

Sewage Water Treatment plant by Using SCADA(Supervisory Control And Data Acquisition)

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Abstract : Now a days our country is growing in technology and in digital era new technology such as IOT ,smart building, smart new concept for evolving and also our government has launching new project related to clean a dirt water to useful water as much as possible . this project is generally useful for government and industry to control there plant from any where in india .A simulation study sewage treatment plant has been perform followed by complete design of sewage treatment plant. The present study involve the chloride, hardness etc. The main objective of this project is to study and simulate the sewage treatment plant by using temperature, pressure, limit switch sensors. For project studied multiple kind of article of various sites. After that we make design of our plan and completed the setup, which is detail explained in this report. The main outcome of project is clean dirt free water. And It is easy to handling and operating by operator. after implication the project require skilled operator for handling.

Key Words: PLC Program ,SCADA (supervisory control data acquisition) simulation.

1.INTRODUCTION

A sewage treatment plant operates by circulating air to encourage the growth of bacteria to break down sewage. The goal being to deliver much cleaner, more environmentally friendly effluent. It involves a similar process to a typical septic tank but has some key differences. Sewage treatment plants, depending on their size, can treat the waste of commercial properties or a number of domestic dwellings. The general construction of a sewage treatment plant doesn't differ too drastically from that of a septic tank. Just as with a septic tank, sewage flows from the property being serviced into the first chamber of the sewage treatment plant. Here, the water sits until grease, oil and scum have floated to the top and solids have settled on the bottom of the tank. Once the process of separation has taken place, the liquid travels into a second chamber which is where sewage treatment plants differ from septic tanks. This chamber is fitted with an air pump that circulates air around the chamber to encourage the growth of aerobic bacteria. This bacteria helps to break down the contaminants in the water, effectively cleaning it.

1.1 Objective

- Removal of floatable and postponed particles
- Adding the chlorine for clean water
- Easy to handle the all process through simulation.

1.2 Problem statement

- To make use of polluted and sewage water for agriculture and domestic purpose after treatment.
- Monitoring and control of water treatment using PLC program and SCADA operations.

1.3 Need of automation

Present economic and environment concerns require businesses to take a realistic approach towards productivity, improvement in quality of product, reducing operating time and cost. The goal is to make full utilization of assets such as raw material, system, labour etc. Automation is a standout method to accomplish this. Automation can be characterized as the use of logical methods to automate the operation as well as control

of hardware, processes, or system, with an objective to limit human interruption and accomplish the above. Automation require skill man power for control that all project.

Some of the benefits of automation can be summarized as:

- Enhanced item quality
- Increase in Reliability
- Eco-friendly operation
- Increase in profitability
- Decrease in downtime, maintenance and operation costs
- Utilization of labour in other sectors where automation is not feasible

2.Required components

A. Wondare ware Intouch

A collection of equipment that will provide an operator at remote location with enough information to determine the status of a particular piece of a equipment or entire substation and cause actions to take place regarding the equipment or network.

Wondare Ware provide key functions.

Wondare Ware Function use in project

- Security
- Alarm
- Real trend
- Data communication
- Tagnames
- Window Script

2.1 Security

SCADA Security is broad term used to describe the protection of SCADA networks. These networks are made up of computer hardware and applications and are utilized to control and monitor vital infrastructure in nations where they are employed. Expression use

- configure user ->user name ->a ->password->aa->access level ->1
- then make two box id and password then select id box->touch link->string ->tagname-> double click -> password entered
- password box -> touch link ->string->tagname ->double click -> password entered

2.2 Alarm

- Gives Signal when abnormal condition are reached.
- Alarms represents occurring of process condition that could cause problems & require operator's response.
- Event represent normal system status messages that do not require an operator response. A typical event is triggered when a certain system condition take place.

Types of alarms used in project

1. Discrete : On/Off
2. Deviation : Major
 Minor
3. Value : LOLO
 LOW
 HIGH
 HIHI
4. Rate of change
5. SPC (Sample per chart)

2.3 Real Trend

They are dynamically change. They are updated continuously during run time and you can see the real time data of your Tags which you have configured. Real time trend help us in seeing actual data that is of the process. Like you have make a tag of Water Level in a Sewage Treatment plant and you want to see the present value of Water level with respect to the time. Then you will use Real Time Trend which can be configured in seconds, Mili-seconds, minutes and hours.

2.4 Window script

- Window scripts are linked to specific window.
- There are three types of Window script.
- ON Show:- Executes one time when the window is initially shown.
- While Showing:- Executes continuously at the specified frequency while the window is showing.
- ON hide:- Executes onetime when window is hidden.

2.5 Key Script

- Key scripts are linked to a specific key or key combination of the keyboard.
- There are three types of key script.
- ON key down:- Executes one time when the key is initially pushdown.
- While down:- Executes continuously at specified frequency while the key is held down.
- ON Key up:- Executes one time when key is released.

2.6 Tagnames

We give a tagname for because SCADA nature is it would be work with huge number of external device like PLCs. So we give tagname to inter link them.

PLC Program

A PLC is a solid state / industrial computer that performs discrete or sequential logic in a factory environment. It was originally developed to replace mechanical relays, timers, counters.

A sequence of instructions is programmed by the user to the PLC memory.

Its purpose is to monitor crucial process parameters and adjust process operations accordingly.

PLCs can be described as small industrial computers with modular components designed to automate control processes. PLCs are the controllers behind almost all modern industrial automation. There are many components to a PLC, but most of them can be put in the following three categories:

- Processor (CPU)
- Inputs Module
- Outputs Module

Input Module:

- Input module act as an interface between the field control input and the cpu. Voltage/current Generated by sensor, transducer, limit switch, push button, etc are applied to the terminal of i/p module.
- Input Module converts the field signal into standard control signal for processing by the PLC.

Output Module:

- Output module acts as a link between the CPU and the output devices located in the field.
- Field devices could be relays, contactor, lamps, motorized actuators, solenoid valves, etc. These devices actually control the process.
- It converts the output signal delivered by CPU into an appropriate voltage level suitable for the output field device. It also provides isolation. O/p Module can be Discrete or Analog.

3.Treatment Techniques

1.Aeration Tank

The activated sludge process is the most common option in primary treatment. Aeration in an activated sludge process is based on pumping air into a tank, which promotes the microbial growth in the wastewater. The microbes feed on the organic material, forming flocks which can easily settle out. aeration tank is connected with canal and filter tank the vt pump is take water and water fill in to the tank . the tank have limit switch that use for indicating that tank is over flow.

2.Filter Tank

Typically a radial tube header with orifices and manifold employing hydraulic suction will be designed to remove all settled solids from the tank and return them either to the head of the activated sludge process (Return Activated Sludge) or to further solid waste treatment (Waste Activated Sludge). The filter tank is connected with aeration tank and chlorination tank. The temperature sensor is connected inside the filter tank for maintaining the inside temperature of tank.

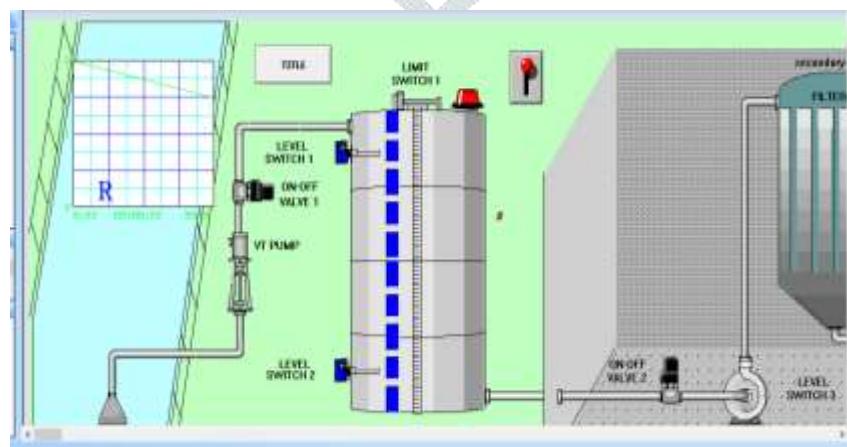
3.Chlorination Tank

A water treatment method that destroys harmful bacteria, parasites, and other organisms. Chlorination also removes soluble iron, manganese, and hydrogen sulfide from the water. The chlorine add in the water that come from the aeration tank.

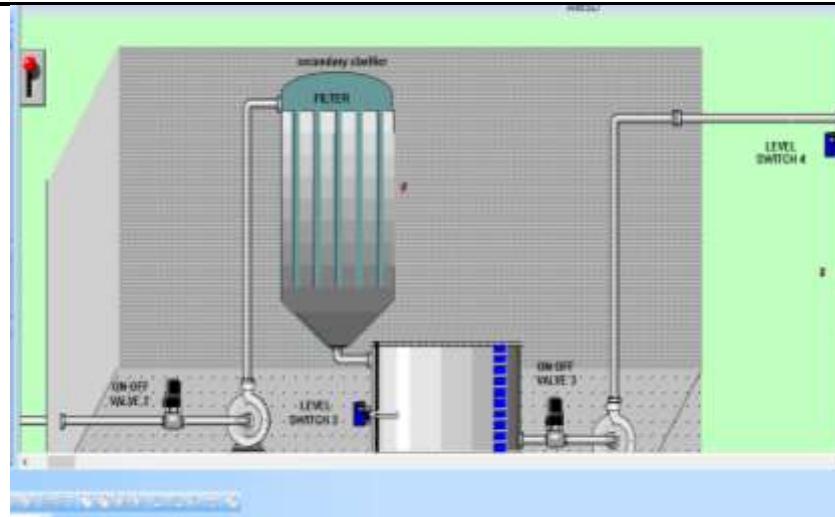
4. Oxidation

Tank 3 contains an AC pump operated with the help of relays to increase the amount of oxygen in the tank as the oxidizing properties can also reduce the concentration of iron, manganese, sulphur and reduce or eliminate taste and odour problems. The raw water is then passed through a suction pump which creates a vacuum and pulls the ozone gas into the water or the air is then bubbled up through the water being treated. Sample of water is taken from tank 3 to measure the pH of water. Once the pH is considered suitable, Solenoid valve SV1 and SV2 are opened according to the purpose.

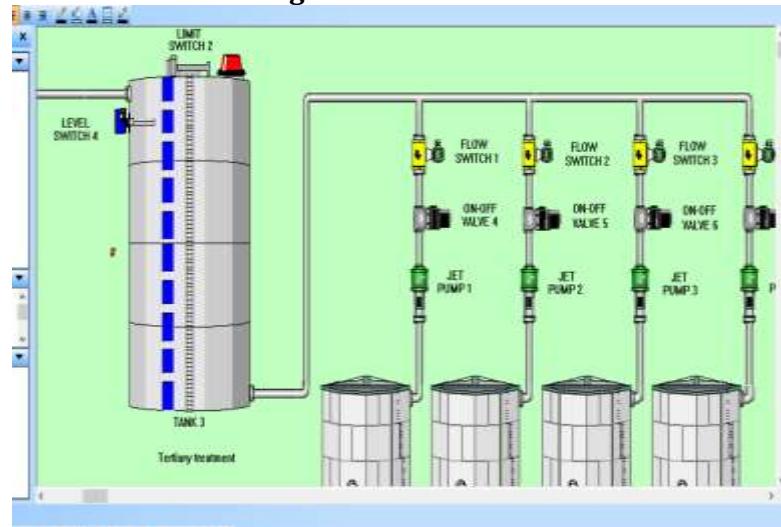
SCADA Program Image



Above Fig. 1 Aeration tank



Above Fig. 2 Filter & chlorine tank



Above Fig.3 Tertiary Tank

CONCLUSIONS

The Simulation of Sewage Water treatment plant is risen by the rise in automation technology level. This completely automated plant is safe and secured when we apply this technology in all plant with scada and PLC. The simulation shows that it is revealed in real time the operation state of the process ,which allows us to monitor process, rectify the error if any.if we applied this system in real plant then the PLC control system is help us in transferring the control signal to various field devices. It increases compatibility of various equipment through interface and protocols. The simulation gives us idea about how the original plant run and how it operate by operator.

Future Plan

In this project if we want to try this project in industry purpose than it is very easy to applied in industry only need of plc as per requirement of industry. The choice of a PLC as a control device, not only has guaranteed the interconnectivity and compatibility of the various equipments through interfaces and protocols, but also has also facilitated the interoperability with the used SCADA implementation. At the same time, there are advantages of allowing using industrial PLC, and especially in this project, it gives flexibility for future upgrades or modifications of the process.

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REFERENCES

- 1)[https://en.wikipedia.org/wiki/SCADA#:~:text=Supervisory%20control%20and%20data%20acquisition,logic%20controllers%20\(PLC\)%20and%20discrete](https://en.wikipedia.org/wiki/SCADA#:~:text=Supervisory%20control%20and%20data%20acquisition,logic%20controllers%20(PLC)%20and%20discrete)
- 2) <https://www.aveva.com/en/solutions/operations/wonderware>
- 3) <http://www.opctechs.com/edoc/SCADA/Intouch.pdf>
- 4)<https://kishorekaruppaswamy.files.wordpress.com/2011/10/intouch-wonderware-manual.pdf>
- 5) <https://realpars.com/scada-applications/>
- 6)<https://www.rockwellautomation.com/en-us/products/hardware/allen-bradley/programmable-controllers.html>
- 7)<https://new.siemens.com/in/en/products/automation/industry-software/automation-software/scada.html#:~:text=The%20SIMATIC%20SCADA%20systems%20and,highest%20quality%20in%20all%20industrieshttps://new.siemens.com/in/en/products/automation/industry-software/automation-software/scada.html#:~:text=The%20SIMATIC%20SCADA%20systems%20and,highest%20quality%20in%20all%20industries.>
- 8)<https://www.slideshare.net/bhavikpatel19196/sewage-treatment-plant-30967889#:~:text=INTRODUCTION%20%EF%83%98%20Sewage%20treatment%20is,physical%2C%20chemical%20and%20biological%20contaminants.>
- 9) <http://www.pacificwater.org/userfiles/file/TR0288.pdf>
- 10) <https://ece-eee.final-year-projects.in/t/scada>
- 11)https://www.google.com/search?q=scada+sensor+data&rlz=1C1YUH_enIN952IN952&oq=scada+sensor+&aqs=chrome.1.69i57j0j0i22i30l3j0i10i22i30.16878j0j9&sourceid=chrome&ie=UTF-8