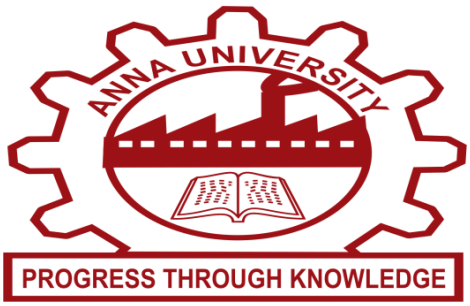

PLC BASED AUTOMATIC DAM SHUTTER CONTROL SYSTEM

A PROJECT REPORT

submitted by

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In partially fulfilment for the award of the degree

Of

BACHELOR OF ENGINEERING

In

MECHANICAL ENGINEERING

ANNA UNIVERSITY REGIONAL CAMPUS MADURAI

ANNA UNIVERSITY CHENNAI 600 025

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BONAFIDE CERTIFICATE

Certified that this project report "**PLC BASED AUTOMATIC DAM SHUTTER CONTROL SYSTEM"** is the bonafide work of **GOKUL KANTH R, RUBANRAJ J S, PRAJITH P, MUKIL DHILIBAN L S,** who carried out the project work under my supervision.

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INTERNAL EXAMINAR EXTERNAL EXAMINER

ACKNOWLEDGEMENT

Firstly, we would like to thank god almightly, who is the root cause and strength in

Each step towards the successful completion of the project.

We express our sincere gratitude to the dean of our college **Dr.K.LINGADURAI,** for providing excellent environment and infrastructure at **Anna University Regional Campus Madurai.**

We sincerely thank the Head of the Department, **Dr.B.STALIN, M.E., PH.D.,** for his attention and encouragement towards our project work.

We express our heartful gratitude to our project Guide & supervisor,

For his constant support and guidance throughout the project work.

We would also like to express our gratitude to all the faculty members of the Department of Mechanical Engineering for their help during our project.

Also thank fellow batchmates who were very co-operative during the period of this entire project.

GOKUL KANTH R

RUBANRAJ J S

PRAJITH P

MUKIL DHILIBAN L S

ABSTRACT

Now-a-days water scarcity has become a serious problem in India and there are many factors responsible for this like improper supply of water from the dam, improper water saving systems, etc.tempt tories has controlling the process variable parameters such as level with real time implementation of gate controlling through DC motor using Programmable Logic Controller. In our proposed system, a programmable logic controller is used as an compact computer playing the major role of a control devices and switches provide incoming signals to the control unit. The system design is provided with two levels in which the one level in upper and one level in the lower outputs the ladder logic is actuated. This work uses PLC of DELTA DVP-SE series inbuilt with 8 digital inputs and provides 4 potential free outputs to control the miniaturized process depicted in thework..

INTRODUCTION TO
PLC BASED AUTOMATIC DAM SHUTTER CONTROL

In Our India approximately there are 3200 dam present. In Gujarat, 202 dams are there out of them 95 dams have gates. Approximately, these dams cover 1,70,000 sq.km area for collecting water.

There is also 2067.68 km long and complex canal network through which about 10 lakes hectares land gets water for irrigation and drinking purpose. The farmers are mostly dependent on rain and after that bore-well water for their crops.
Recently, all the farmers use in flood irrigation system for planting their crops which needs more water.

As we know, water is gradually becoming one of the most valuable natural resources. As the solution to problem we are developing this project to develop a PLC based system which detects or senses the water level in dam and thereby control the movement of gates automatically. Automation is use of various control systems for operating equipment in industries such as machinery, processes in factories.

The biggest benefit of automation is that it is saves labor work; it is also used to save energy and manpower to improve quality, accuracy and precision , reliability

SYSTEM DEVELOPMENT

In this system we developed the overall method in many ways. First one is that the targeted devices can be controlled by PLC (Programmable Logic Controller)

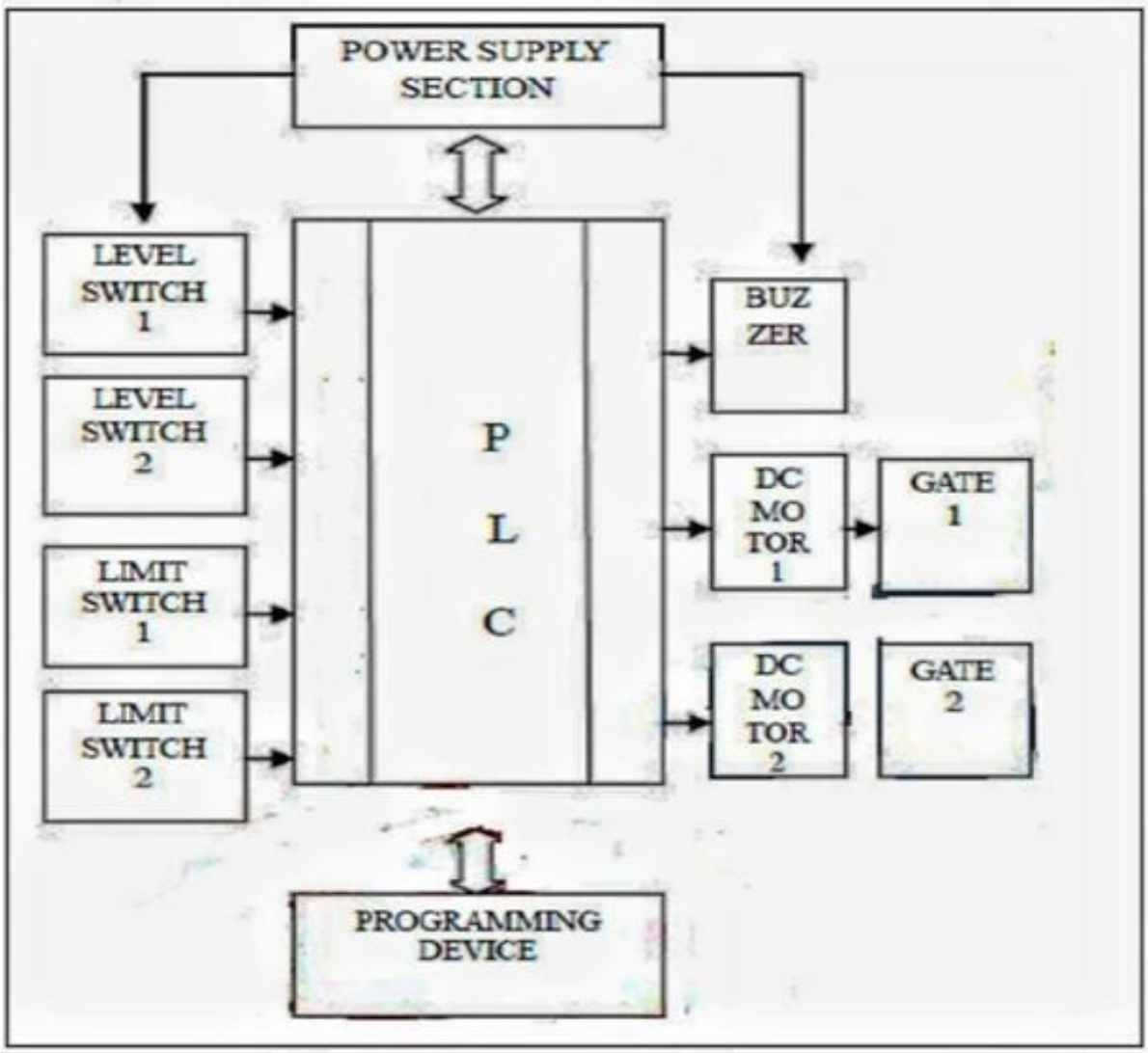


Fig.1 Block diagram of system using PLC

IMPLEMENTATION OF PROPOSED SYSTEM

In this section the method that we have developed to implement the system has been explained. There are various components we have used to implement this system.

whole system is divided into different sections and each are explained separately

PROGRAMMABLE LOGIC CONTROLLER(PLC)

This is heart of our proposed system which controls the entire operation of system. This compact DELTA PLC, economical programmable controllers offer several I/O configurations. In this PLC.There are 8 input and 4 output are available. These PLCs were programmed in "ladder logic", which strongly defines a schematic diagram of relay logic

Ladder logic is a programming languages, that represents a program by a graphical diagram based on the circuit diagrams of relay logic circuit. It is primarily used to develop software for programmable logic controllers (PLCs) used in industrial control applications. In our system, screenshot of programming.

PLC DIAGRAMS

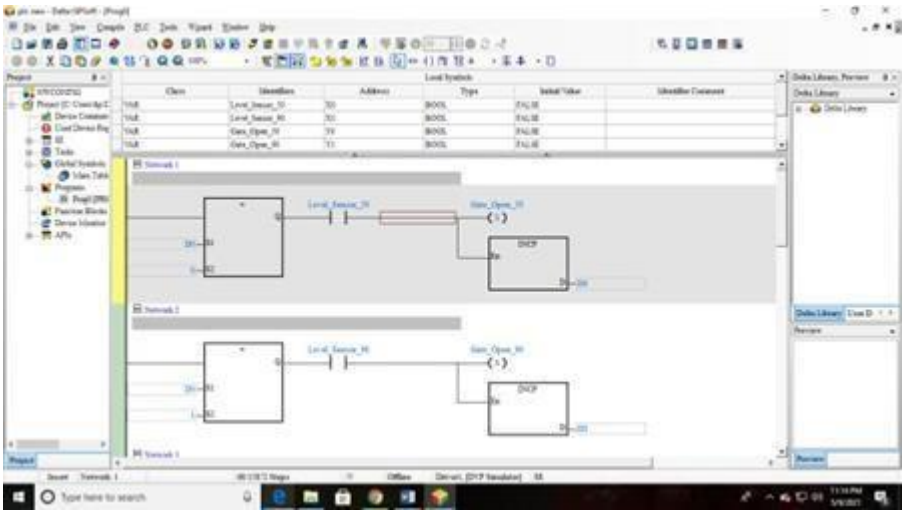


Fig:1**PROGRAMMABLE LOGIC CONTROLLER**

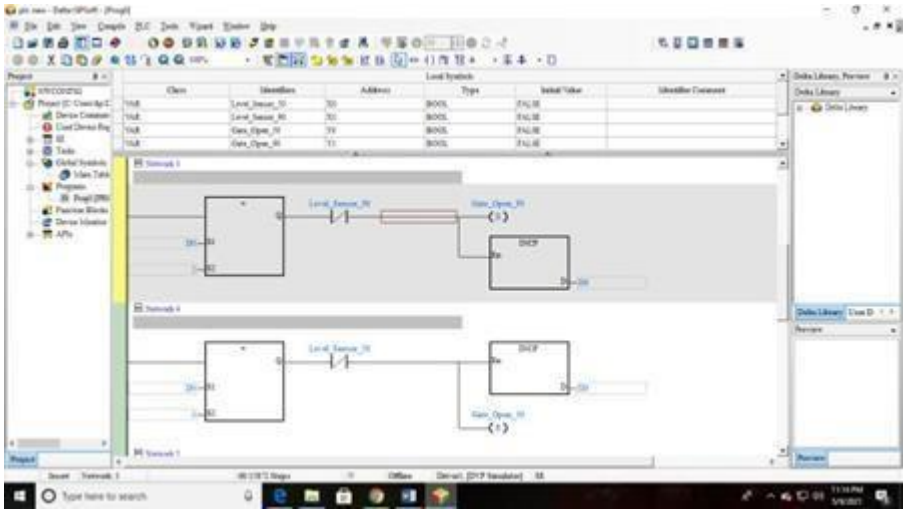


Fig:2**PROGRAMMABLE LOGIC CONTROLLER**

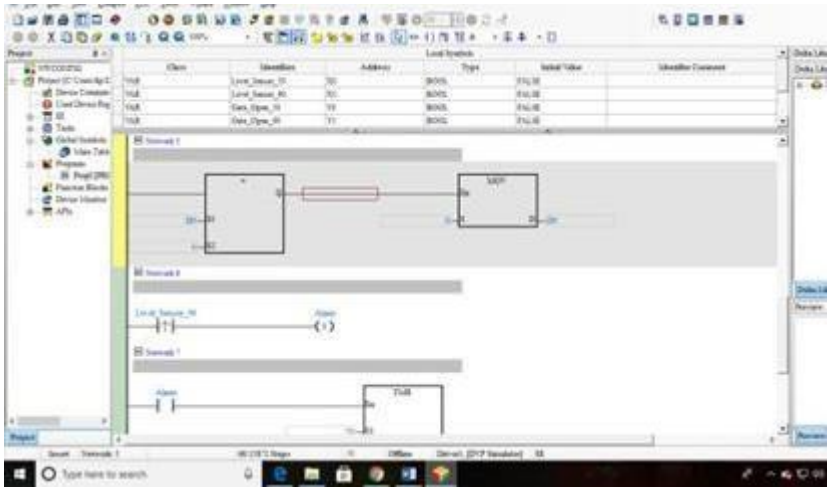


Fig:3**PROGRAMMABLE LOGIC CONTROLLER**

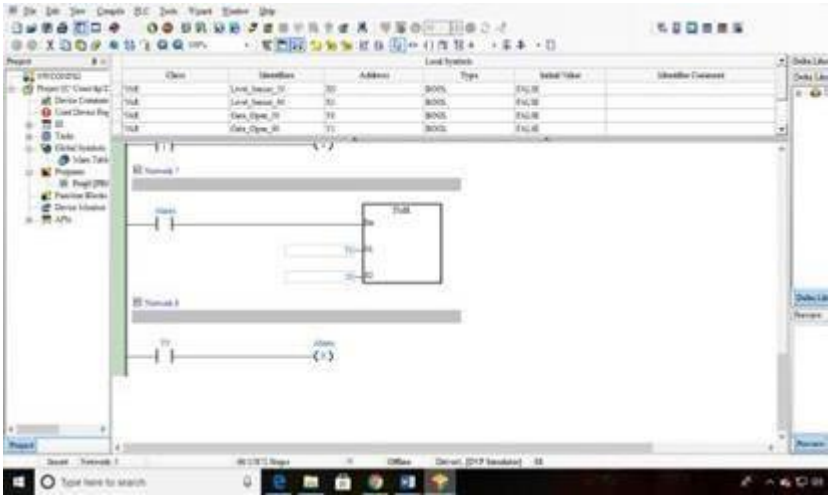


Fig:4**PROGRAMMABLE LOGIC CONTROLLER(PLC)**

SENSING ELEMENT

Sensing element in our proposed system is the ball float type which attached to the level sensor. Whenever the water level increases the ball will keep floating above the water level. Whenever the desired level is achieved then level switch will trigger the input of PLC which controls the action of opening and closing of gates.

GATE CONTROL

In gate control assembly there are two gates used in our proposed system. One gate is used for 50% level of water in dam which depends on water level detected by level switch 1And another gate is used for extreme high level or 90% level of water in dam which depends on level switch 2. The opening and closing of gates is achieved by the dc motor, the motor shaft is connectedwith the geared belt or wire which is placed on gate assembly

LED AND BUZZER

The LED and buzzer are used for security purpose to alert the people about flood. When the water level increases above the extreme high level at the same time buzzing sound will be produced by the buzzer.

HMI

For HMI(Human Machine Interface) software used isDOPSoft 4.00.08. It is used for collecting the data from sensors and devices located at remote site and display oncomputer at control site for monitoring and controlling. In our project we are using DOPSoft for graphical representation of motor control operation during opening and closing of gates.

DESCRIPTION OF MODULE DIAGRAM

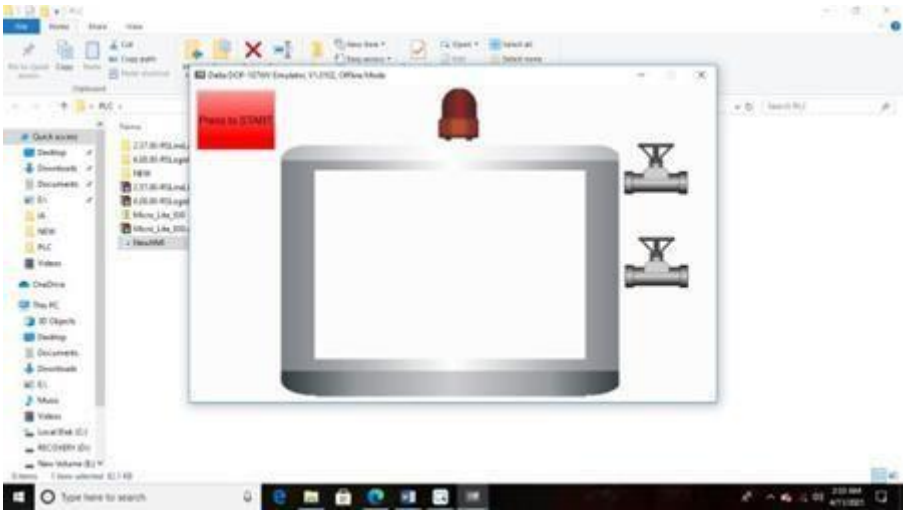


Fig1:DESCRIPTION OF MODULE

A programmable logic controller (PLC) or programmable controller is a digital computer or industrial computer used for automation of electromechanical processes of such devices, this control of machinery on factory assembly lines, amusement rides. PLCs are used in many industries, sites and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements,extendedtemperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory.

Here the PLC used is of Delta DVP SE series whichis most complete network type slim PLC in the industry.In this module, there is built-in mini USB ,also canbe connected using Ethernet and 2 RS-485 ports.It has program capacity of 12000 steps. Also it has built in Ethernet which supports MODBUS TCP and Ethernet/IP.

FUTURE SCOPE

To enhance the sophistication of this process we can make use of level transmitter and standalone PID controller. This system is opening and closing with in particular stages of gates.

The level transmitter can be used of RFID devices for wireless communication along with the PLC.

In this system we are use also GPS (Global position system), are indicating for particular person will receiving message and alert through mobile.

B GATE MEASUREMENT SYSTEM

❖ C O N T E N T S

TECHNICAL SPECIFICATION

- **Input supply:** 24V DC. (+/- 2V) .
- **Input:** Digital Pulse Inputs (24V) .
- **Display:** 16x2 alphanumeric LCD with back lit.
- **Measurement:** 0-15 Mtr.
- **Resolution:** 5 mm or better.
- **Accuracy:** +/- 3mm.
- **CPU:** Microprocessor based solid state.
- **Programming:** Field programmable through RS 232 from PC.

- **Communication port:** 2 wire RS485 port for communication at the speed of 19.2K bps.

- **Keyboard:** Membrane keyboard, Auto / Manual Switch.

- **Limit switch Input:** Full open and full close position.

- **Terminal:** On back panel MSTB-5.0.

- **Environmental:** - Op. Temp. : -20 to 60 ° C .

- **Humidity** : 0-99% .

- **Dimension:** Panel mounted design of dimension 96 X144 X 175 mm.

- **Accessories:** Mounting Clamps.

▸Limit switches.

SYSTEM FLOW CHART

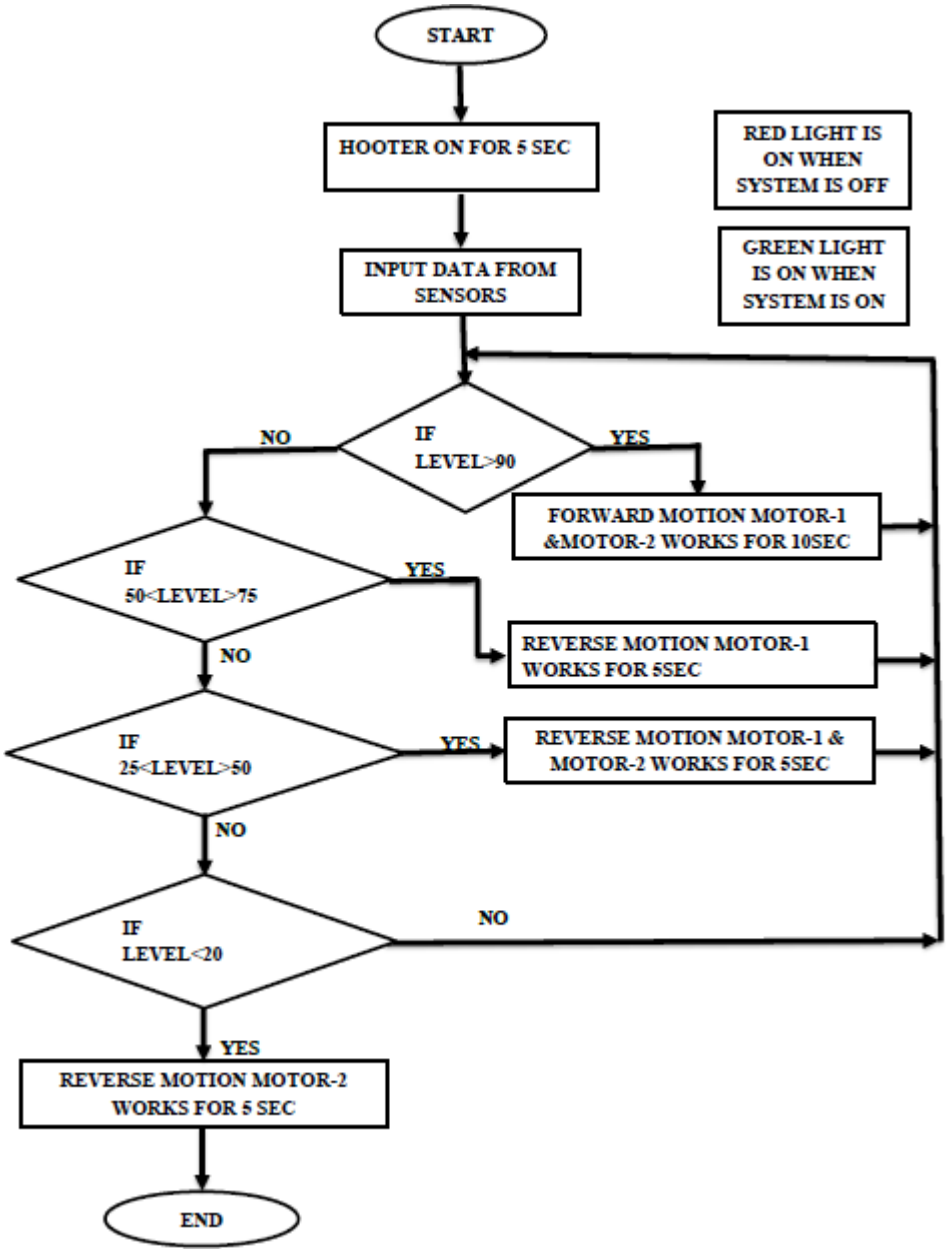


Fig 1:System flow chart.

FLOW CHART-SYSTEM OVERVIEW

There are some important tools and systems which are very useful for this model.

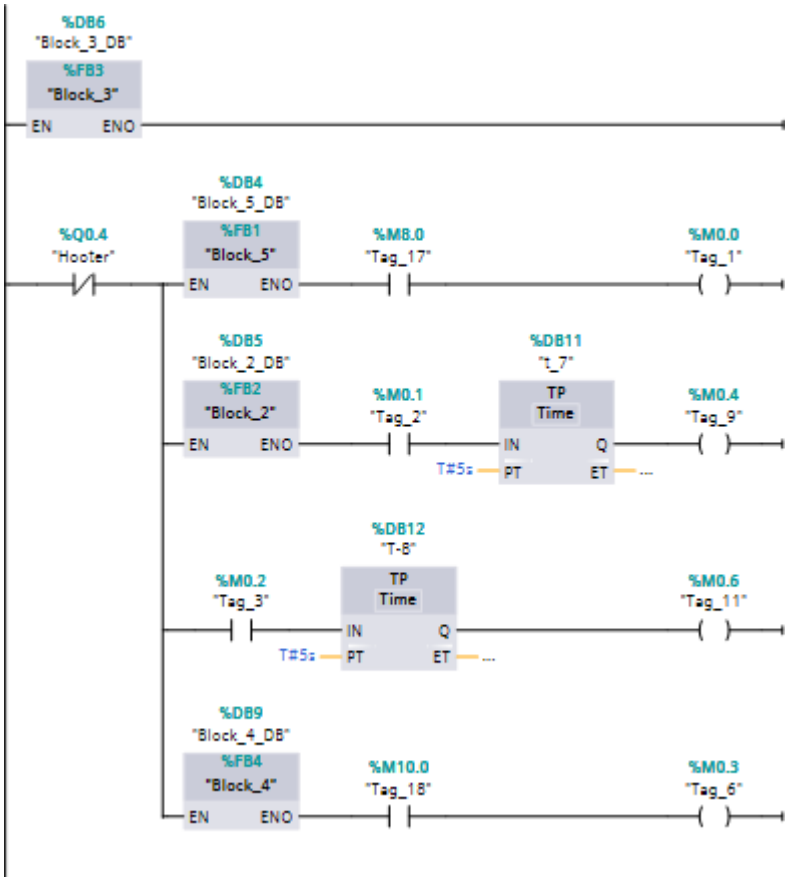


Fig. 2: Ladder program for the system

PLC is heart of this system. All the operations are done by the PLC. We have implemented the automation in SIEMENS-SIMANTIC S7-1200 model. There are 14 digital inputs and 2 analog inputs and 10 digital outputs. The analog input uses sensors of 0-10 VDC and 4-20 mA current rating. The size of work memory available in this PLC is 100 KB.

SCADA

We use SCADA for getting the data from devices and switches in system so that we can display it on PC. Hence it can be monitored and controlling can be done. SCADA also help in providing graphical presentations of the two gates when they open or close with help of DC motor. The logic can be made with the help of SCADA in which data and time is recorded.

OPERATION

When the main switch is turned on, green light is also turned ON to show that the whole system is in operating mode. And hooter is turned ON for 5 sec and after that the sensors give input signal to the PLC. If the level sensor connected at 90% of the water level gives the input signal to be high than the motor-1 and motor-2 operates in forward direction for 10sec. Hence, opening the full gates. If the water level drops to the range of more than 50 but less than 75 than the motor-1 operates for 5sec in reverse direction.

Closing gate-1. While motor-2 operates for 5sec in reverse direction closing gate-2 to half. If the level sensor connected at 20% of thewater level gives the input signal to be high than the motor-2 operates for 5 sec in reverse direction. Hence, closing the gate-2 completely.

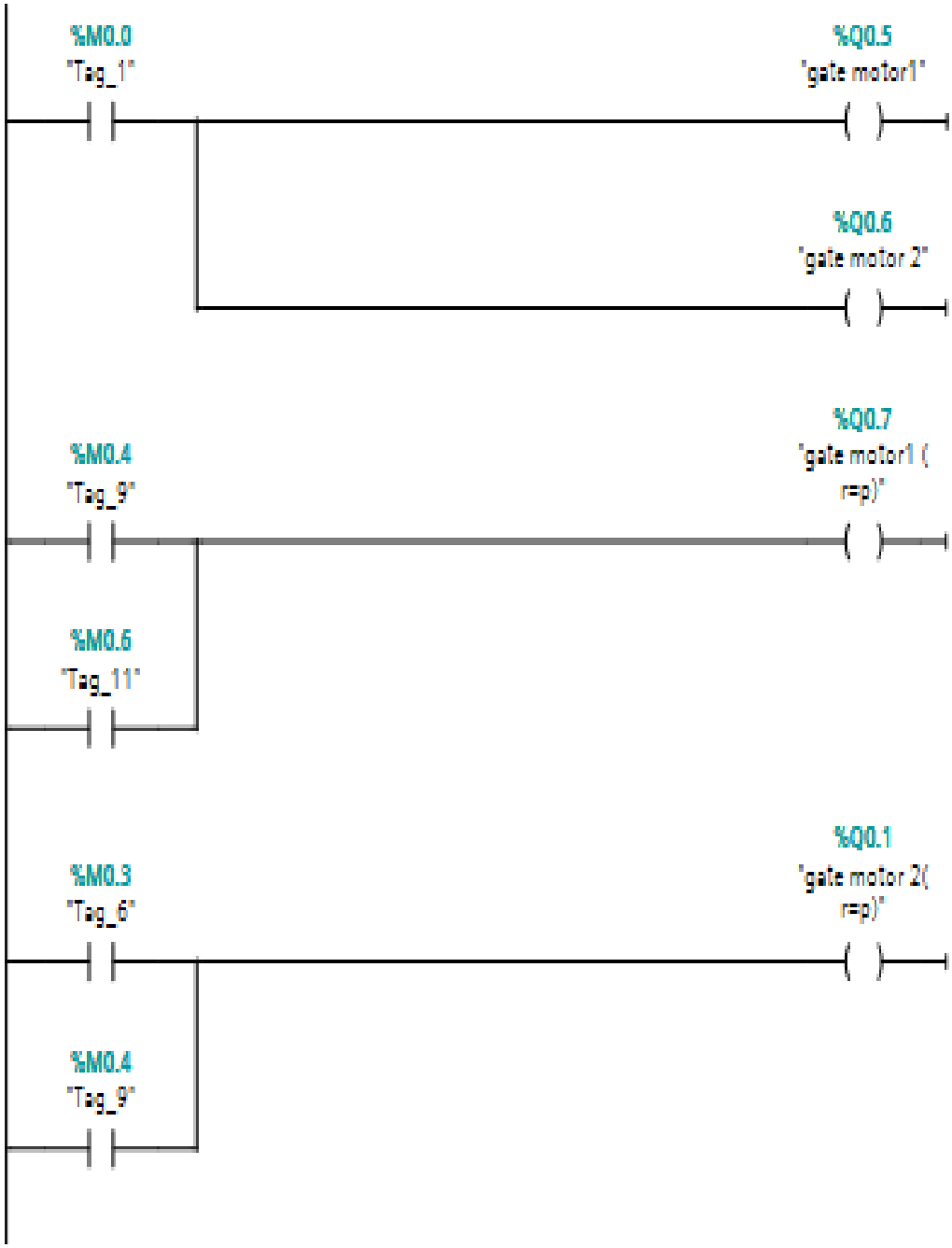


Fig. 3: Output port of the system.

SCADA DISPLAY

Supervisory control and data acquisition system is used for remote operation of the controlling system of dam gates operations[3]. A Human Machine Interface (HMI) is used is to display the status of the water level and also the visual screen shows the operation of various components of the system. HMI can also be used to change the state of the main switch of the system.
The various states of the whole system can be seen in the figure 4, illustrating the visual view of the whole system.

RESULT

The automation of gates has been implemented in SIEMENSSIMANTIC S7-1200 module. The ladder programming has made the controlling of gates very easy. The flowchart of this system is an initiative for future plans of small and large hydro-electric power plant projects. This project is focused on the human safety and concerns for the global environment conservation, through the appropriate use of the water. It also fulfils the desired goals of hydro-electric power plant project.

PLC system provides automation through rigid control enforcement, to eliminate human errors and to minimize manual interventions. PLC system is easy to maintain and control.

They are economically good and simple to operate[6]. The system has following advantages for future.

Fig. 3: HMI visual display

Fig. 4: HMI visual display

- Easy operator interface due to colour graphic and advisory system introduction.

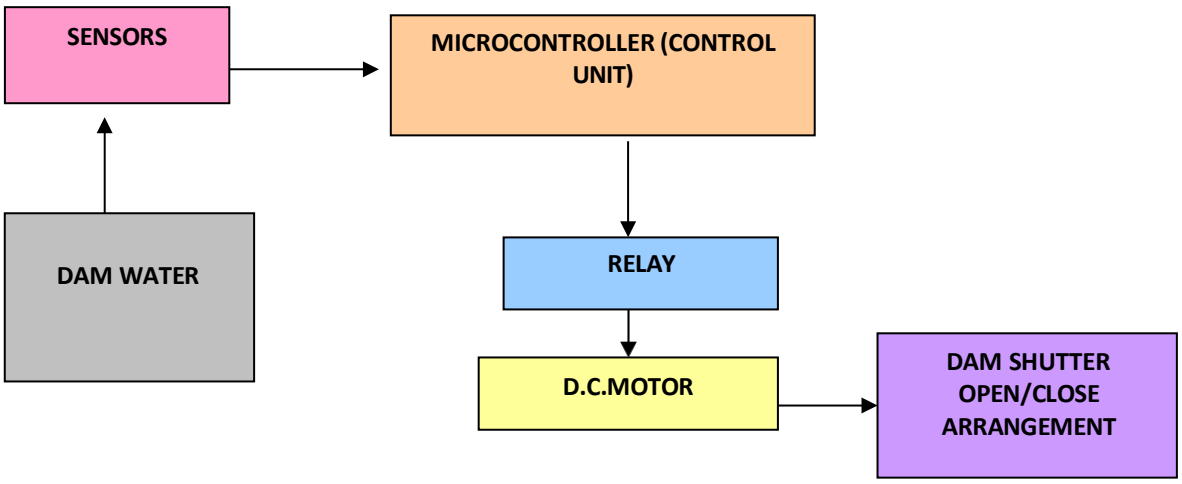
- Analog signal handling and close-loop control programming.

- This model will increase the application by using other highlevel sensors and controllers.

- For actual position of water, different methods can be used like as GPS, level sensors, Capacitor theory etc.

- This paper will enhance the automation technique in any fields.

BLOCK DIAGRAM



FEATURES

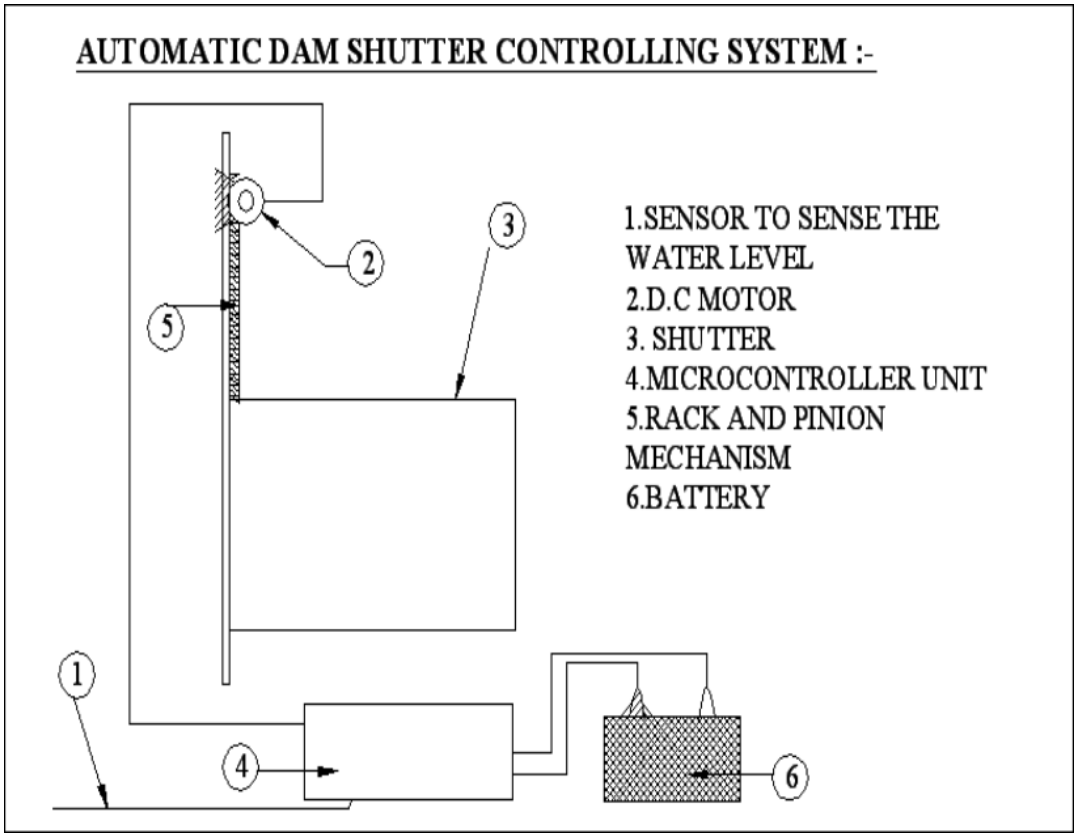
- The water level scanning section scans the water level with beep sound after power resumes.
- When water reaches the full level, the motor turns off and provides a beep sound for about a minute.
- When water goes below the particular level, the motor close the dam with beep sound.

APPLICATION

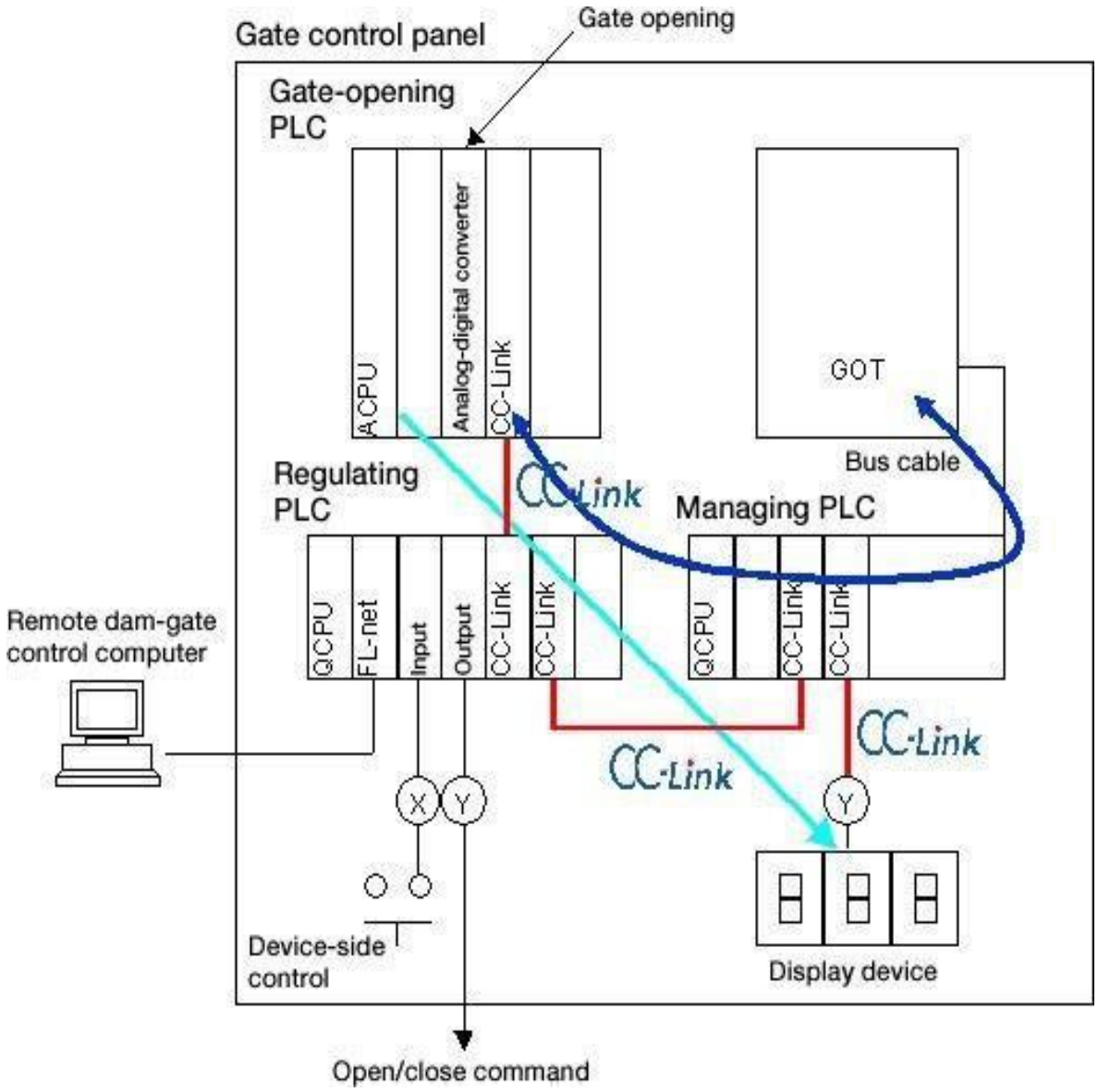
- It is used to Dam.
- In overhead tank home application.

- In industry motor application.

AUTOMATIC DAM SHUTTER CONTROLLING SYSTEM DIAGRAM



GATE CONTROL PANEL



PROGRAMMABLE LOGIC CONTROLLER

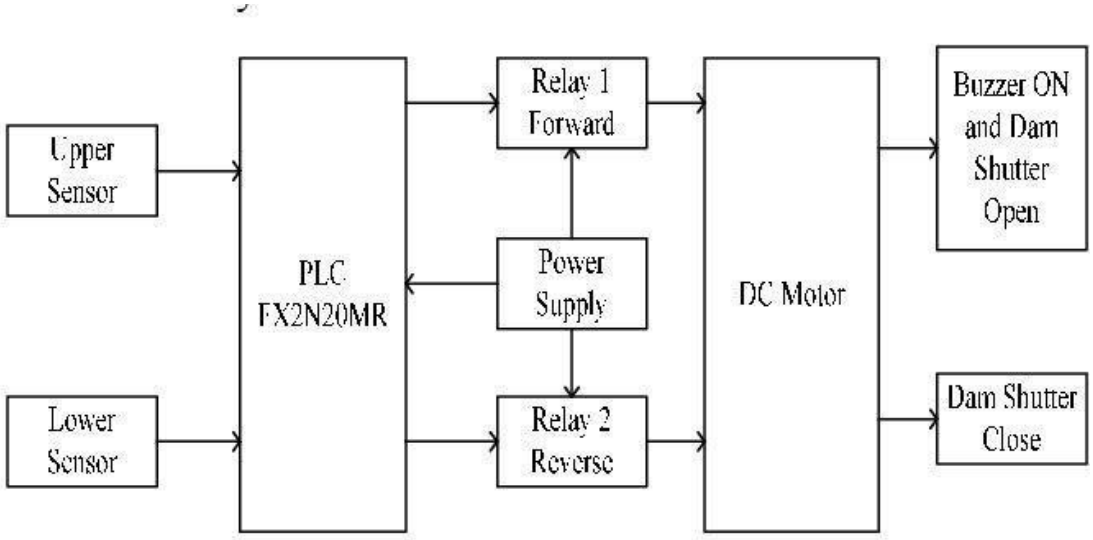


Fig. 1 Block Diagram of Gate Control System of Dam using Programmable Logic Controller

FEATURES

KEYBOARD AND DISPLAY INTERFACE

16x2 alphanumeric LCD with back lit.

Increment, Enter, Decrement keys on front panel.

GATE DISPLAY STATUS

Displays gate opening on first line and status on second line.

If no movement displays GATE STEADY

If gate is moving upward displays MOVING UP

If gate is mov

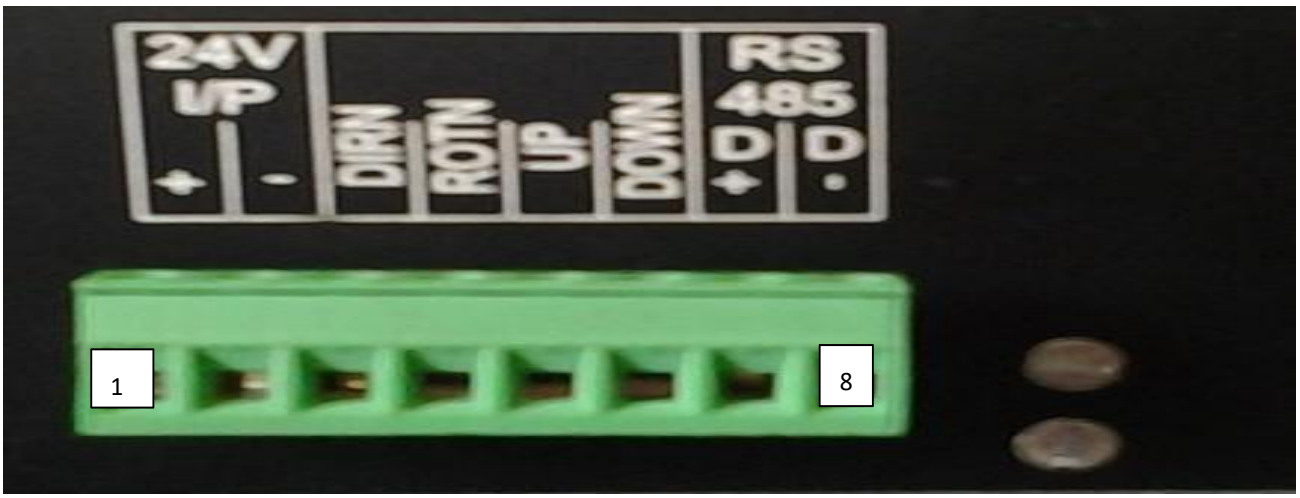
AUTO/MANUAL SWITCH

Auto-Manual switchis provided to change gate opening if required.

Put Auto-Manual switch toManual Position, press increment key to increase gate opening. Then release increment switch if desiregate opening comes.

To decrease gate opening, press decrement switch, releaseswitch if desire gate opening.

BACKPANEL



Pin No.	Signal Description
1	+24 DC
2	GND 24V
3	Direction switch
4	Rotation Switch
5	Full Open Switch
6	Full Close Switch
7	RS-485 (D+)

PROGRAMMING SETUP

MECH-GMS RS485 TORS232 PC

Switch ON GSM,

String	Description
29534	Total Count
00762	Gate Height
#	End of String
D	data

Switch OFF GMS

DIP SW-1	DIP SW-2	DIP SW-3	DIP SW-4	DIP SW-5	DIP SW-6	DIP SW-7	DIP SW-8	ID
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	A
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	B
OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	C
OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	D
OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	E
OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	F
OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	G
OFF	OFF	OFF	OFF	OFF	ON	ON	ON	H
OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	I
OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	J
OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	K
OFF	OFF	OFF	OFF	ON	OFF	ON	ON	L
OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	M
OFF	OFF	OFF	OFF	ON	ON	OFF	ON	N
OFF	OFF	OFF	OFF	ON	ON	ON	OFF	O
OFF	OFF	OFF	OFF	ON	ON	ON	ON	P

SAFETY INSTRUCTIONS/WARNINGS

- Do not use GMS in flammable environment.
- The GMS may only be used if it is in working condition.
- Do not apply more or less input voltage than specified.
- cuit while connecting cables.

Make sure before changing ID of GMS

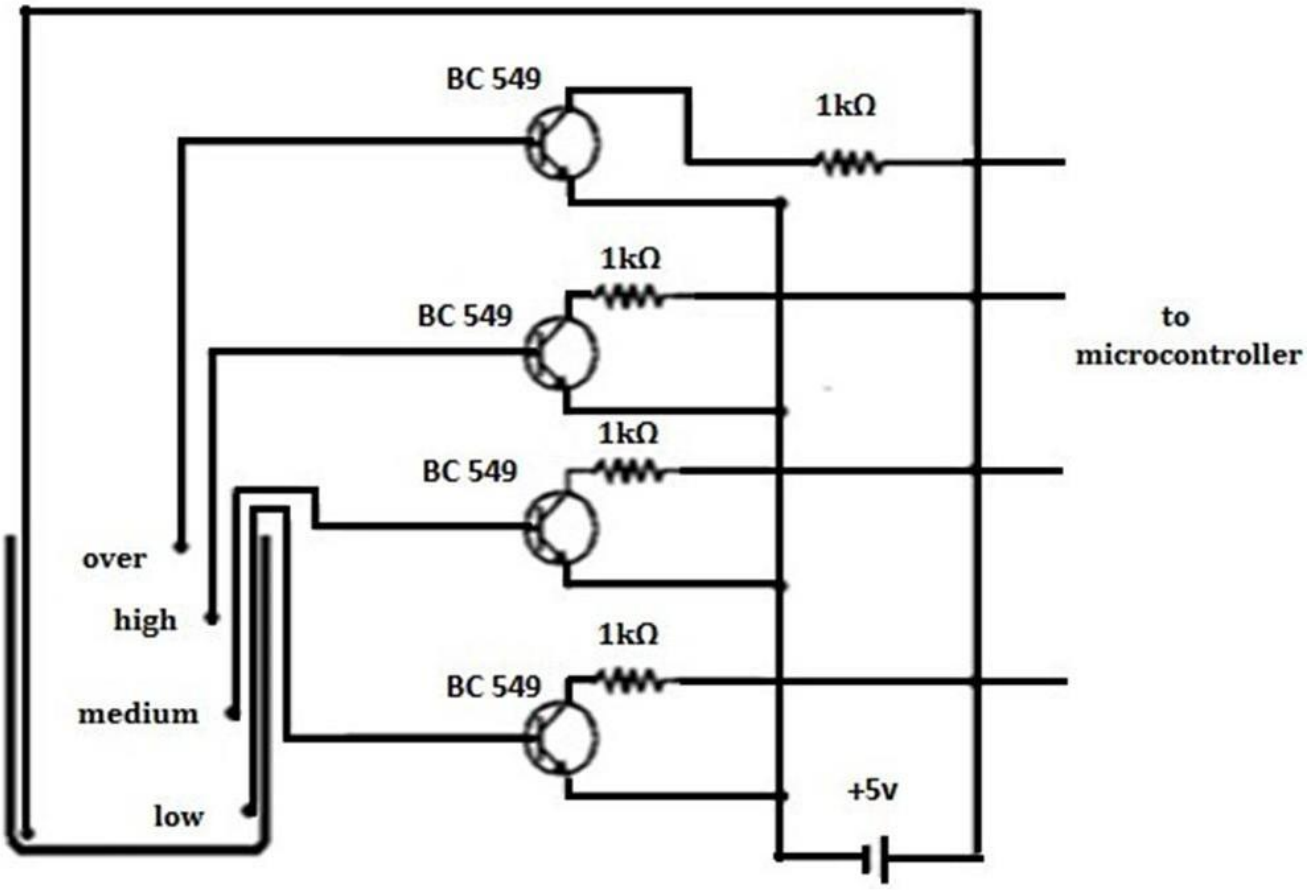
Sensing circuitry

LED GLOW ON SENSOR OUTPUT

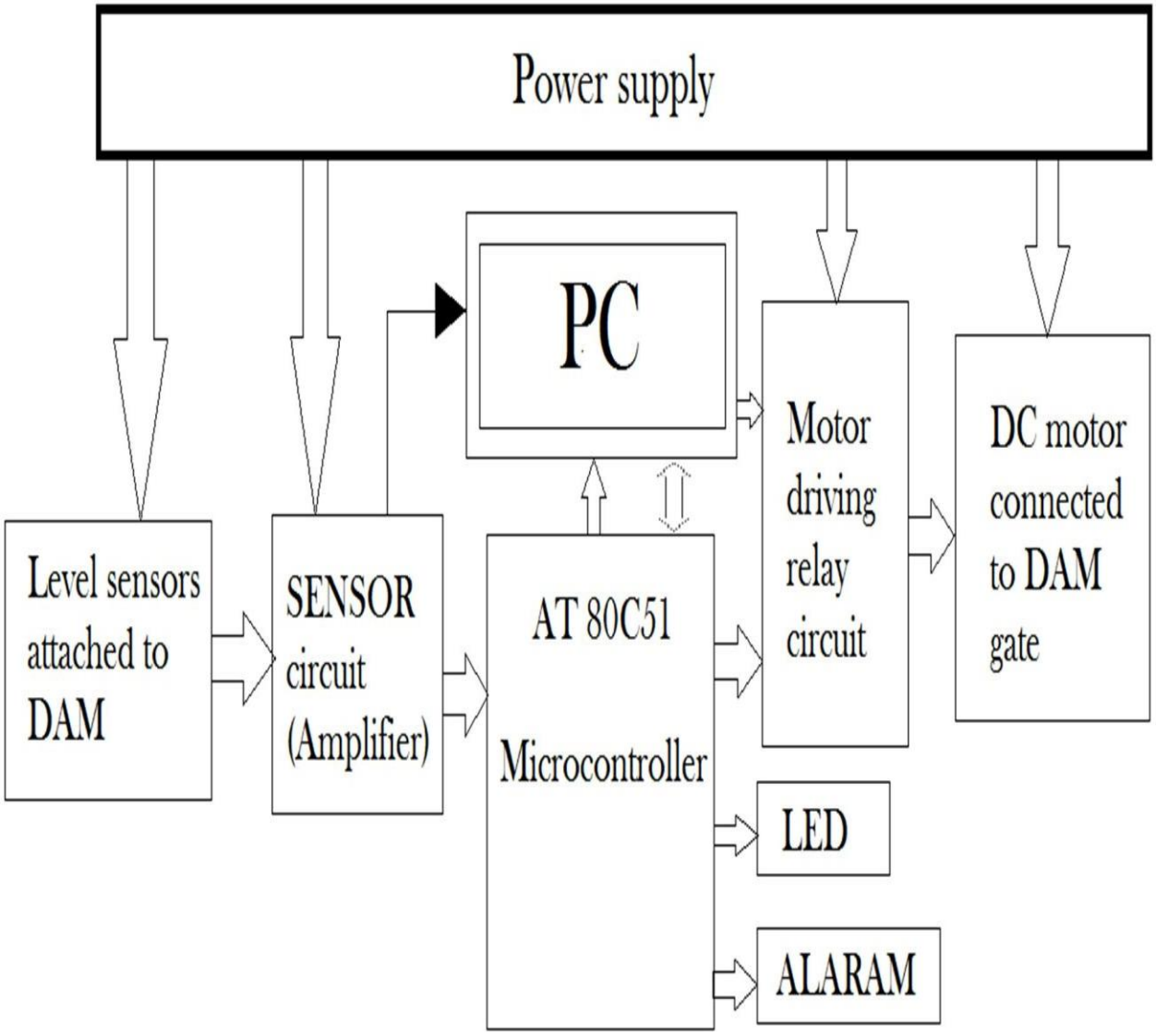
ircuit diagram

Sensor o/p	LED 1	LED 2	LED 3	LED 4	Motor	Upper Reservoir	Reserve Tank
0000	OFF	OFF	OFF	OFF	OFF	Empty	Empty
1000	ON	OFF	OFF	OFF	ON	1/4	Water Exist
1100	ON	ON	OFF	OFF	NO OP.	2/4	Water Exist
1110	ON	ON	ON	OFF	NO OP.	¾	Water Exist
1111	ON	ON	ON	ON	NO OP.	FULL	Water Exist

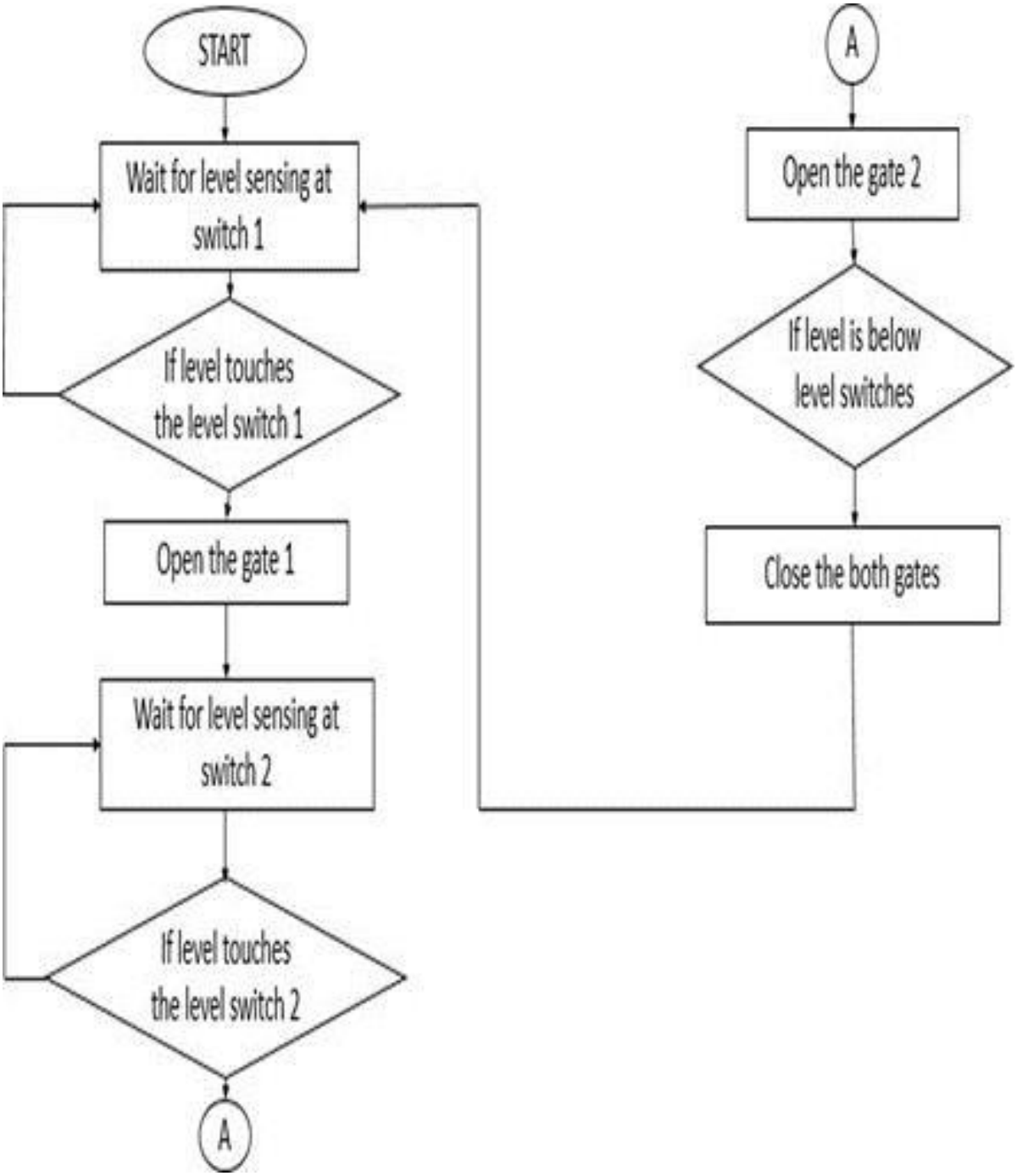
circuit diagram



BLOCK DIAGRAM



FLOWCHART


START
Wait for level sensing at switch 1
If level touches the level switch 1
Open the gate 1
Wait for level sensing at switch 2
If level touches the level switch 2
A
A
Open the gate 2
If level is below level switches
Close the both gates

FUTURE SCOPE

To enhance the sophistication of this process we can make use of level transmitter and standalone PID controller. This system is opening and closing with in particular stages of gates.

The level transmitter can be used of RFID devices for wireless communication along with the PLC. In this system we are use also GPS (Global position system), are indicating for particular person will receiving message and alert through mobile.

Thus the communication between the controller andthe driving element can be established wirelessly.

Therefore a major future work can be possible in which a centralized control of all the dams in a state using GPRS

CONCLUSION

In this paper, it represents an automatic controlling ofa DC motor using PLC and HMI.

This System model of a PLC based Dam automation system which is the completely automated can control the level of the dam gates using backup of the water.

Thus using PLC and HMI the level of water in the dam is controlled effectively there by opening and closing the gates of the dam whenever the level increases.

Therefore the use of Programmable logic control has opened doors for a level of automation Dam system and HMI also monitoring the

An entire plant and stored the entire information about openingand closing of the gate .

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[3] Nevon projects.com