# Waste Water Treatment Using PLC and SCADA

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*Abstract -- The proposed automation solution for waste water treatment plant involves the use of a series of small control systems that run the facility, PLC (Programmable Logic Controller) continuously monitor the operation of pumps, closures and other devices, collect and execute commands coming from the higher levels, while programmable controllers (PLC) are used to control various processes based on the data and the built-in algorithm. According to the given specifications, a control panel was created in a suitable SCADA software for the control and monitoring of waste water treatment, which requires the communication between the SCADA application and local PLC controller is necessary. A program that provides the appropriate behavior of the valve, placed at the entrance and the control of the pumps was written in a ladder diagram. The alarm and monitoring system is of the highest importance. It covers the most significant facilities of the waste water treatment plant having pumping stations, reservoirs and supply lines and shows that the plant as a whole works well. If something unexpected happens – such as a failure or a malfunction of a vital facility – the system should register and alerts the staffs who work there.*

*Indexed Terms – Supervisory Control and Data Acquisition (SCADA), Programmable Logic Controller (PLC), Inputs/Outputs tags, Programming Interface, Alarms.*

## I. INTRODUCTION

Everyone generates wastewater. Typical residential water usage is from 75 to 100 gallons per person per day. Seventy-three percent of the population is connected to a centralized (municipal) wastewater collection and treatment system, while the remaining 27percent uses on-site septic systems. Water is not used up. When people are through with water it becomes wastewater—better known as sewage—that must be cleaned up before it is returned to the environment for reuse. In one way or another, all water is recycled. In the past, people had the idea that wastewater was something that could be disposed of— it would just disappear. This idea has caused many people to assume that when they dispose of the wastewater they also dispose of any problems or hazards related to it. Today we recognize that we must recycle water to maintain sustainable supplies of safe drinking water for future generations. In order to clean up or treat wastewater for recycling, it is important to understand what wastewater contains, what problems it may cause, and what it takes to clean it up.

In addition to water that we want to recycle, wastewater contains pathogens (disease organisms), nutrients such as nitrogen and phosphorus, solids, chemicals from cleaners and disinfectants and even hazardous substances.1 Given all of the components of wastewater, it seems fairly obvious that we need to treat wastewater not only to recycle the water and nutrients but also to protect human and environmental health. Many people, however, are not very concerned about wastewater treatment until it hits home. They can ignore it until bacteria or nitrates show up in their drinking water, the lake gets green in the summer and the beach is closed, or the area begins to smell like sewage on warm days. Sometimes residents discover they can't get a building permit or sell their home without a septic inspection or upgrade, or they find out there is no room on their property for a new or replacement septic system. Often when one homeowner has a sewage treatment problem, others in the neighborhood have the same problem. People don't always talk to their neighbors about sewage problems for a variety of reasons, including risk of enforcement actions. Ultimately, people using water are responsible for treating and recycling their own wastewater. As individuals and members of a larger community, everyone must take responsibility for wastewater generated in their community. To protect the health of all, they must make sure that all wastewater is delivered to a good treatment facility.

## II. BLOCK DIAGRAM

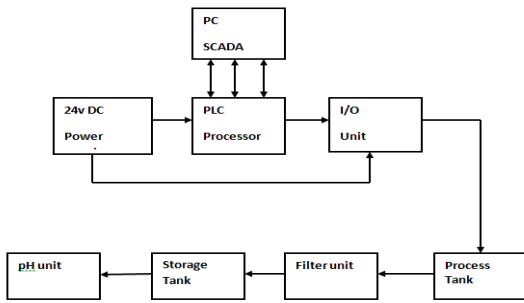The block diagram of the overall process is Represented in figure 1

Fig. 1: - Block diagram of waste water treatment plant.

a)    POWER SUPPLY UNIT:
The power supply unit supplies the 24 v dc to both the plc processor and input output unit of the plc.

b)    PROCESS TANK:
The waste water will fill in the process tank to remove the floated waste as well as the sediments. The filled water will be agitated and the floated wastes as well as the sediments will be removed through the dust valves.

c)    FILTER TANK:
After the completion of the process 1 & process 2, the water will get filterised in this filtering section. And the filtered water will send to the pH measurement process & for industrial usage by selecting the switch.

d)    STORAGE TANK:
The water will be stored in storage tank after filtration.

e)    pH UNIT:
In this process the pH level of the water will be measured. If the ph of the water is 7, then it is pure water and it will taken to the storage tank through its inlet valve. Otherwise it will take to the collecting tank of filtration process.

### III.    DESCRIPTION

The waste water treatment plant consist of two procedures, one is to extraction of pure water to be transmitted through one side, with calculating PH value (i.e. 7%). Another one is used to industrial application. For the above procedure, it consist of two industrial tank consist of 4 pressure value (p1….p4) 2 inlet valve (IV1, IV2) & 4 dust valve (DV1…DV4) and one outlet valve (Ov1) & Agitator.

a)    QUANTIZATION PROCESS 1 AND 2:
Quantizer (tank 1) consists of above components. While switch ON the process the waste water to be pumped and flow through p1 & p2 through tank 1 (quantizer 1). While the waste water transmitted (IV1 & IV 2) allow the water to tank at high pressure. Initially the dust valve is in Off stage while the IV1 & IV2 open simultaneously DV1, DV2, DV3, DV4, should extract the dust from the waste water simultaneously  would be stored other side.

If the quantizer 1 (tank 1) reached 95% from tank. P1 &p2 stopped simultaneously IV1, IV2 closed. Agitator 1 & Agitator should start immediately with continuous running of 25's. During running time of Agitator 1 & Agitator 2. The ps3 and ps4 of pure water would be transmitted inlet to quantizer 1 tank at high force.

While passed pv1 the outlet valve would open (ov1) for high pressure. During this step the outlet water to be passed through either calculation PH & transfer through drinking water otherwise industrial water.
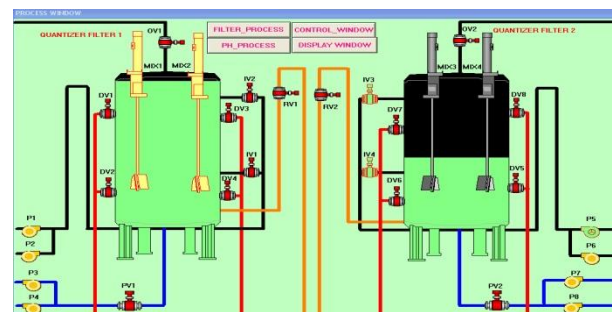


Fig. 2: - Process Window

b)    CONTROL WINDOW:
The whole quantizer 1 & 2 tank to be controlled by control window. Such as calculation pH value, percentage of pure water stored for industrial application measured of pressure valve, outlet valve and at last the collection of dust has to be stored & the extraction of pure drinking water to be stored in separate tank.

Fig. 3: - Control window.

c)   DISPLAY WINDOW:

The whole project field devices has been monitoring through this display window.
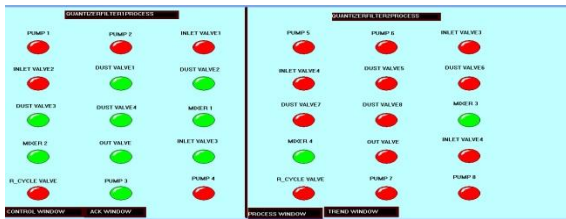


Fig. 4: - Display window

d)   FILTER WINDOW:

After the completion of the process 1 & process 2, the water will get filterised in this filtering section. And the filtered water will send to the PH measurement process & for industrial usage by selecting the switch. It is represented in figure 12.
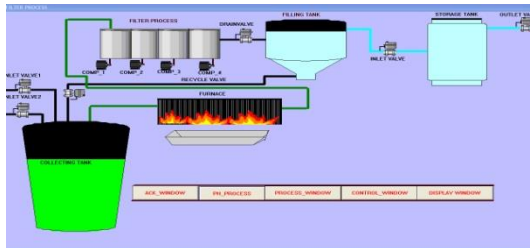


Fig. 5: - Filter window

e)   pH WINDOW:

After completion of filtration process the water is send to pH measurement window. in this the pH level of the water is analyzed by pH sensor, if it shows pH value is 7 then it send to storage tank for using purpose ,if pH above 7 it again send back to collecting tank in filtration process The  pH window is represented in figure 13.
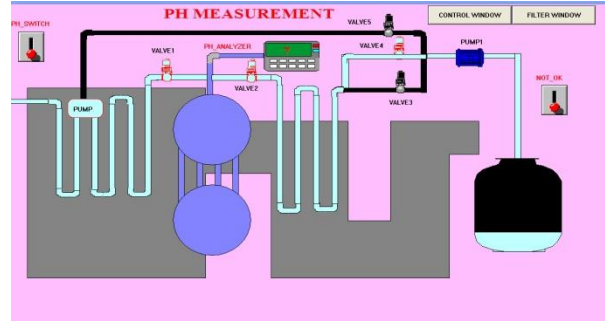


Fig. 6: - pH window

IV.      SCADA

In this project we are using INTOUCH WANDERWARE 9.5 SCADA Software. SCADA INTOUCH is a software application program for process control, collection of data in real time from remote locations in order to control equipments and conditions. SCADA is used in power plants, oil and gas refining, waste control telecommunications and transportation. The hardware collects and feeds the data into a computer that has SCADA software installed. The computer then further processes this data and presents it in a timely manner. By using intouch, we can generate powerful applications, which can deed the key features of Microsoft windows, graphics, networking and more. INTOUCH can also lengthen by adding custom active wizards, generic objects and creating INTOUCH quick script extensions.

All the INTOUCH quick scripts are event driven. The event can be a data change, condition, mouse click, timer, and so on. The order of processing is application specific.

| Script Type | Description |
|---|---|
| Application | Linked to the entire application |
| Window | Linked to a specific window |

## V. PLC

A PLC Allen Bradley SLC 500 is a solid state device designed to perform the logic functions, previously accomplished by components such as electromechanical relays, drum switches, mechanical timers/counters etc, for the control and operation of manufacturing process equipment and machinery. The requirement of highly specialized, high speed manufacturing process created a demand for smaller, faster acting, more reliable, low power consuming, expandable eliminating much of the hard wiring control devices called PLC's.

The Allen Bradley RSLogix family of compatible ladder logic programming packages helps you maximize performance, save project development time, and improve productivity.

## VI. CONCLUSION

PLCs are continuously growing and evolving to be the best option for a variety of industrial automation applications. This work deals with Waste Water treatment Scope of PLC programming is increasing rapidly because of greater programming flexibility and ease, scalability, more memory, smaller sizes, very high-speed (gigabit) Ethernet, and built-in wireless features. In the future, PLCs will continuously evolve while adapting technology enhancements in communications, hardware, and software.

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