REAL TIME PLC BASED CONTROL SYSTEMS USING WIRELESS SENSOR NETWORKS

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ABSTRACT

A main aim of proposed system is to monitor and control a PLC based system wirelessly for an industry with wired PLC, it can be achieved using GSM & RF module. In some cases no person is required to do the process manually. Person can need only to send the reply about the process that is to be carried out and PLC will check the status of the SMS sent by person and take the action according to it. Status of field is sent to user by PLC via RF module based on the input status of the sensors that are placed at the field an these simulation of this project will be carried out by using INTOUCH HMI. To verify the functionality and monitor the temperature and humidity sensor levels INTOUCH HMI symbol factory tool is used and these system design is implemented in windows scripts with C language can be generated by using INTOUCH HMI. For implement this project I am going to use GSM SIM300 module, DVP 10SX PLC, Switches as a sensors, Motors as an output and RS485 to RS232 converter.

Keywords: GSM, Humidity sensor, INTOUCH HMI, PLC, Pressure sensor, RF module.

1. INTRODUCTION

A programmable logic controller are commonly known as PLC, is a digital, solid state, industrial computer using for an integrated circuits instead of electromechanical devices to implement their control functions. Also, it was invented in order to replace their sequential circuits which were mainly used for a machine controls. It is capable of storing instructions, such as timing, sequencing, arithmetic, counting, data communication and manipulation, to control machines and processes.

Also, According to NEMA(National Electrical Manufacture's Association ,USA),the definition of PLC has been given as Digital electronic devices that can uses a programmable memory and to store instructions and to implement specific functions such as logic , sequencing, timing, counting, and arithmetic to control machines and processes.

A PLC programming is done by using a Ladder diagram Language among some several languages. From a Ladder diagram is specialized an schematic language are commonly used to industrial control logic unit systems. It called as "ladder" diagram and because it likeness to a ladder with two vertical rails are (supply power) and as many "rungs" are (horizontal lines) as there are control circuits to represent.

To implement wired PLC with a wireless sensor networks on RF module and some important modules to increases their efficient communications. Various of important modules are like: Implements GSM module, System interfaces with RF for Wireless communications, Any location in the field we can know sensors value through GSM controller and can controls sensors value, Obtaining efficient controls.

In these Wired PLC are implemented with a wireless sensor networks for efficient transferring data values. Sensors are controlled and monitored through GSM module corresponding its set value points. For RF module is to communicate their remote location areas. Depends on that corrected values from set points it can be functioned. Each process of sensors values can be transferred for dedicated system or a person to knowing their present situation of field.

II. PROPOSED SYSTEM

PLC based control system with Wireless Sensor Networks. Humidity sensor is to sense how much humidity present in that place. Depends upon the humidity level solenoid valve will be opened. Also, float sensor is to sense whether water is reached on a specified limit. Timer based system is also implemented whenever if possible.

Through RF module can monitor and control their complete process automation. Adding of GSM module can knows their status of working operation in these system.
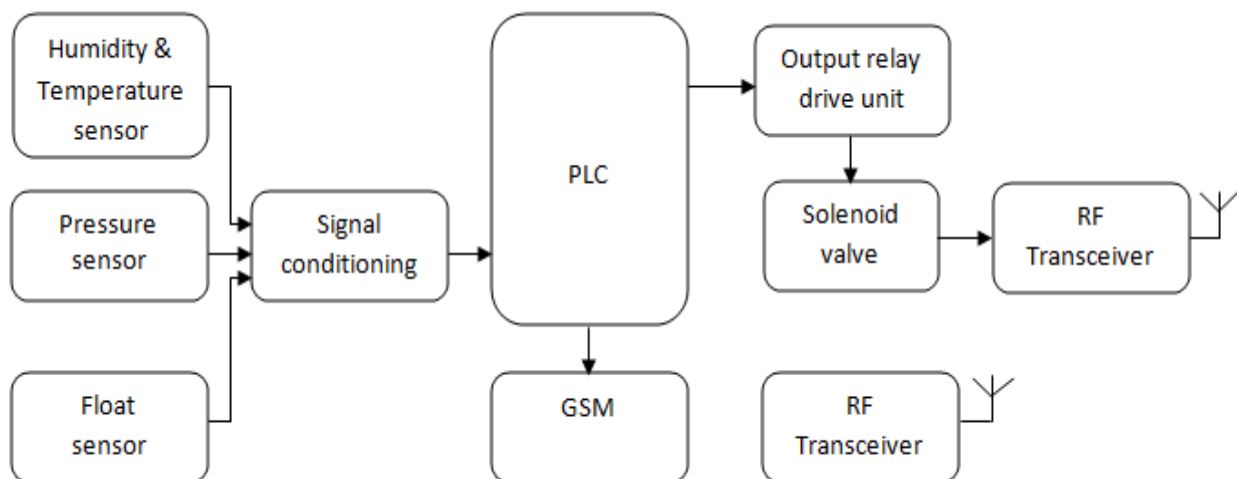
III. BLOCK DIAGRAM

Fig.1 Block Diagram

The above block diagram Fig.1 represents the automatic control mechanism. Here each of the functional unit is represented in a block. Basic function of the whole of the system is to control by an RF module. Main control unit of the circuit is the PLC controller whose description is given before.

Delta10sx PLC controller works on a voltage of 24V DC so it is fed from SMPS power supply unit through a plug. The humidity sensor sense the humidity in soil and gives analog voltage input to controller A/D port, similarly the "float sensor" also sense the water level reached or not and passes the voltage signal to controller. The A/D converter are converts the analog signals into an digital signals which is compared by an values to controller. Whenever the humidity level is below then the solenoid valve is switched ON and kept running till humidity is brought below and then the supply is cut OFF through solenoid valve.

3.1 Components & Description

3.1.1 RS485 to RS232 Converter

It is a converter that converts the rs232 communication port to rs485 communication port. It needs the separate power supply to convert the data. At rs485 side one connection is for power supply, two connections for an ground, and remaining two are for rs485A and rs485B.

3.1.2 GSM Module

Fig.2 GSM Circuit Diagram

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number in it. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Most of applications like data transfer, SMS Control, remote logging and control can be developed easily.

The modem can either be connected to PC serial port directly or to any microcontroller or PLC. It can be used to send and receive SMS . They can be a also used in GPRS mode to connect to internet and do many applications for data control and logging. In GPRS mode you can also connect to any remote FTP server and upload files for data logging.

3.1.3 Delta PLC DVP10SX

The name itself suggests the type of PLC and I/O it provides like DVP is a series name, 10 stands for (6+4) 6 inputs and 4 outputs, SX series as shown in fig 4. The delta PLC is cheaper than other brands of the PLC and easy to configure with any application of industry as well.

3.2 Sensors

3.2.1 Pressure Sensor

Pressure sensors have been in demand since the advent of the steam age. In such sensors are used daily to monitor the pressure of fluids in engines, pipes, hydraulics. Some specialized sensors are also used to determine the pressure of gases or solids. A typical pressure sensor is about a cubic inch in sizes, some may be a hundred or more times smaller, example those used in micro electromechanical systems.
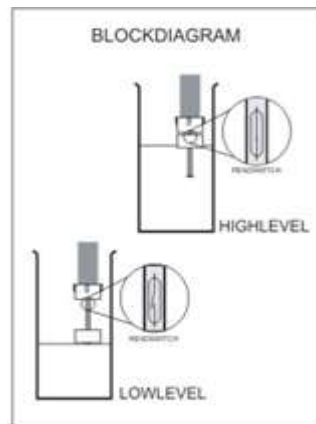
3.2.2. Float Sensor

Fig.3 Float sensor working Diagram

Here the principle behind these mechanical, cable, magnetic and other float level sensors are involves the opening or closing of an mechanical switches, and also either by direct contact with their switches, or magnetic operation of a reeds. With an magnetically actuated float level sensors, it switching occurs when a permanent magnet is sealed inside a level float rises or falls to the actuation level on it.

With a mechanically actuated float level, switching take places as a result of the movement on float against a miniature of (micro) switches. For an both mechanical and magnetic float sensor, temperature, chemical compatibility, specific gravity (density), and viscosity affect the selection of the stem and the float.

3.2.3 Solenoid Valve

Solenoid valve is an electromechanically functioned valve for a controlling process. These valves are controlled by it electric current and through a solenoid: in a such case of two-port valve has flow is switched either on or off; and also in the case of a three-port valve, here outflow is switched in between depends on two outlet ports. Multiple of solenoid valves can also to be placed together on manifold.

And solenoid valves are the most often used control elements in their fluidics. From tasks are to be shut off, dose, release, distribute or mix fluids. These are found in several application areas. Solenoids offer fast and safe switching, long service life, high reliability, good medium compatibility of materials used, low controlling power and compact designs.

Besides the plunger-type actuator which is used most frequently, pivoted-armature actuators and rocker actuators are also used.

IV. SIMULATION & RESULT

Hence the programming sides first have to configure the PLC in a communication mode for communication purposes and it is usual part for all types of PLC for communication. And that next have to SET as memory bit for every an AT commands to communicate with their GSM module. After that enter the code of hex for all that command including a message that want to a send to the mobile.

Similarly should load their program in corresponding PLC and connect their RS485 to RS232 converter at RS485 terminal is to be provided in these PLC and at other end of the cable should connected to RS232 cable and whose another end of cable will be connected to a GSM module.
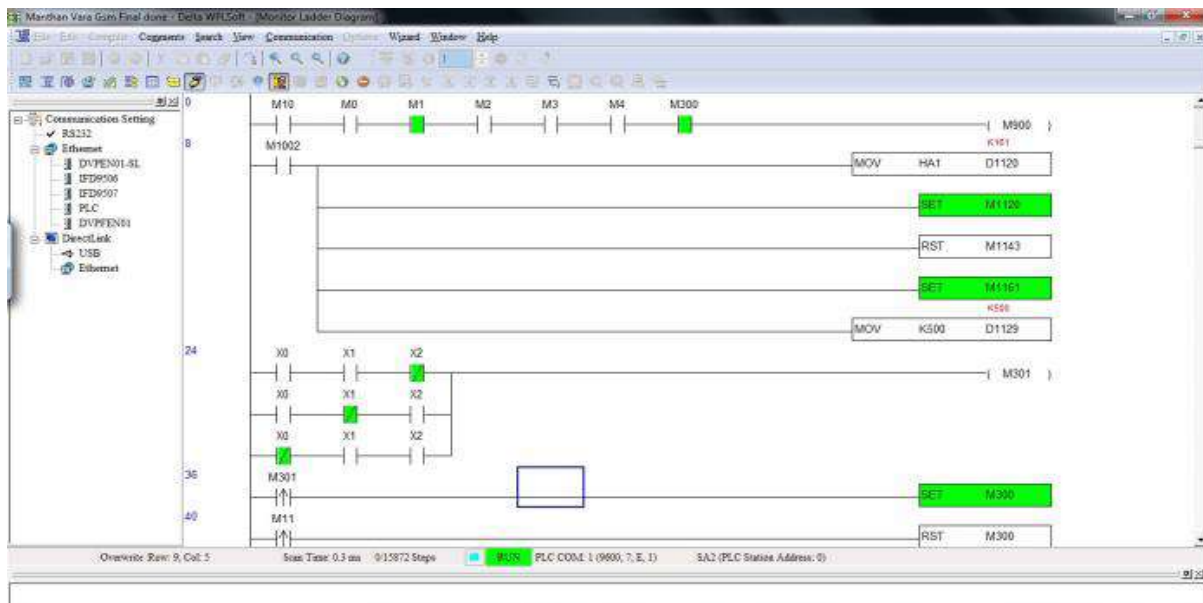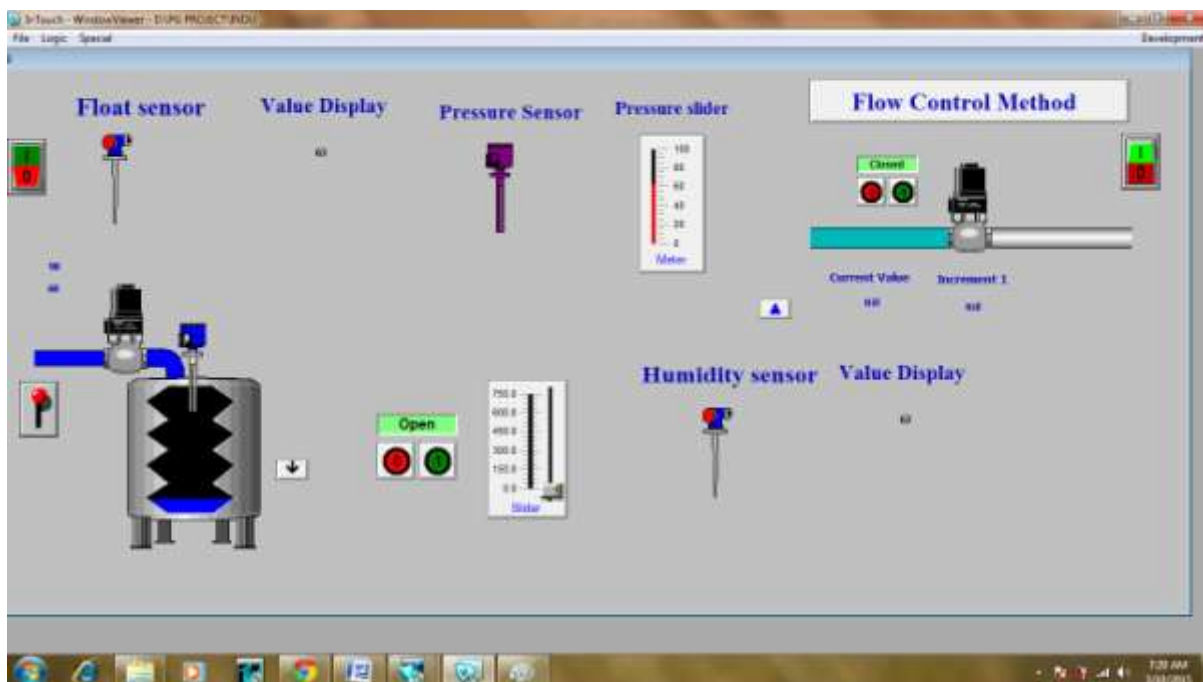

Fig 4 RUN mode of Program

Fig 5 RUN mode in INTOUCH HMI tool

Fig 4 & Fig 5 shows their RUN mode in application mode & simulation of Run mode in INTOUCH HMI tool software.

4.1 Application

- Gardens maintenance sectors and others irrigation plants cultivation sectors are also to be adopted.

4.2 Future Enhancement

In this future it can extend their scope of PLC for wireless application by interfacing ZIGBEE module with PLC and it can get their same result as ZIGBEE modules interfaced with controller. By adding additional parameters of some sensors it improves their performance of these systems.

V. CONCLUSION

From these simulations shown above it can conclude that interfacing of GSM and RF module with PLC is done successfully and these can use it at any PLC based industry for wirelessly controlling and monitoring of industry process and also they can use it for agriculture processes are based on PLC.

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