:1 Ultrasonic Level System

1. Timing the interval between the pulse's transmission and subsequent reception at the head allows for measurement. Units calibrated to the range being measured are used to convert this delay. In order to increase the precision of the transmitted energy, a cone is typically affixed to the head due to the natural tendency for U/S waves to spread. The majority of U/S systems use a target that is close to the head, typically inside the cone, as a self-calibration tool. A "zero target"—a reflecting surface at the zero of the desired range—is also a common feature of installations. The tank floor is typically the zero goal in tank installations. A plate is positioned exactly beneath the head at the level that corresponds to zero flow in flow measuring applications, like a weir (see Incontrol).

2. The transducer face coating, process liquid foaming, and interior tank constructions might cause issues with U/S devices. In certain closed tank setups, false echoes might be problematic. These devices' non-contact nature makes installation and maintenance simple and, for the most part, keeps operators away from hazardous materials.

2.3 Ultrasonic Sensor working principle

The transmitter and receiver units are the two components that make up an ultrasonic sensor. The structure of the transmitter and receiver unit is straightforward; a piezoelectric crystal is just attached to the diaphragm vibrator and is secured with mechanical anchors. The metal plate displays alternating voltage at a frequency between 40 kHz and 400 kHz. The piezoelectric effect is the result of the atomic structure of the piezoelectric crystal contracting (binding), expanding, or shrinking in response to the polarity of the applied voltage. An ultrasonic vibrator is released into the air (the environment) as a result of contractions that are transmitted to the diaphragm. When a specific object is present, ultrasonic waves will reflect and be reflected back by the receiver sensor units. Additionally, the diaphragm vibrator receiver will vibrate due to the sensor unit, and an alternating voltage with the same frequency will be produced by the piezoelectric effect. The quality of the transmitter and receiver sensors, as well as the distant item identified nearby, determine the large amplitude signals produced by electric receiver sensor units. This sensor's Yuang sensing technique determines the distance between the sensors and the target item by employing the reflection approach. The distance between the sensors is determined by multiplying the speed at which the ultrasonic signal propagates through media, specifically air, by half of the time it takes for the circuit to receive a series of Tx to Rx. When the pemencar is active, time is counted until the receiver circuit provides input. When the circuit receives no input signal for a predetermined amount of time, it is deemed that there is no impediment in front of it.

3. Major components of digital fuel measure level indicator :

The below mentioned components are major in the setup.

3.1 Ultrasonic level sensors

Ultrasonic level sensors, also known as sonic level sensors, are perfect for non-contact level detection of bulk solids like cement, sand, grain, rice, and plastic pellets, as well as very viscous liquids like heavy oil, grease, latex, and slurries. High frequency, "ultra" sonic (20 kHz to 200 kHz) acoustic waves are emitted by the sensors and reflected back to the emitting transducer, which then detects them.

Figure: 2 Ultrasonic sensor

Ultrasonic level sensors are also impacted by changes in moisture levels, as well as by variations in the temperature and pressure within the hopper or container, because the speed of sound in air varies with temperature and moisture level. However, the technology can be made extremely accurate by applying correction factors to the level measurement when ultrasonic sensors are combined with temperature and humidity sensors or a distance reference.

The ultrasonic sensor's response is additionally impacted by turbulence, froth, steam, chemical mists (vapors), and variations in the process material's concentration. Steam and chemical mists and vapors distort and/or absorb the sound wave; turbulence and foam hinder the sound wave's proper reflection to the sensor; and concentration variations alter the amount of energy in the sound wave that is reflected back to the sensor. Some of the aforementioned limitations are addressed by the use of wave guides and stilling wells.

To guarantee that sound waves are reflected back to the sensor perpendicularly, proper installation is essential. Otherwise, the transducer detects less sound waves when the sensor is even slightly out of alignment with the process material. To prevent false returns and the incorrect response that follows, the hopper, bin, or tank should also be clear of obstructions like brackets, ladders, or other objects.

The ultrasonic transducer experiences a mechanical vibration period known as "ringing" since it is utilized for both transmitting and receiving acoustic energy. Prior to processing the echoed signal, this vibration must diminish, or cease. A distance from the transducer's face that is blind and unable to detect an object is the end result. We call it the "blanking zone."

The ultrasonic sensor can be made intelligent by utilizing the need for electronic signal processing circuits. It is possible to design ultrasonic sensors that offer continuous monitoring, point level control, or both. This is a good technique for adjusting calibration and filtering of the sensor signal, remote wireless monitoring, or plant network communications because it has a microprocessor and uses relatively little power. It can also communicate serially with other computing devices. The ultrasonic sensor's strong combination of affordability and excellent functionality accounts for its broad adoption.

3.2. Description of microcontroller: - IC 89C51

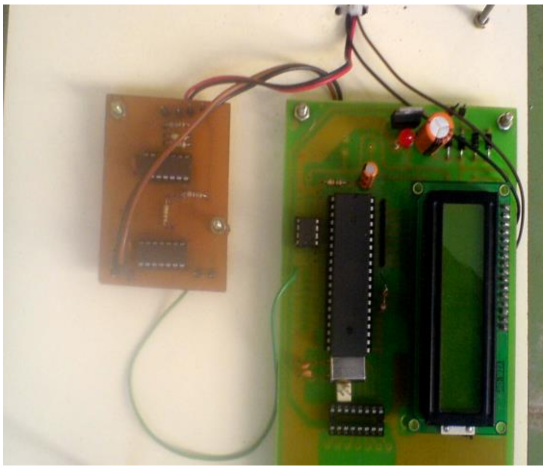

Figure: 3 Microcontroller Kit

The IC89C51 requires 5 volts to function. A non-volatile FLASH program memory (up to 64 k bytes in the 89C51RD+) that may be serially and parallel programmed is present in the 89C51RX+ devices. Through software control, in-system programming enables devices to modify their own program memory in the final product. This makes it possible to upgrade the application firmware in the field, among other uses.

These devices, which are variations of the 80C51 microcontroller family, are Single-Chip 8-Bit microcontrollers produced using an advanced CMOS process. The 80C51's instruction set is shared by all the devices. For devices that don't need a 12 V programming voltage, see the P89C51RX2 data page. In addition, the devices have an upgraded UART, on-chip oscillator and timing circuits, three 16-bit timer/event counters, four 8-bit I/O ports, and a multi-source, four-priority-level, nested interrupt structure.

Standard TTL-compatible memories and circuitry can be used to enhance each system's memory capacity up to 64 k bytes. The P89C51RX+ Family's additional characteristics make those microcontrollers considerably more potent for applications requiring high-speed I/O, pulse width modulation, and up/down counting capabilities, including motor control.

3.3 IC ULN 2003

The IC ULN2003 requires 9 volts to operate. Seven open collector Darlington pairs with common emitters are found in each of the high voltage, high current ULN2003 and ULN2004 Darlington arrays. Every channel has a 500mA rating and can tolerate 600mA peak currents. To make the board layout simpler, the inputs are pinned across from the outputs, and suppression diodes are used for inductive load driving.

3.4. Relay

An electromagnet is created by winding a multi-turn coil around an iron core in an electromagnetic relay. The core of the coil becomes momentarily magnetized when current is passed through it to activate it. The iron armature is drawn to the magnetized core. One or more sets of contacts are operated by the armature's rotation. The armature and contacts are released when the coil is de-energized.

While the contacts can switch high powers like the mains supply, the coil can be powered by a low power source like a transistor. Additionally, the relay can be located far from the source of control. When a relay is turned off, it can produce an extremely high voltage across the coil. Other circuit components may sustain damage as a result. A diode is attached across the coil to stop this. The diode's cathode is attached to the coil's most positive end.

3.5 Buzzer

Figure:4 Circuit symbol

Beepers pass a modest current of roughly 10mA and have a broad voltage range of 3-30V. The red lead of buzzers and beepers is positive (+), thus they must be connected correctly.

3.6 Tank Assembly

It has a rectangular shape and is 12 x 8 x 9 inches. It is composed of mild steel. There is a single drain cock at the tank's bottom. It has a single stand installed.

4. Block diagram& circuit diagram :

The Figure 5&6 illustrates block diagram and line diagram of the digital of the digital level fuel level monitoring

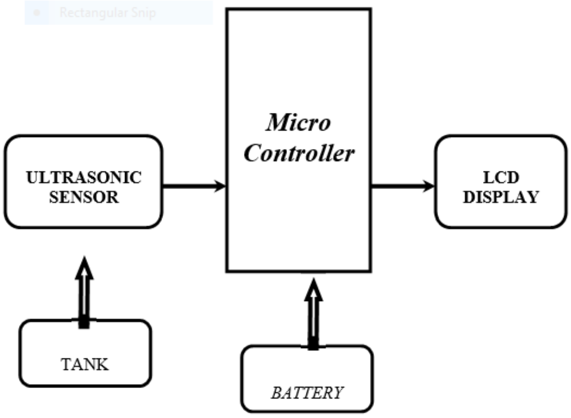

Figure:5 Block diagram

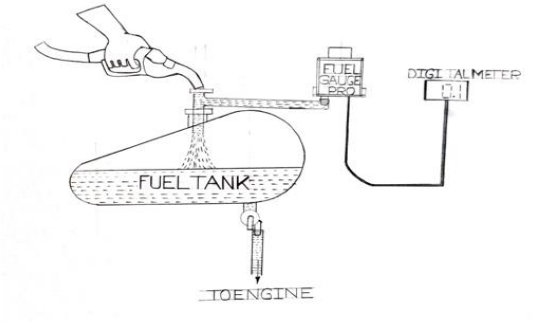

Figure:6 Functional diagram

5. Working principles of fuel level controller :

Digital does not show fuel level indications. These days, an analog model is used to indicate them. This makes it impossible to determine the fuel level precisely. To employ sensors to determine the precise amount of gasoline used in IC engines. Electric energy is the key idea for determining the fuel level. The microcontroller unit is used to display the fuel level after the ultrasonic sensor detects it. A buzzer that is also controlled by another IC will sound to alert drivers when the fuel level is low. The kit's fuel level sensor detects the fuel level, which is then shown on the LCD. Thus, determining the IC engine's fuel level is the project's primary focus.

6. Advantages & Application :

Applications:
include the stationary

- I.C. engine and this kind of fuel level monitoring.
- Because there is no power source, it can be utilized in the site area.

Advantages:

- Fuel level is measured accurately.
- Each designated level has a fuel level indicator.
- The engine's fuel level is also discovered by unskilled labor.

Disadvantages:

- It is not appropriate for use with moving engines and should only be utilized with stationary engines.
- It's difficult to install and maintain controllers.

7. Conclusion:

We have successfully included the FUEL LEVEL MEASURE INDICATOR function for all vehicle types in our project. It continues to be very precise and accurate. We have examined and evaluated the prototype model that we created using an application to determine whether or not this system is appropriate.

BIBLOGRAPHY :

1. Dan Nec Sulescu (2003) 'Mechatranics' McGraw Hill Publishers.
2. Dorai Rangasamy (2003) 'Advanced Microcontroller and peripheral chips' Madras Air walk publishers.
3. Douglas V.Hall (1997) 'Microprocessor Interfering Programming & Hardware' Tata McGraw Hill.
4. Dr.S.K.Mukharjee, Dr.Surender Kumar (2003) 'Mechatronics in Manufacturing System' Tech India Publication.
5. Muhammed Ali Mazidi, Junice Gillispie Mazaid, Rolin D. McKlinlay (2006) 'The 8051 Microcontroller and Embedded System' Prentice Hall India Pvt Ltd.
6. R.L. Murty (2007) 'Precision Engineering in Manufacturing' New Age International Publishers.
7. Rajkamal (2002) 'Embedded Systems' Wily International Publication.
8. M.D Singh, j.g. Joshi (2006) 'Mechatronics' Prentice Hall India Pvt Ltd.