



Analysis and assessment of sewage water treatment plant by using PLC

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ABSTRACT

Sewage water consists of Agricultural, industrial and human wastes. It is mandatory to remove organic material by process of sewage water treatment. The sewage treatment plant involves physical, biological treatment stages. An important objective of municipal and industrial sewage waste water treatment is to separate pollutants, remove toxic materials, neutralize coarse particles, and destroy pathogens such that quality of discharged water is more improved to meet the allowable level of water to be discharged into water bodies or for cultivated land. The target of secondary treatment is that the further treatment of the effluent from primary treatment to get rid of the residual organics and suspended solids. The main objective of wastewater treatment is to get rid of as considerably of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. To avoid wastage of water by recycling water discharged from companies, homes, businesses, and industries and reduce pollution, to be used in agricultural sector and domestic purpose.

Keywords: Programmable logic controller, HMI, Sewage water treatment plant, Effluent, Ladder logic Programming, activated sludge.

1. INTRODUCTION

India's increase and overall economic development are expected to steer to a rise in water consumption across sector especially the agricultural sector. With the enhancement of beverage supply to urban and rural areas the waste water generation also will increase. Water treatment is that the process of beverage suitable for its applications. Water treatment evolves science, engineering, business and humanities. The treatment contains are mechanical, physical, biological, and chemical methodologies. Like any technology, science is that the foundation and engineering makes sure that the technology works as designed. Wastewater is employed water. It includes substances like body waste, food scraps, oils, soaps and chemicals. In homes, this includes water from sinks, showers, bathtubs, toilets, washing machines and dishwashers. Businesses and industries also contribute their share of used water that needs to be cleaned. We consider wastewater treatment as water use because it's so internally connected with

the opposite uses of water. Most of the water employed by houses, industries, and businesses must need to be treated before its released back to the environment.

Generally wastewater treatment plant removes solids, everything from rags and plastics to face and smaller particles found in wastewater. Moreover, they reduced organic water and pollutant by grow incubating present bacteria and other microorganisms which consume the organic matter in wastewater and are then break away the water; and, finally restore the oxygen to make sure that the water replace into rivers or lakes has enough oxygen to support life. It's documented that wastewater treatment plan has always undergone evolution with time and introduction of technology. Wastewater treatment systems take human and industrial liquid wastes and make them safe enough to return to the aquatic environment. The most objective of secondary treatment is that the further treatment of the effluent from primary treatment to get rid of the residual organics and suspended solids. The major aim of sewage water treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. In some cases wastewater can be clean enough for reuse for particular purposes. Wastewater treatment system use same processes of purification that would occur in natural aquatic system only they do it faster band controlled situations.

PLCs are continuously growing and evolving to be the only option for a selection of economic automation applications. Importance of plc programming is rising rapidly due to greater programming flexibility and ease, scalability, more memory, smaller sizes, very high-speed (gigabit) Ethernet, and built-in wireless features. With UN reports warning of water stress being faced by two third of worldwide population by 2025, the scope of waste water treatment is large one. Wastewater plants are getting to see getting used in several technical setups like sewage treatment plant, tertiary treatment, agricultural wastewater treatment plants etc. This waste water treatment plant is often installed in numerous setups which can be industrial, institutional, in human colonies also as agricultural lands. It is very essential to provide some degree of treatment to sewage wastewater before it can be used for farming and landscape hydration for aquaculture.

1.1 Programmable Logic Controller (PLC)

PLC is main way of working the normal procedure so PLC controllers the circuit [4]. The program attached implanting into chip therefore chip can complete control operations [5]. The particular survey is found that PLC has many devices. The most of devices are made by foreign organizations. India must import from abroad. The different PLC chips has different characteristics are often with several languages. There only 0 or 1 are the two stages within circuits. Consistent with particular component control as long as designing procedure. PLC works whole circuit control [6]. Programming Language of Programmable Logic Controller PLC programming languages are as follows:

- Ladder Logic Programming
- Operational Block Diagram
- Continuous Function Chart

The mature programming language in programmable logic controller is ladder logic programming. It is perfectly suited to demonstrate combinational logic. In this project, I have used ladder logic programming. Programmable logic controller has many inputs as well as output which interprets logically 'high' and 'low' from switches and various sensors. It also has many output terminals which interpret logically 'high' and 'low' to contactors, power light, solenoids, motors and many other devices to on/off control. The ladder logic programming language was design. The engineer conversant to read ladder logic would feel secure programming to manage function.

2. LITURATURE REVIEW

AWWA research foundation prepared series of report along with extensive literature review on natural solutions for sewage treatment plant waste disposal problem in 1969. There's some presence of water treatment plant in India. In India only five metro cities have treatment capacity on the brink of 100% of their sewage generation like Hyderabad, Vadodara, Chennai, Ludhiana, and Ahmadabad. Dyna Electric (2008) [13] established a networked platform which may be used while remote monitoring as well as controlling PLCs. the rationale of that, Dyna electrics. Mentioned, that the computing capability of PCs is growing and thus the accessible alternative of network protocols and standards are varying. In their complex, a Semantic S7 200/300 PLC is applied. The available communication techniques of the PLC are LAN, WAN or GSM. To understand the last word experimental target, the most important parts of their system are the Transmission Control Protocol / Internet Protocol setup and Global System for Mobile Communications.

3. PLC SEWAGE TREATMENT PROCESS

Wastewater treatment systems take human and industrial liquid wastes and make them safe enough to return to the aquatic environment. The most objective of secondary treatment is that the further treatment of the effluent from primary treatment to get rid of the residual organics and suspended solids. The major aim of sewage waste water treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. In some cases wastewater can be clean enough for reuse for particular purposes. Wastewater treatment system use same processes of purification that would occur in natural aquatic system only they do it faster band controlled situations.

3.1 Flow Diagram of Waste Water Treatment Plant

The flow diagram of wastewater treatment plant is as shown in Fig.3.1. The sewage water control system initially removes

large particle through grid machines. The wastewater influent is input sludge by preliminary treatment. after that, the primary clarifier flows primary sludge. The wastewater is transferred via primary clarifier to the aeration tank. The air is transferred to aeration tank; the water is then transferred to secondary clarifier. After that water disinfection is done and then final effluent is produced. The primary clarifier water is again recycling and activates sludge to waste activated sludge.

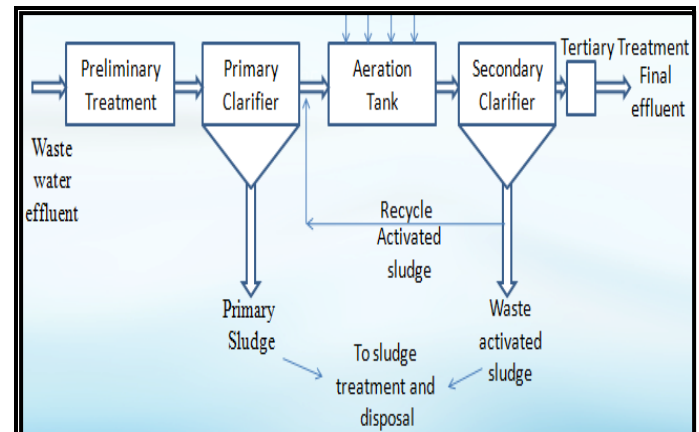


Fig. 1: Flow Diagram of Waste water Treatment Plant

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3.2 Control System of Sewage Water Treatment Plant

Industrial sewage treatment system of the electrical system diagram is shown in Fig 2 By using the core logic controller, PLC controls equipments to stop/run and speed is detecting inputs of panel operation button and all types of sensor uses input. The programmable logic controller has many types of inputs such as operation panel, input of liquid level sensor, and input of level sensor and feedback value of dissolved oxygen analyzer. The output of programmable logic controller is grid-timing operation, pump operation, centrifugal dehydrator. The display panel is connected to the output of PLC; Frequency converter is connected serially with the display as well as aerator operation. The grid well PLC ladder diagram is as shown in the Fig .3. The ladder logic programming is used here, NO (Normally Open) and NC (Normally Close) are used by writing these programming.

The binary coding is applicable in this coding, only 0 and 1. The connecting course grid contactor starts operation by course grid. When the indicator value is less than set value, the relay is switch ON and course grid stop running. The CMP is compared with preset value on compare respectively. The most of devices are made by foreign organizations. India must import from abroad. The different PLC chips has different characteristics are often with several languages. There only 0 or 1 are the two stages within circuits.

When identified value is exceeding than standard value, the output of relay are switched ON. PLC plays prime role in industrial applications.[2] The PLC techniques is applied to

normal sewage waste water treatment plant. As compare its normal sewage wastewater treatment plant, the PLC system greatly improves automation sewage treatment plant [3].

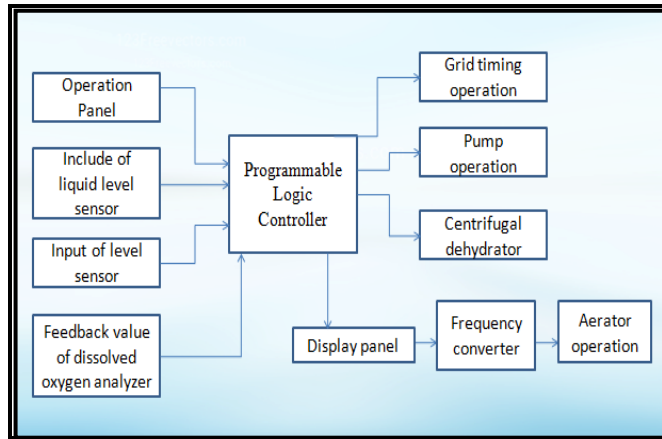


Fig. 2: Control System Diagram

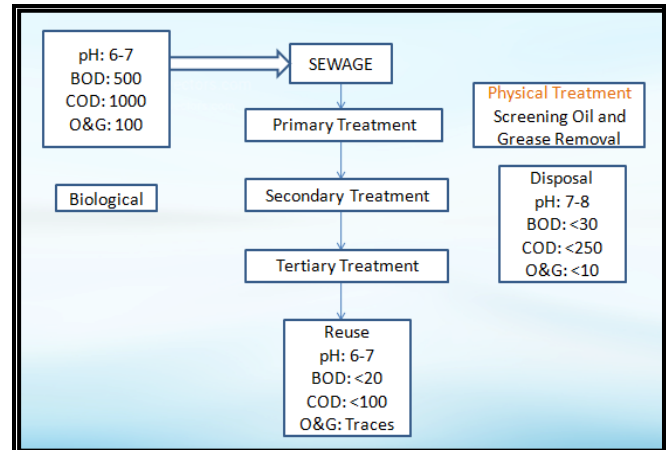


Fig. 5: Control System Diagram

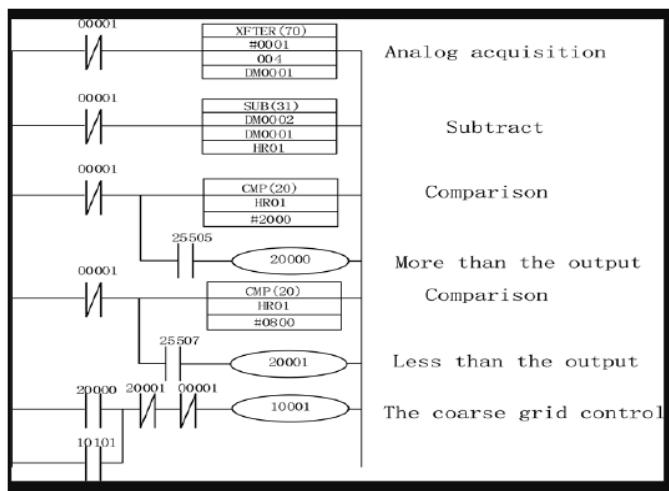


Fig. 3: Grid Well PLC Ladder Diagram

3.3 System Architecture

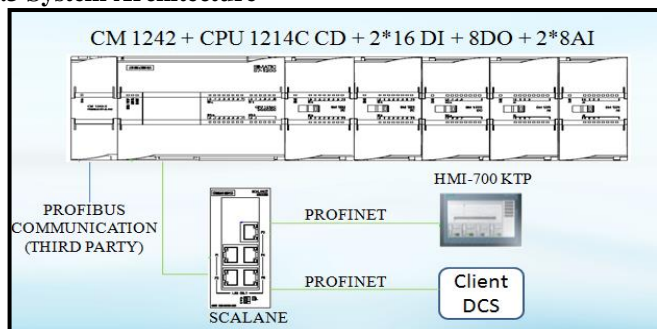


Fig. 4: System Architecture

The system architecture of control system for electrical panel is as shown in the Fig. 4. The CPU 1214C-DCDCDC has 16 digital inputs which has 24 V DC supply and 10 digital output which has 24V DC supply. This CPU consists of 2 analog inputs. Profibus communication allows large number of components share copper cables. The installation cost is very low than other communication system.

4. RESULT

As shown in Fig. 5, there are three basic stages of wastewater treatment plant such as primary treatment, secondary treatment and tertiary treatment. The primary treatment involves physical treatment likes oil and grease removal. The secondary treatment involves biological process where COD and BOD

major reduction takes place. After secondary treatment done, third step is tertiary treatment process. Here BOD and COD levels are further down so that treated water can be reuse.

The secondary treatment involves biological process where COD and BOD major reduction takes place. After biological treatment there is a chlorination system provided for disinfection. After secondary treatment done, third step is tertiary treatment process. Here BOD and COD levels are further down so that treated water can be reuse.

Table 1: Control System Diagram

Sr. No.	Mode of Operation	Temperature	Time in Minutes
1.	Filtration	120	10
2.	Cooling	50	13
3.	Heating	123.5	19
4.	Cooling	48.5	18
Total Time In Minutes			65
1.	Heating	122.5	14
2.	Cooling	45.5	12
3.	Heating	120	16
4.	Cooling	47.5	13
Total Time In Minutes			55

Table 1 shows temperature parameter and time of state carried out for plant site. The different modes of operation like filtration, heating and cooling temperature with respect to time as well as total time in minutes.

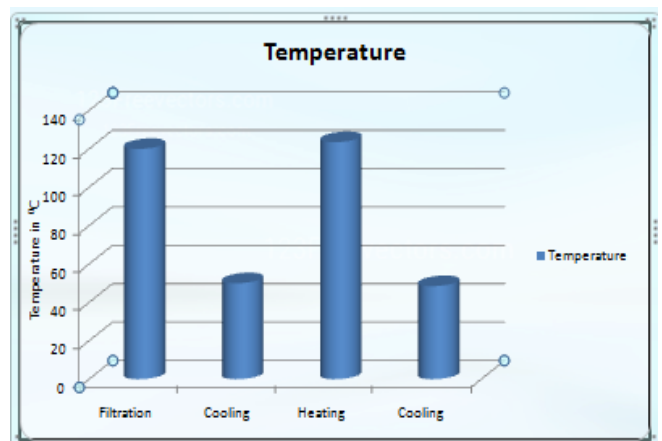


Fig. 6: Graph on Temperature v/s Mode of operation

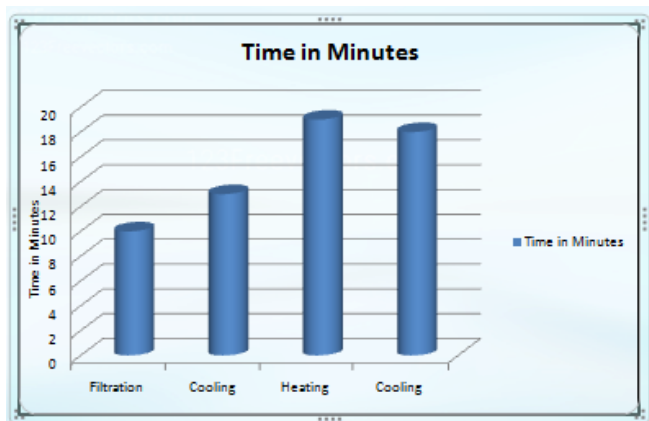


Fig. 7: Graph on Time v/s Mode of operation

5. CONCLUSION

From the result, it was found that water impurity re discarded through filtration process and it supported by analytical result. By using PLC we have automated the water treatment process and limitation overcome from manual processing. The system efficiency is 98%-99% thus saving the precious resource like water. The PLC controlled have fed and supported control system in different ways. PLC supplied and support engineer what they need and keep protect from hazardous machineries. With their many features and benefits, PLC will continue to useful in future.

6. AKNOWLEDGEMENT

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