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AUTOMATIC EMBEDDED SLOG REMOVAL TECHNIQUE FOR DRIP IRRIGATION

SathiyaBama P[1], Lakshmi Priya C[2], Ramesh SM[3], Maheshwari O[4],Jeevitha R[5]

[1], [4] PG Scholar, ME-Embedded Systems [2],[5] Assistant Professor [3] Associate Professor
Department of Electronics and Communication Engineering, Bannari Amman Institute of Technology, Sathyamangalam, TamilNadu, India

***ABSTRACT*-In the era of water shortage, drip irrigation is commonly used now-a-day. Water used in these cases are obtained from various sources and contains dirt and impurities. Filters are usually mounted in the master pipe thereby used to prevent clogging as the outlet of drip irrigation and sprinklers are very small. Manual cleaning of filters are done periodically to avoid clogging[6]. Though the problem seems to be simple the outcome turns out worse. If cleaning is not done periodically, pressure of the water flow gets reversed leading to collapse of the entire irrigation system. This paper provides automatic drip filter cleaning mechanism. This system uses pressure indicator and four solenoid valves controlled by a microcontroller to implement this design. When the pressure in the main pipe system exceeds the threshold, the microcontroller activates the solenoid value to direct the water flow in opposite direction thereby cleaning the clog. This system provides zero maintenance scheme for the drip system users.**

Keywords: PIC microcontroller, solenoid valve, pressure indicator.

I. INTRODUCTION

Filters[5] play an essential role in the proper functioning of drip irrigation system. Many techniques and devices are used for cleaning the water used in irrigation. The technique depends on the water source and includes sand separators, media filters, screen filters, settling ponds and disk filters. Inorder to keep the drip irrigation system clog free the system must be free of debris. This paper suggests a technique for automatic debris removal in the drip system where screen and media filters are used. This makes use of pressure gauge and solenoid valve controlled by a microcontroller.

II. RELATED WORK

I.PIC MICROCONTROLLER

PIC is a High-Performance RISC CPU with only 35 single-word instructions .All instructions execute in single-cycle except for program branches, which are two-cycle. Operating speed for DC is 20 MHz clock input. PIC has 100,000 erase/write cycle Enhanced Flash program memory typical and 1,000,000 erase/write cycle Data EEPROM memory typical .

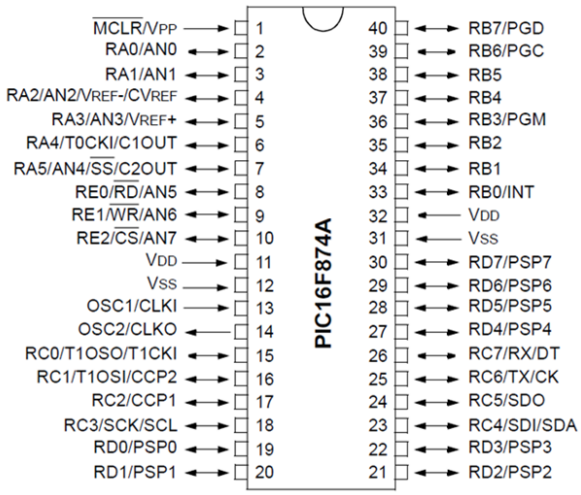

Fig..1.Pin diagram

It is self-reprogrammable under software control and supports In-Circuit Serial Programming (ICSP) and In-Circuit Debug (ICD) via two pins, Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation. It supports selectable oscillator options with power saving Sleep mode and programmable code protection.

II.SOLENOID VALVE

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid. The water enters the solenoid valve through the inlet and enters the outlet through orifice. The orifice is opened and closed by a plunger. Normally-closed valves use a spring which presses the plunger tip

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against the opening of the orifice. The sealing material at the tip of the plunger keeps the media from entering the orifice, until the plunger is lifted up by an electromagnetic field created by the coil[7].

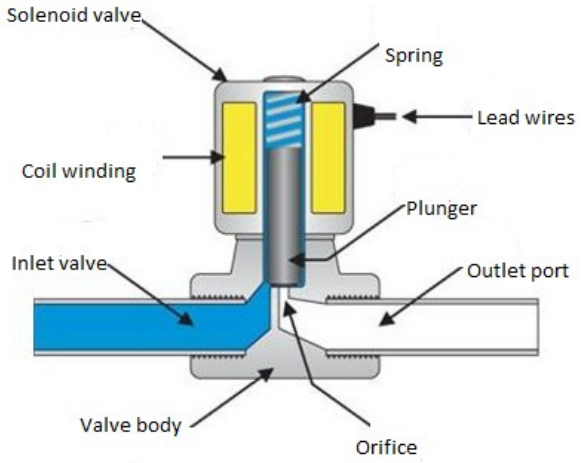

Fig.2.Solenoid Valve

III.PRESSURE GAUGE

A pressure indicator measures pressure in liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. It acts as a transducer and generates a signal as a function of the pressure imposed.

III. WORKING

The system involves 4 valves, valve1 is mounted before the filter and valve3 after the filter. Valve2 is taken using a tee before valve1 and connected using a tee pipe just before valve3. Valve4 is connected to a pipe opening set between valve1 and the filter.

Pressure indicator is connected to the pipe system and the filter. The output of the pressure indicator is connected as an input to the microcontroller. The microcontroller is programmed so as to control the water flow. During normal operation water flows through valve1 and valve3, whereas valve2 and valve4 remains closed.

If the pressure indicator crosses the predefined threshold, the microcontroller is programmed to turn off the valve 1 and 3 and opens the valve 2 and 4, so that water flows in reverse direction to clean the slog and dust particles sedimented[1]. As soon as the pressure reduces below the threshold, valve 2 and 4 closes and turns on valve 1 and 3.

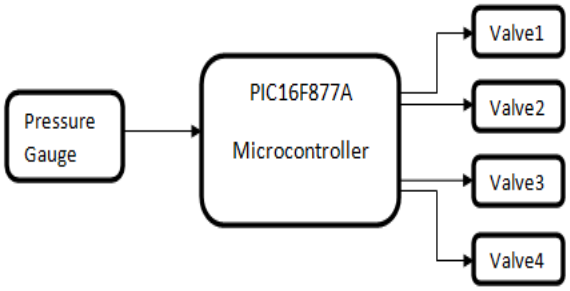

Fig.3.Block Diagram

CODE FOR SIMULATION

```
#include<pic.h>
#define V1 RB0
#define V2 RB1
#define V3 RB2
#define V4 RB3
void main()
{
        TRISB=0X00;
        TRISA=0XFF;
        PORTB=0X00;
        while(1)
        {
                if(RA2==1)
                {       V1=1;
                        V2=1;
                        V3=0;
                        V4=0;
                }
                else if
                {
                        V1=0;
                        V2=0;
                        V3=1;
                        V4=1;
                }
                else
{
V1=0;
V2=0;
V3=0;
V4=0;
}
        }
}
```


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IV. SIMULATION RESULT

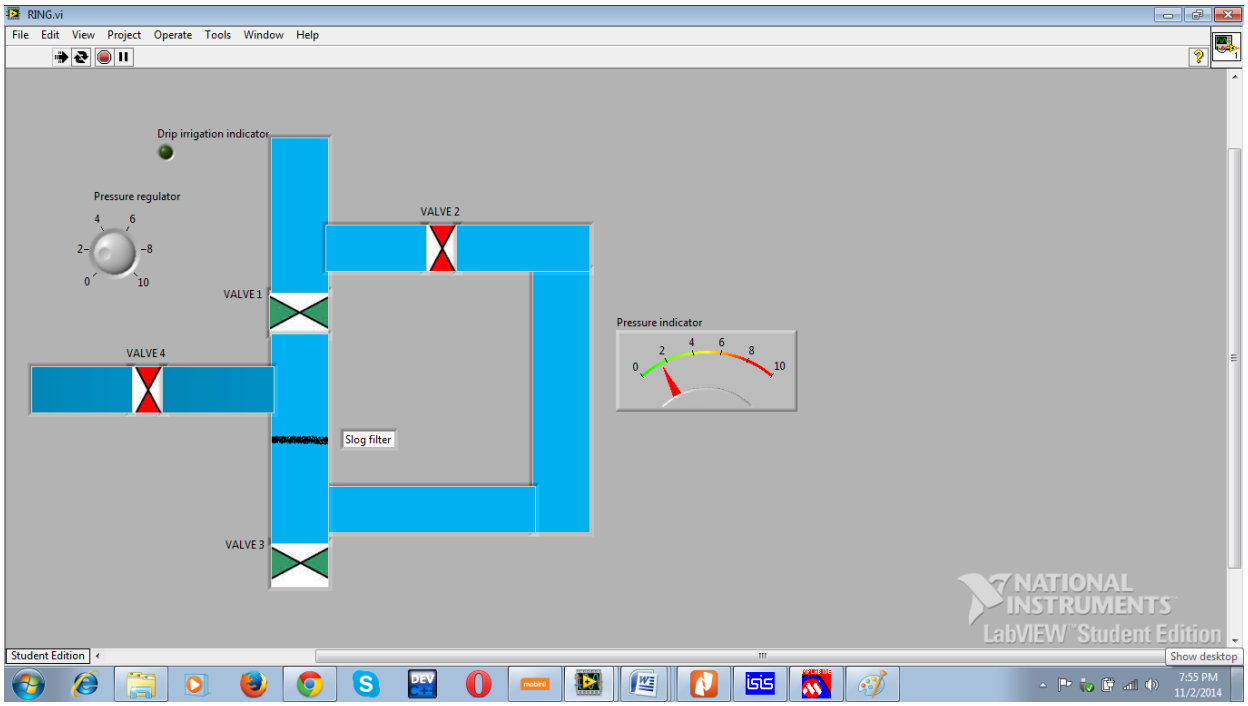

Fig.4.LabVIEW simulation during normal operation valve1 and 3 open.

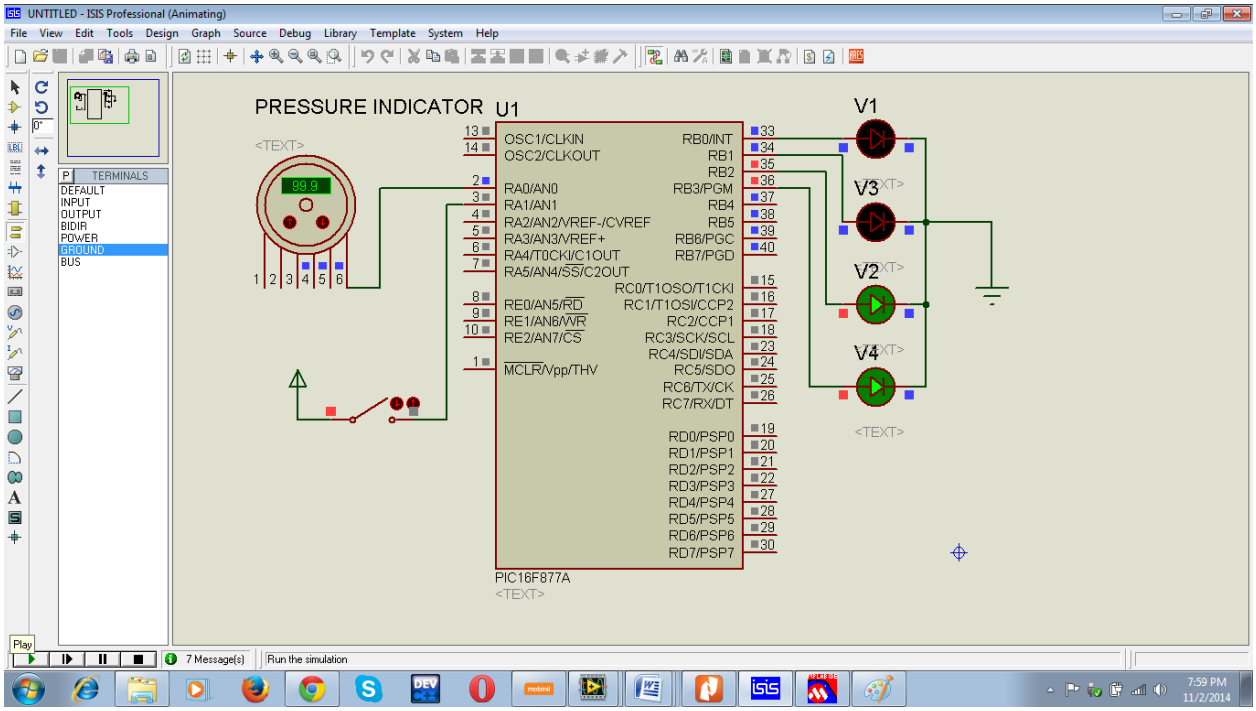

Fig.5.Proteus simulation showing control of valve using pressure gauge and microcontroller.

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V. CONCLUSION

Thus slog removal in drip and sprinkler irrigation can be automated using microcontroller, thereby reducing the manual work. It also prevents accidental or careless damage to the irrigation system. The system can be further improved by incorporating this technique to automatic irrigation system.

VI. REFERENCES

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