ISSN (Online): 2230-7893
www.IJCEM.org

Microcontroller Based System for Bore-Well 3-Phase Motor to Avoid Dry Running

Aashish Joshi[1], Ashish Mali[2], Avdhut Jadhav[3], Nagesh Chavan[4]

[1,2,3,4]Department of Electronics and Tele-communication
Karmayogi Engineering College, Shelve. Pandharpur, Maharashtra-413304, India

Abstract

In summer day's it is commonly observed that water in the bore wells of farmers cannot flow continuously. Reason behind that issue may be less rain or scarcity of water in area etc. India is one of the countries who mostly face this problem. If there is no water available in the bore-well still motor runs then there is possibility of burn out of motor winding & emplers. To avoid this problem we have to take precautions by designing auto timer which will run the motor when water is available and stop the motor when water is unavailable. This issue can be solved by assembly language programming of the system with On-Off delay.

Keywords: *Bore-well, controller, timer, starter, 3-phase motor.*

1. INTRODUCTION

Every year, more than 20% of electric motors installed burnout around the world. This is in spite of protection systems being provided and dry run. This proves inadequacy of selected protection systems. In most cases, the reasons for pumping system failure are dry run of motors. These include improper selection of pump, improper handling of the system, and improper selection of protective devices. The protective device for the pump is the heart of the total system. Great care is needed while making an appropriate selection of the same. Different kinds of protective relays are available to perform different functions. It is important that a proper protective device is selected for this. So to avoid this we provide the timer auto for motors. Incorrect selection of protective devices can lead to the notion that these are not fulfilling their intended functions.

Our pump motor protector controllers are microcontroller based systems with instant response (faster than conventional starter systems) as this response is based on solid state devices & ultra precision current sensing elements. These systems trip and protect instantly at improper current sensing. Dry running is dangerous for submersible pumps. Motors of submersible pumps are designed for running under water. They use water as a heat-transfer medium. In case the water level goes down and the pump runs dry, the motor gets overheated and burns out. Due to such Dry running the bearing temperature also increases, damaging the bearing and the surrounding portion of the pump. We use the microcontroller for this. By using the ports of microcontroller we control the starter of the motor. In starter we control the two phase out of 3-phase.We interface the switch buttons to the ports. Then by using these switch buttons we give the ON and OFF time to the motor. According to the availability of water in the bore wells we provide the timing. Then according to time provided to ON a section switch the motor will run. Then after completion of time the motor stops running. In this we provide the battery backup to the microcontroller unit. This is very useful for farmers. The existing system is very costly we overcome that drawback. We can prepare the system at low cost. The farmers do not have to wait for ON and OFF the motors. If there is interrupt of electricity then after electricity came we do not require
To come and start the motor. The time provided then according to that time the motor will run and after completion of time the motor stops. We use the assembly language programming for this.

2. PROPOSED WORK

2.1. Block diagram

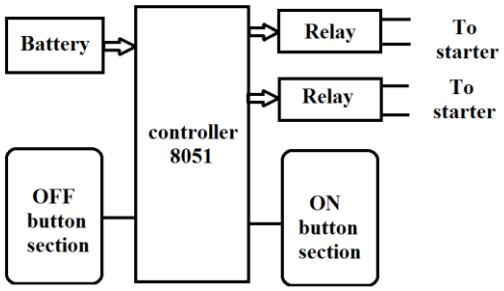

Fig1. Block Diagram of System

The 89C51 is low power, high performance CMOS 8-bit microcontroller with 4K bytes of flash programmable and erasable read only memory (PEROM). The device is manufactured using high-density non volatile memory technology and is compatible with the

ISSN (Online): 2230-7893
www.IJCEM.org

industry-standard MCS-51 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.

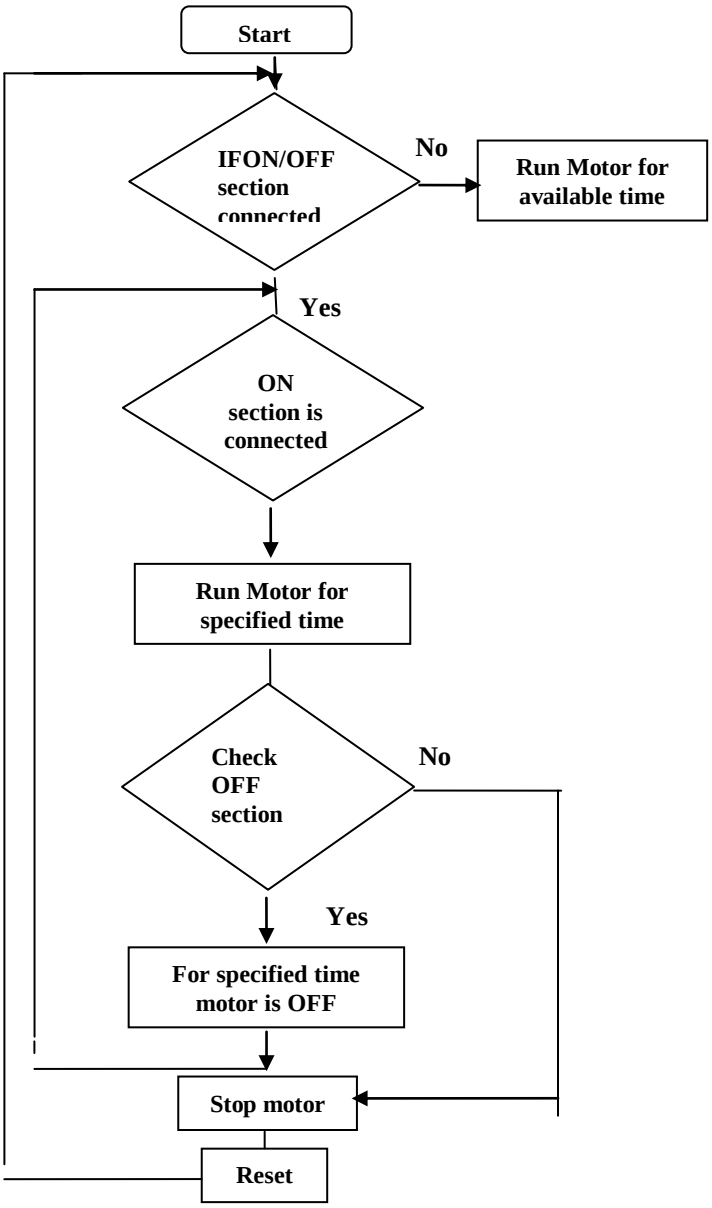

Fig.2. Flow Chart of Drowsy Driver system

The relay block has a potential to drive the various controlled devices. In this block mainly we are using the transistor, relays and diodes. In this we are using the relays for controlling the 2-phase out of 3-phase starter of the motor. Output signal from 89C51 is given to base of transistor through a pull-up resistor, which we are further energizing the relays. The ON and OFF button section are the switches used for giving the ON & OFF time to the motors.

Battery is used to give the back-up to the micro-controller. When power is available then battery is in charging mode. It provides un-interrupt power supply to the microcontroller when power is off.

2.2. Flow Chart:

Flow chart begins from start. First it checks the ON OFF section is connected or not. If ON OFF section is not connected then control goes to run the motor for available of 3 phase. And if ON OFF section is connected the control checks first ON section is connected or not. If ON section is connected the motor runs for specific time. Then the control goes to the next stage. It checks the off section is connected or not, if OFF section is not connected then motor will be stop. And if OFF section is connected then motor is OFF for given time, after OFF time is completed then motor is ON. And this process is repeat in loop.

3. Flow of Hardware:

To derive the power supply for the circuit, the 230V, 50Hz AC mains is stepped down by transformer to deliver a secondary output of 12V, 2A. The transformer output is rectified by a full-wave rectifier comprising diodes 1N4007. Then it is filtered by C1 & regulated by IC 7805, Capacitor C2 bypasses the ripples present in the regulated supply. Regulated 5V is used to power the circuit except relays.

The microcontroller is the heart of the heart of our system. It is an 8 bit microcontroller with 4KB flash programmable & erasable read only read-only memory(PEROM), It has 32 input/output (i/o) lines, two 16 bit timers/counters, a five vector two level interrupt architecture, a full duplex serial port, on chip oscillator and clock circuitry. And power on circuit is provided. 12 MHz crystal along with two 33Pf capacitor provides basic clock frequency to microcontroller AT89C51RD2. Here we provide the separate button for reset which is connected to the pin number 9 of microcontroller.

ISSN (Online): 2230-7893
www.IJCEM.org

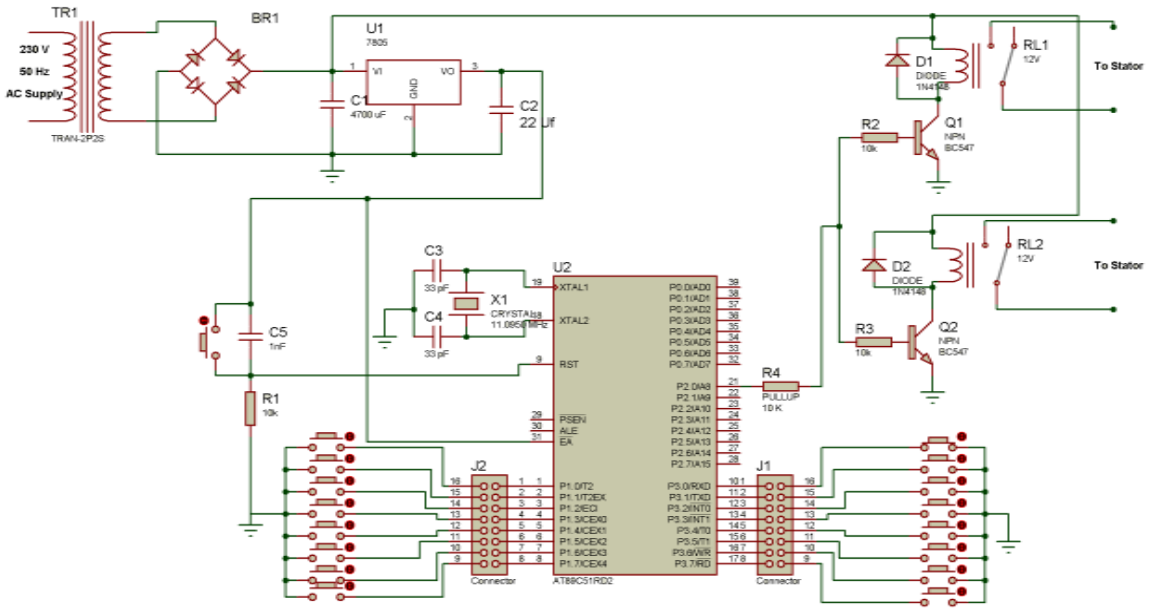

Fig.3. Circuit diagram of Microcontroller based system for bore-well 3 phase motor to avoid dry Running

In this port 1 of microcontroller we connect the push buttons. These push buttons are used for providing ON time to the microcontroller. In similar fashion we use the push buttons for port 3 and they acts as off time for microcontroller AT89C51RD2. According to ON and OFF time the motor will turn ON and OFF for specified time given in the programming.

The port 2.0 of port is used for controlling the motor starter through the relay. The port 2.0 that is pin no 21 is connected to the pull-up resistor R4. The pull-up resistor is of 10K. The pull-up resistor is then connected to the transistor. We use the transistor BC 547 for this. We connect the pull-up resistor base of the transistor with 10K resistor. Here we use the two BC547 transistors. The two relays are connected to the collector of the transistor BC547. For relay we provide the special 12V power supply. Here we also provide the two phases out of 3 phases to the relays. In this we connect the two phase from the relay to the Motor starter. We connect one phase directly to the starter of the motor. Here we control the one phase for motor ON and OFF condition. When we provide ON time and OFF time to the microcontroller according to given time the motor will run. For the back up to the microcontroller we provide the 5V chargeable battery.

The following conditions we were provided by using to the microcontroller for ON and OFF of motor.

CONDITION 1 –In the condition when do not push any button from ON and OFF section. Then project directly acts as the auto for motor. When light come then project directly acts as the auto for motor.

CONDITION 2- In the second condition when we provide the ON time to the microcontroller. Then the motor will run for specified time then it will turn off continuously.

CONDITION 3- In the third condition when we push the ON and OFF button from push button set. Then the motor run for given specific time then it will turn OFF, when off time is over then it will again turn ON. It continuously ON and OFF the motor for given specified time.

All these conditions are based on how electricity is provided to the agriculture motors. For agriculture MSEB provides the 6 hours of light.

4. Estimation of delay:

1MC=12T

Where T= $\frac{1}{\text{crystal frequency}}$

Crystal frequency=11.0592 MHz

$$T = \frac{1}{11.0592\ MHz}$$

1MC=12×0.09013μsec

ISSN (Online): 2230-7893
www.IJCEM.org

1MC=1.08156µsec

Calculation of total delay

If we want to calculate the time delay of 5 sec. then calculation is as follow.

We know,

Total Delay=2×count×count×count×1 MC

Total delay is 5 sec so,

5 sec=2×255×255×255×X×1.08156µsec

Count=255 because 8 bit register have maximum count is 255

Therefore,

X=23

Program logic for 5 sec delay

```
ON:  mov  r2,#23h;23is  count  calculated  from
calculation
H1  : mov r1,#0ffh
H2  : mov r0,#0ffh
H3  : djnz r0,H3
      djnz r1,H2
      djnz r2,H1
      ret
```

To provide ON/OFF time for the motor we use port 1& port 3. For ON time section we use the 8 pin from port 1 for each pin from port 1 provide some time delay. Each pin is connected to button, when we want to provide ON time to the motor press this button, after pressing the button the respective pin of port is high for the provided time delay.

OFF section is work similar as per the ON section.

5. Experimental Result

Experimental Setup:-

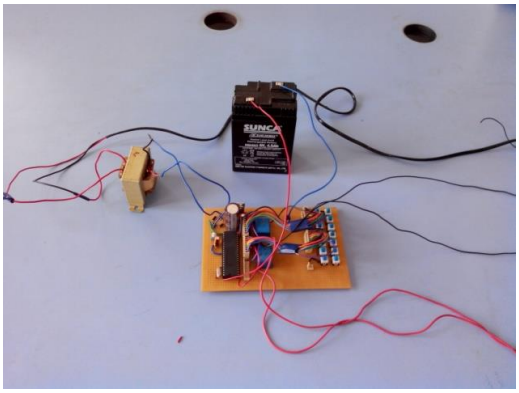

Fig.4. Experimental setup

After the connection of the system to the starter we check the conditions as follows.

Electricity	Switch		Condition
	ON	OFF	
Available	No press	No press	Auto start. (When electricity available motor start. When unavailable motor off.)
Available	press	No press	The motor on for given time and then off till we reset the IC.
Available	press	press	The motor on and off continuously for given time up to reset the IC.
Not regular	press	No press	In this condition when we press the on switch the motor run for some time & electricity goes off. When electricity came the motor run for remaining time. And off till we reset the IC.

Table No. 1 Results and conditions

6. Conclusion

We have developed the system which will avoid the dry run of 3-phase motor by using microcontroller and assembly language programming.

In the developed work we solve the problem of dry run of motors by providing on and off time to the motor.

Acknowledgments

We would like to sincerely thank my Guide Prof. Joshi.A.A. For his constant encouragement and support throughout my paper work. They always ensure that my work is being held in proper direction and always guided me in planning work at each stage of my work. We take

this opportunity to express sincere appreciation and deep sense of encouragement, which had a great influence in bringing this project to success. We remain ever indebted to him for the keen interest shown and moral support offered all through pursuance of this work.

References

[1] J. J. Novak and R. D. Kirby, "Better, Faster, and More Economical Integrated Protective Relaying and Control Using Digital Bits and Logic," IEEE Transactions on Industry Applications, Vol. 46, Issue 4, July/August 2010, pp. 1281–1294.
http://dx.doi.org/10.1109/PCICon.2011.6085880.
[2] The 8051 Microcontroller and Embedded System; Second edition By Muhammad Ali Mazadi. PEARSON Publication. Page Number43, 65 to 70,115,428.
[3] IEEE Guide for AC Motor Protection, IEEE C37.96-2000, 2000.
[4] Motors and Generators, ANSI/NEMA MG 1-2003, August 2003.