Design of Tank Cleaning System Using Microcontroller and Mobile Application

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ABSTRACT: The Tank cleaning system explained in this project utilizes the microcontroller 89S52 for controlling the all the different actions of the system, android application to give instruction to controller with the help of Bluetooth module. This system minimizes the use of water and manpower requirement. There are main three part in this system-spreading the detergent or chemicals required, cleaning with brushes and finally washing with water. Using this system we clean the cylindrical tank or particularly milk tanks in dairy. It will save time and manpower. This system can be installed in industries where the cylindrical tanks are used with large numbers.

KEYWORDS: Automation, cylindrical tank, Microcontroller 89S52, Android application, Bluetooth module, Motors, Brush, Mechanical assembly.

I. INTRODUCTION

Every day we use the milk tank for transporting the milk and collect the milk from small village town. It is necessary to clean this tank regularly to avoid future hazards from milk. If we can't clean it regularly and truly clean it smells bad, scale and algae get deposited in the tank, on the bottom of the tank and the sides of the tank. This deposition contaminates the milk and makes is unfit for use. With time algae and bacteria grow and breed in this milk tank infect it and could make us fall sick eventually. Hence dairy tank cleaning is very important. The tanks which are used for transporting the oil / milk / petroleum are cleaned by manually with the help of lots of water and chemicals, due to this peoples are get reacted by chemicals and there is possibility of lungs diseases. So came to a conclusion that cleaning the tank using automation process can be useful to solve all these problems. So to reduce this we want to develop technology which clean this tanks by its own. In this case, machine has the capability to clean the tank easily and quickly. This system has separate pipes for water and detergent. It also has brush. It will provide us high quality cleaning. It will also provide a mobility and self sufficiency.

II. BLOCK DIAGRAM

The main components of Tank Cleaning System:

➢ Power supply
➢ Microcontroller 89S52
➢ Relay driver circuit
➢ Bluetooth module
➢ Display
➢ Android Application
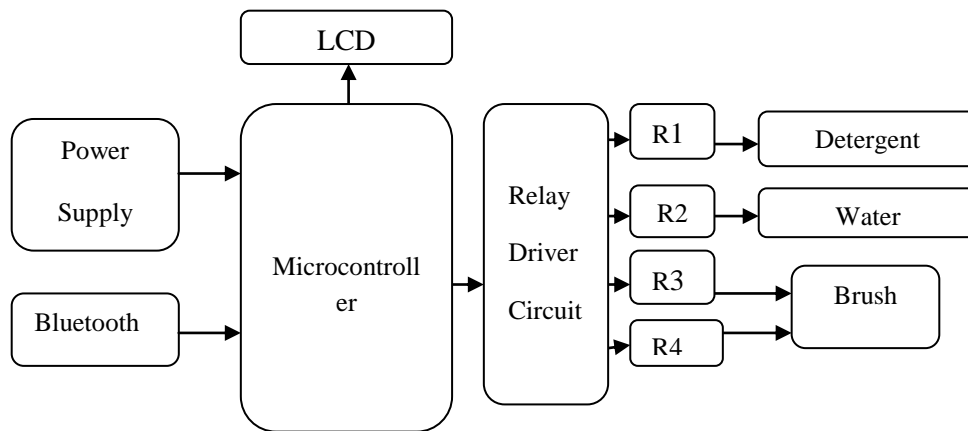➢ Brushes
➢ Wiper Motor
➢ DC water motor

Fig.1 Block Diagram of Tank Cleaning system

A. Microcontroller (89S52):

Fig.2 Microcontroller IC

The Microcontroller IC 89S52 has 256 x 8 bit internal RAM which is most important feature for this application. Here eight to ten readings can be recorded in RAM after each half an hour to achieve data logging. The Timer/Counter application of 89S52 is used to count the pulses from proximity sensor. The interrupt pin INTR0 is used to switch into different setting modes. The serial channel is used to get interface with PC for data logger application.

The AT89C52 provides the following standard features:

- 8Kbytes of Flash
- 256 bytes of RAM
- 32 I/O lines
- three 16-bit timer/counters
- six-vector two-level interrupt architecture
- a full duplex serial port
- on-chip oscillator
- clock circuitry

In addition, the AT89C52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power down Mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next hardware reset.
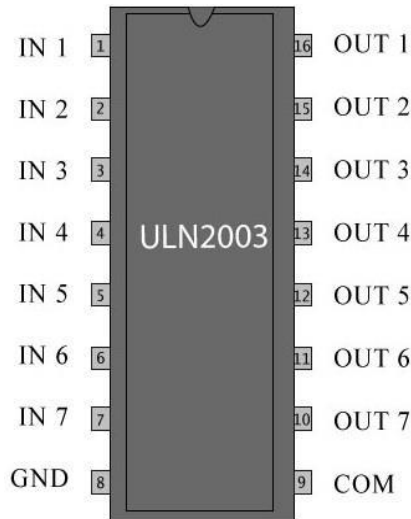
B. Relay Driver Circuit (ULN2003):

Fig.3 Relay driver circuit pinout

The ULx200xA devices are high-voltage, high-current Darlington transistor arrays. Each consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The Darlington pairs can be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers. For 100-V (otherwise interchangeable) versions of the ULx2003A devices, see the SLRS023 data sheet for the SN75468 and SN75469 devices. The ULN2002A device is designed specifically for use with 14V to 25V PMOS devices. Each input of this device has a Zener diode and resistor in series to control the input current to a safe limit. The ULx2003A devices have a 2.7kΩ series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices.

C. Bluetooth Module:

Fig.4 Bluetooth Module

Bluetooth modem is a device that acts as mediator between any embedded system and the Bluetooth communication medium. It has built-In protocol for serial communication i.e. serial port profile. Thus it provides an

ideal solution for developers who want to integrate Bluetooth wireless technology into their design with limited knowledge of Bluetooth and RF technologies. This unit requires +3.3V DC for it proper operation.

This is a Bluetooth module for use with any microcontroller. It uses the UART protocol to make it easy to send and receive data wirelessly. The HC-06 module is a slave only device. This means that it can connect to most phones and computers with Bluetooth but it cannot connect to other slave only devices such as keyboards and other HC-06 modules. To connect with other slave devices a master module would be necessary such as the HC-05 version which can do both master and slave.

D. Android Application:

Fig.5 Android application development

We use the android application to give the instruction to the system. It consist of total 8 buttons such as for water motor turn ON and OFF, Detergent motor turn ON and OFF, Brush rotation ON and OFF and two more buttons are for adjusting the position of the brush which rotates the brush in clockwise and anticlockwise direction. All the communication is serial communication with the help of Bluetooth module and mobile Bluetooth.

E. Relay:

Fig.6 Relay

These are high quality Single Pole - Double Throw (SPDT) sealed 12V Sugar Cube relays. Use them to switch high voltage (240AC), and/or high current devices(7A).

This relay's coil is rated up to 14V, with a minimum switching voltage of 10V. The contacts are rated up to 7A @ 250VAC and 7A @ 24VDC.

Features:

- 12V DC SPDT Relay
- Rated up to 7A @240VAC
- Fully Sealed

F. Display:

Fig.7 LCD

16x2 LCD - it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

Specification

➢ Character LCD 16x2

➢ 5x8 dots includes cursor

➢ Built-in controller (ST7066 or Equivalent)

➢ +5V power supply only

➢ Negative voltage optional for +3V power supply

➢ 1/16 duty cycle

➢ White LED backlight not available

III. DESCRIPTION

This project explores the automation in the dairies. The purpose of this project is to build a system, which could be controlled using mobile application.

All the actions of the system are controlled through the mobile application and the microcontroller. The clock pulses required to drive the controller easily is given to controller with the help of crystal oscillator circuit and is connected to the pin no. 18 and 19 of the controller. The reset circuit is also required to the controller to reset the it to the first instruction. It is connected at the reset input pin i.e. pin no. 9. To display the current processing operation we required a digital display. So, we connect a 16x2 LCD at the port 0 of the controller. Port 0 gives the data to display on LCD. We required three motors from that one is wiper motor and other two are DC motors. But the voltage required to drive the motor is high and it does not provided by controller. We can use the DC water motors to sprinkle the water and detergent inside the can for cleaning purpose. And we can use the wiper motor with brush which is rotate in both the directions i.e. clockwise and anticlockwise. To provide required voltage we use relays with relay driver circuit. For

the serial communication between controller and mobile application we use Bluetooth module. It is connected to the some pin of port 3 i.e. is pin no.10 and pin no.11. For making the mobile application we can use an android studio. We made a mechanical assembly to place a dairy can on that assembly.
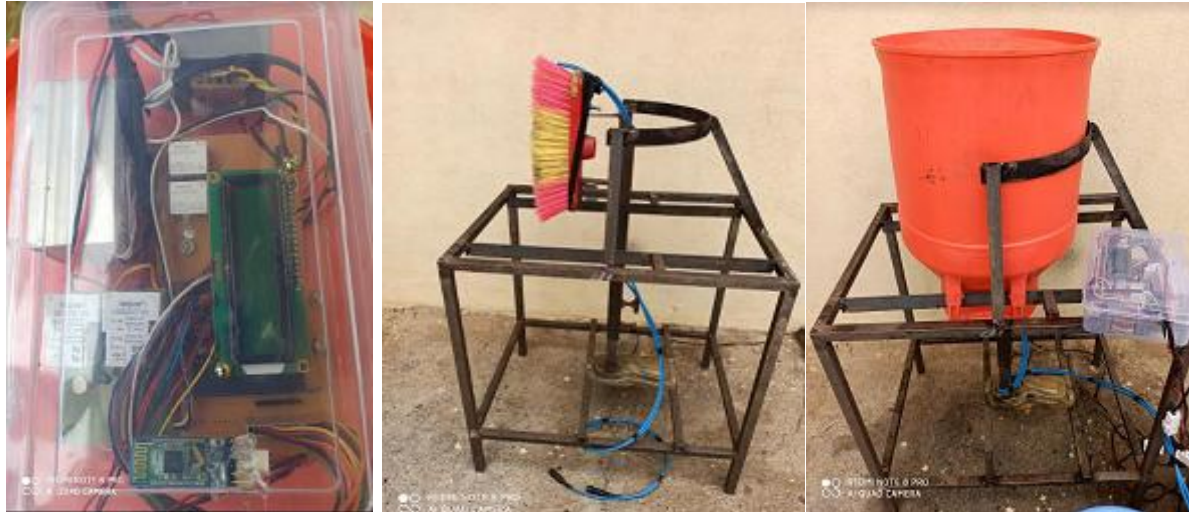
IV. RESULTS

Fig.8 Content of Project Assembly

V. CONCLUSION

The tank cleaning system was used to clean the milk tanks by using microcontroller, Bluetooth module, android application, motors and rotating brush. This method was more effective and safe than the conventional methods. This method is capable to clean milk tanks within less time and human efforts.

REFERENCES

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