

PLC BASED WASTE WATER TREATMENT AND FIRE ALARM SYSTEM

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Abstract— Water is basic necessity of life used for many purposes one of which is industrial use. Industries generally take water from rivers or lakes but they have to pay heavy taxes for that. So it's necessary for them to recycle that to reduce cost and also conserve it. Main function of this project is to clean industry effluent and recycle it for further use. Many manufacturing industries produce their products with using water. With their products industries produce wastewater, which can be removed with the help of waste water treatment process along with water recycling can help us to sustainably manage our vital water resources. In this system, propose a few automated processes for a partial automation of the apartment which can be mostly used in residential areas and industries. It is developed using PLC. The main intent is treated water which can be in turn used for many other purposes and can be cost effective as well. In this paper, our major focus is about industrial automation. Thus by the use of PLCs all the input and output field devices can be controlled automatically with the proper programming. PLC automates the sequence of operation to avoid human interference so accuracy is improved and speed of process has been increased. This will reduce the manual manpower too. Everything seems to be more efficient due to the PLCs. The main aim is industrial and small enterprises sewage treatment to realize the good sewage treatment of automatic control system with high accurate, reliability, convenient and flexible control and scalability.

Keywords— PLC (Programmable Logic Controller), Smoke Sensor, Solenoid Valve, DC Motor, Automation, Water Pump, Waste Water treatment.

INTRODUCTION

Many nations and regions all over the world are facing threats of severe water scarcities or deprivation of the water environment resulting from issues such as hot-headed population growth, rising living standards carried about by economic progress and growing use of industrial water. Almost all industrial processes produce some form of pollute water. Throughout the years the solicitation for high calibre, greater effectiveness and computerized machines has enhanced in the mechanical part of water treatment plants. However, with growing urban population, altering lifestyles and industrialization the quality of contaminated water has worsened over the years and hence requires action before it can be reprocessed for any purpose.

Water treatment plants require consistent observing and audit at incessant interims. There are possibilities of blunders at ascertaining and various stages required with human works furthermore the absence of few structures of microcontrollers. The standard PLC micro830 is utilized to switch the exertion of the subsystems at the passageway of the plant. PLC small scale 830 applications are generally utilized as a part of industry to control and simplicity dull procedure. This contains mechanization of water treatment plant utilizing PLC miniaturized scale 830. Programmable Logic Controller is interfaced with debased water treatment for working the valves. Programmable Logic Controller is utilized to control the part of machine consequently. It is automated modern microchip made controller that executes discrete or consecutive rationale in mechanical environment. It was built up to swap mechanical hand-off, clock and counter subsequently it is likewise called modern Programmable Logic Controller. Controlling high Pressure is unsafe employment, so here robotization assumes enthusiastic part. There are various fields where weight and water level control fundamental to be done momentarily. Consequently it creates dreary exchange to handle the item naturally furthermore preparing time may shift because of human supervision botches. This may not give unsurprising results. Along these lines computerization has critical influence in this procedure. Robotization revises the human errors, rise the repeatability and precision of the framework and decrease the time ingesting.

The point of this framework portrays operation of Programmable Logic Controller to current real-time model of the sullied water treatment plant. Utilizing Programmable Logic Controller the position of the parameters can't just be perpetually checked additionally the procedure of the crucial parameters can be controlled.

This kind of operation has numerous advantages. It includes: improved wellbeing level and saving of time, money and time redeemable by the time conservation, actual procedures checking, life and dependability of plant has to be upgraded, suppleness using the structure can be change, simplicity of stacking report of the plans. By utilizing Programmable Logic Controller made mechanization around commercial enterprises, lofts can prompt an enhanced, loose life by diminishing expenses and edifying the magnificence of life.

BLOCK DIAGRAM

Figure 1 depicts the simple outline of the system hardware. The proposed work includes inputs, outputs, hardware and PLC. The input consists of reservoir tanks, power supply, smoke sensor and master switch ON/OFF. The output consists of DC motors, control valves, water pumps and buzzer. The reservoir tank consisting of the waste water to be treated. The water pump controlled by PLC, pumps the water through a mesh to filter macro particle like sand, stones etc. the next stage consists of the filter membrane which filter minute or dissolved particle present in the water. At last chlorination process will takes place. The solenoid valves open and close according to the controlling action of PLC to allow the water treatment in different stages. send back the treated water to the small scale industries, apartment and also can be recycled for horticultural. This treated water is delivered to the small scale industries or apartments one after the other for some predefined length of time and so embedded timer functions in this system to do the process. Whole process for waste water treatment is keep on repeat.

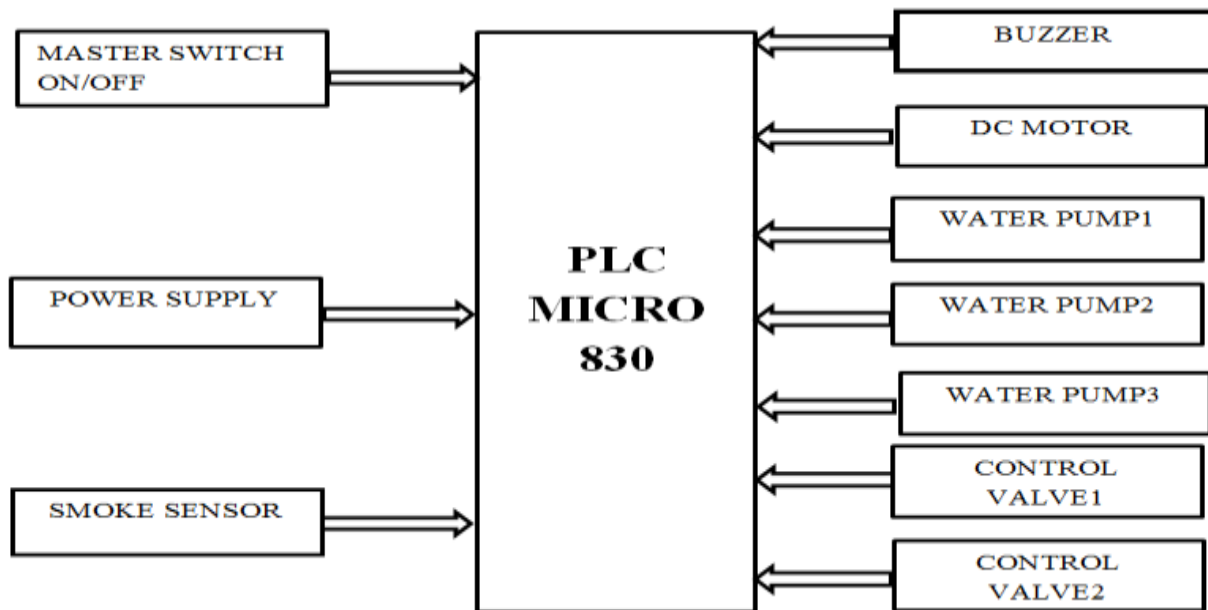


Figure1. Block diagram of Programmable Logic Controller based waste water treatment

Smoke Sensor: Smoke sensor MQ7 identifies the nearness of carbon monoxide within air and its reads the output of the analogue voltage at fixations from 10 to 10,000 ppm. Only one analogue input pin from PLC micro 830 required sensor's simple analogue voltage for the purpose of interface. The smoke sensor used here is MQ7. This MQ7 sensor is suitable for an wide range of applications and very reasonable.

Control valve: In this system 12V solenoid valve using as a control valve. A solenoid control valve working as a electromechanically. This 12V solenoid valve is controlled by an electric current through a solenoid valve. These are utilized to stop, discharge, measurements and circulate liquids. These valves give minimized configuration, safe and quick operating, great medium similarity of the materials utilized, long administration life, low control power and high unwavering quality.

DC Motor: A DC motor has being controlled by PLC micro 830. In this system using 5V DC motor. It will operate the stirrer. A DC motor's any class of electrical machines that proselytes direct current electrical force into mechanical force. A DC engine's velocity can be controlled over a wide range, utilizing either a changing the quality of current in its field windings or by variable supply voltage.

Water Pump: In this system using a 6V DC water pump for pumping water into the tank when water level in the tank reduces to low level and turn off on filling of water to maximum level.

Programmable Logic Controller: The programmable logic controller is characterized as a computerized electronic gadget to execute capacities and to store direction, for example, sequencing, rationale, timing, math words to control machines, procedures and numbering. PLC is utilized to control the succession of operation. In this framework PLC is controlling the info parameters like sensors, power supply and output parameters like water pump, solenoid valves, DC motors. Programmable logic controller i.e. the input or output character is like that of an electromagnetic pneumatic valve controller or relay. In the electronic memory the program

will be stored. In any case, the undertaking of a PLC have quickly increased, Timer and counter capacities, which can be executed for all intents and purposes by any of today's PLCs. The PLC utilized as a part of this framework is micro830. Everything is by all accounts more exact, solid and more proficient because of PLCs. The Programmable logic controller depicted in the figure 2.

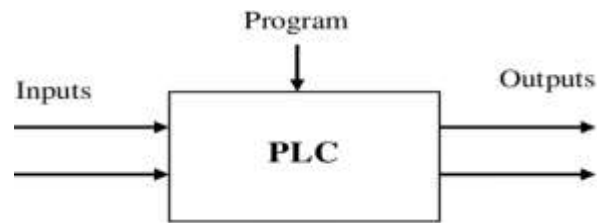


Figure 2 Programmable logic controller

SOFTWARE REQUIREMENTS

RS Logix-500: The ladder logic programming group which helps customer to amplify execution, spare endeavour progression time and upgrade effectiveness. This application is designed to work in windows operating system. RS Logix helps the program with DOS based programming packages for the SLC 500 and Micrologix group of processors, making code maintenance on equipment essentials convenient and straightforward.

Ladder Logic: Ladder logic is one of the programming language which exhibits in graphical form it is widely used to design software for programming logic controllers. After connecting our hardware parts to the programming logic controllers it is essential that to write a program for PLC controller operations. The most widely used language to program a PLC is ladder logic. The software engineer builds up the system and unites their PC to PLC's through a system or Ethernet link and after that download the project to PLC.

Each line in the programming code of ladder logic is represented as "Rung". The Programmable Logic Controller actualizes the code first rung at once beginning with the primary rung and a working down. Fundamentally ladder logic functions are IF-THEN proclamations. each rung is actualized from the left to right. The outputs at the right part of every rung are set to a condition that mirrors the status of the lenient contacts in a specific rung. The below figure 3 shows the sample programming on ladder logic.

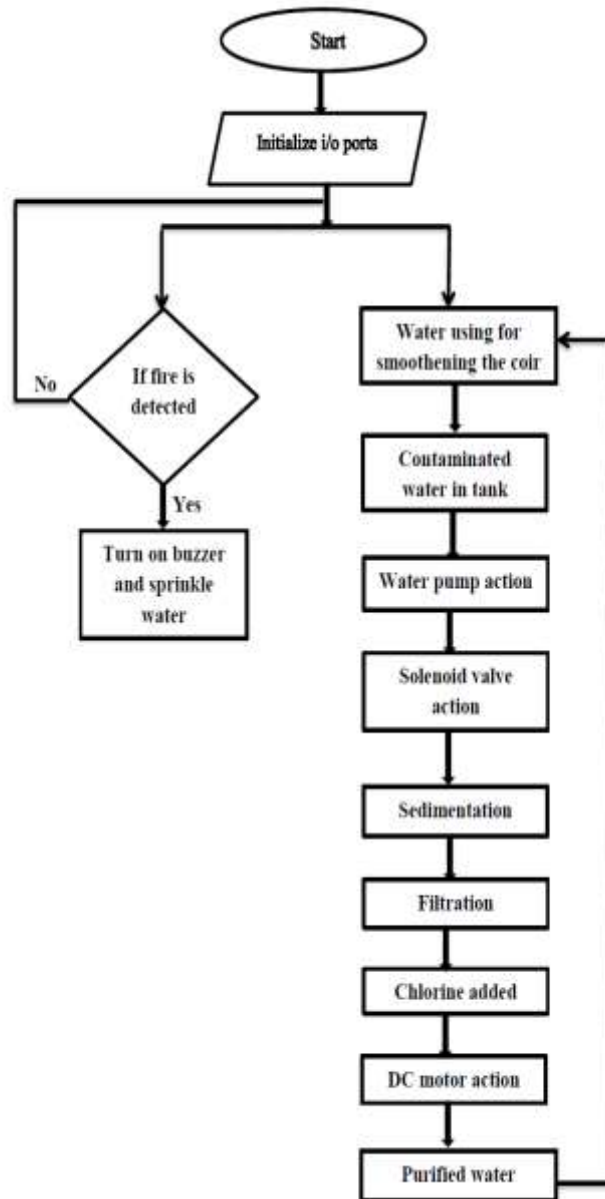


Figure 3 Sample programming on ladder logic.

RS Linx: RS Linx is utilized to interface the Rockwell and project automation. RS Linx acts as a communication server for the RS Logix 500 application. Likewise, different open interfaces are accommodated outsider HMI, accumulation of information and examination bundles or custom customer application programming. RS Linx gives an OPC client interface to C/C++ customers and an OPC computerization interface for VB/VBA customers. A complete arrangement of correspondence drivers is accommodated the systems administration needs from more established legacy Allen Bradley system bolstered by remote steering through 1785-KA, 1785-KA5, 5130-KA, and 5820-EI to the more up to date more fit controller logic gates. Communication hardware for example PC-based network card or serial port, PCMCIA is bolstered.

RS Emulator: When hardware part is not connected to PLC even then can check the results of the system by using software called RS Emulator. It exercises series give backing to the S88 hardware stage state model for cluster and machine control applications through the stage director discretionary component. It incorporates test the application code and HMI screens at the work area without requiring the genuine equipment, Reduce equipment damage and related expenses coming about because of utilization programming mistakes; Get the items to market speedier by diminishing the advancement and reconciliation time.

Flow Chart



RESULTS

The Snapshot of the prototype designed for this project is shown in the figure 4



Figure 4 Snapshot of the prototype designed.

The designed model demonstrates the automated wastewater treatment process and fire alarm system around the small scale industry by utilizing Programmable logic controller micro 830 and 24V power supply. The designed system mainly includes the reservoir container and storage container, pumps, solenoid valve, DC motor in which sedimentation, filtration and chlorination process happen. The PLC set up depends on which device utilizing as a part of the procedure. At the end of procedure purified water passed to the industry.

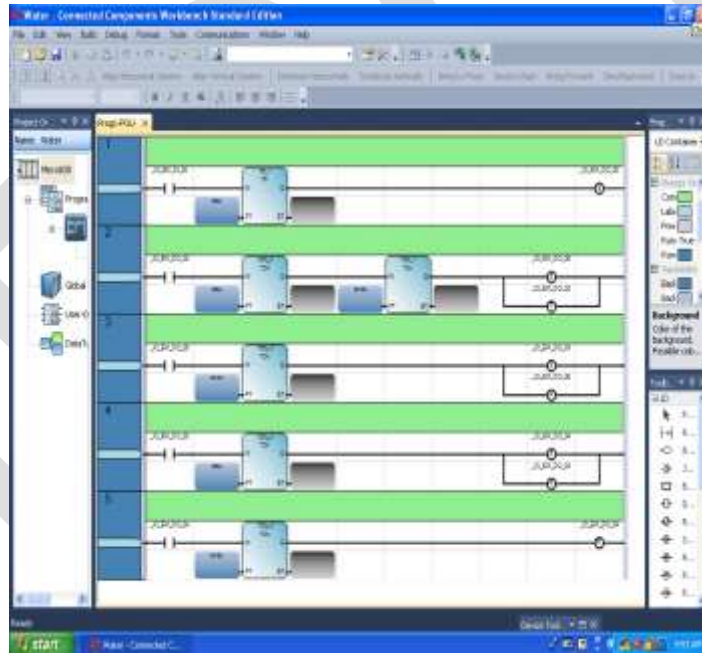


Figure 5 snap shot of ladder logic program of waste water treatment process.

The ladder logic program has and continues to show the traditional way of electrical orders of working. The ladder program represents the interconnection of field devices in a manner that the turning ON or activation, off one device will switch ON another device rendering to a prearranged order of events.

The instruction by instruction Programmable logic controller here executes the program. The prior step and proper action is made Based on the program and the status of the input achieved. The activity may be enactment of specific output and the outcomes can be put off and stored in memory.

The based on the programming instructions, a Programmable logic controller takes input from sensors and real-world device and controls the real-world output devices. To write programming instructions the ladder logic programs are used in Programmable logic controllers

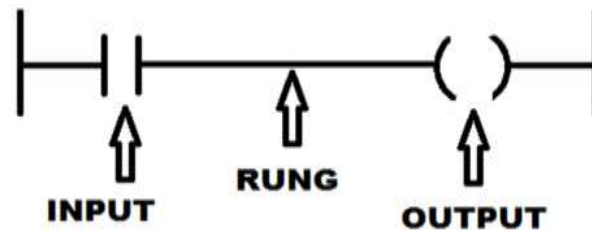


Figure 6 Simple ladder logic

A ladder logic program mainly includes the following elements.

- Rung
- Input and
- Output

A ladder logic program includes one or more horizontal lines known as rungs. The rungs include elements of the input and output. In a ladder logic program, the output element is known as coil and the input element is known as contact.

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CONCLUSION

The treatment of contaminated water can be done with this proposed work, this waste water treatment plant clean up the small scale industry effluents. So, treated water can be recycled for further use. Thus, purified water is recycled and stored. It has great importance in small and large scale industries as well as in society. Water is one of the very important natural resource and one of the basic necessities in human life. Waste water treatment processes are very precise and good controlled. It is technically proven that any kind of pollutant water can be removed from proposed system. The waste water treatment of this system is treated depending on the type of industries. The PLC micro830 based this proposed work has a great role to play in discharging the contaminated and polluted water before releasing it back to the environment. By using PLC micro830 achieved automated treated water process and defeat the constraints of manual power. By utilizing Programmable Logic Controller micro830 the less cost automation system for small scale industries can be designed and it is easier to understand for the user. Use of treated water and recycling process in our daily life is one of the great contributions in saving limited reservoir of water.

FUTURE SCOPE

By knowing the methodology of PLC micro830 controller used in the proposed system, it can be further develop for large scale industries, residencies or apartment and also for drinking purpose. Without these waste water treatment, not able to get purified water for domestic uses. The control engineer can investigate the procedure if any blunders happens furthermore be monitored what is going on during the process of system. For real time monitoring and controlling purpose can be use SCADA system. This PLC micro830 based automation prompts a superior, agreeable life by diminishing expense and enhance the nature of human's life.

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