

# Automatic water tank level controller engineering essay

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## **Abstract:**

For the supply of water it is very common method to use an overhead tank. Generally, a person has to manually switch ON the water pump when the overhead tank is running low of water, also when the tank is filled a person has no idea about the current water level in the tank. For the user's convenience, automatic water level controller is used. Here, the water level controller is designed using microcontroller 8051 and relay. The main advantage of this water level controller circuit is that it can automatically control the water pump without any user interaction. The pump is not allowed to start when the water in the sump tank is low. This project consists of water level sensors, fixed in the necessary spots in the over head tank. Whenever the water level decrease below or exceed the prescribed level the motor will be switched ON/OFF, thereby controlling the water level efficiently. Keywords: microcontroller 8051, relay, sensors.

## **Work Plan**

The circuit should be analysed and simplified first, to improve the performance and to reduce the components without affecting the performance of the controller . In the drawn circuit we make use of four sensors and for domestic purpose it is not necessary to have greater accuracy so if the performance permits the sensors should be reduced to two. So by reducing the number of sensors the corresponding components connected between the ports and the sensors will be reduced considerably.

ie the indicating LED, s and the transistors will be reduced . thus, by using this simplified circuit the power consumption can be reduced without affecting the expected performance.

## **Introduction:**

Many a time, we forget to switch off the motor pushing water into the over head tank in our households. As a result water keeps over flowing until we notice the overflow and switch off the pump. As the over head tank is usually kept on the top most floor, it is cumbersome to go up frequently to check water level in the over head tank. So the design of water level controller will solve this problem by switching ON and OFF the motor depending on the water level in the tank. The status of the water level is displayed in the LCD display.

## **Circuit description:**

The water level controller mainly comprises of microcontroller AT89S51, step-down transformer 5V, DPDT relay, transistor 2N2222, crystal Oscillator(11. 2MHz) and some passive components. The five water sensing probes are connected to the transistors base and their collectors are connected to the microcontroller's port P2. 4 to P2. 7. The collector terminals of the transistors are connected to the Vcc supply through the resistors and the emitters are grounded. The crystal oscillator is connected in parallel to the pin XTAL 1 and XTAL 2. The water level in the tank is identified by the five LED which are connected to the pin P0. 0 to P0. 4 and the DPDT relay is connected to the pin P0. 5 which does the job of switching. The probe in the sump tank is connected to the microcontroller pin P0. 6 through the

transistor and its respective LED is connected to the pin P0. 7. The required 5v power supply is provided by the step-down transformer. The components are connected in such a manner as shown in the circuit diagram.

### **Circuit Diagram:**

water level controller using 8051Water level controller using AT89S51

### **Programme.**

```
MOV P2,#11111111B
MOV P0,#11111111B
MOV A,#00000000B
MAIN: ACALL
SMPCK
MOV A, P2
CJNE A,#11110000B, LABEL1
SETB P0. 1
SETB P0. 2
SETB P0. 3
SETB P0. 4
CLR P0. 0
SETB P0. 5
LABEL1: MOV A, P2
CJNE A,#11111000B, LABEL2
SETB P0. 0
SETB P0. 2
SETB P0. 3
SETB P0. 4
CLR P0. 1
LABEL2: MOV A, P2
CJNE A,#11111100B, LABEL3
SETB P0. 0
SETB P0. 1
SETB P0. 3
SETB P0. 4
CLR P0. 2
LABEL3: MOV A, P2
CJNE A,#11111110B, LABEL4
SETB P0. 0
SETB P0. 1
SETB P0. 2
SETB P0. 4
CLR P0. 3
JB P0. 6, LABEL4
CLR P0. 5
LABEL4: MOV A, P2
CJNE A,#11111111B, MAIN
SETB P0. 0
SETB P0. 1
SETB P0. 2
SETB P0. 3
CLR P0. 4
JB P0. 6, MAIN
CLR P0. 5
SJMP MAIN
SMPCK: JB P0. 6, LABEL5
SETB P0. 7
SJMP LABEL6
LABEL5: SETB P0. 5
CLR P0. 7
LABEL6: RET
```

### **Operation:**

The water level controller monitors the level of the over head tank and automatically switches on the water pump when ever the level goes below a preset limit. The level of the over head tank is indicated using 5 leds and the pump is switched of when the over head tank is filled. The pump is not allowed to start if the water level in the sump tank is low and also the pump is switched off when the level inside the sump tank goes low during a pumping cycle. The circuit diagram of the water level controller is shown

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below. The level sensor probes for the overhead tank are interfaced to the port 2 of the microcontroller through transistors. Have a look at the sensor probe arrangement for the overhead tank in Fig1. A positive voltage supply probe goes to the down bottom of the tank. The probes for sensing 1/4, 1/2, 3/4 and FULL levels are placed with equal spacing one by one above the bottom positive probe. Consider the topmost (full level) probe, its other end is connected to the base of transistor Q4 through resistor R16. Whenever water rises to the full level current flows into the base of transistor Q4 which makes it ON and so its collector voltage goes low. The collector of Q4 is connected to P2. 4 and a low voltage at P2. 4 means the over head tank is not FULL. When water level goes below the full level probe, the base of Q2 becomes open making it OFF. Now its collector voltage goes high and high at P2. 4 means the tank is not full. The same applies to other sensor probes (3/4, 1/2, 1/4) and the microprocessor understands the current level by scanning the port pins P2. 4 , P2. 5, P2. 6 and P2. 7. All these port pin are high (all sensor probes are open) means the tank is empty. Port pin P0. 5 is used to control the pump. When ever it is required start pumping, the controller makes P0. 5 low which makes transistor Q6 ON which in turn activates the relay K1 that switches the pump. Also the LED d6 glows indicating the motor is ON. LED D7 is the low sump indicator. When the water level in the sump tank goes low, the controller makes P0. 7 low which makes LED D7 to glow. The circuit diagram of the water level controller is shown in the figure below.

**Conclusion:**

This type of water level controller will reduce the human interference. The power consumption of the motor and the wastage of water because of unwanted overflow can be controlled.