PLC based Sewage Water Treatment

Prathamesh Thakur
(Author)
Dept. Instrumentation Engineering
Vidyavardhini's College of Engineering and Technology
Mumbai, India

Jay Rathod
(Author)
Dept. Instrumentation Engineering
Vidyavardhini's College of Engineering and Technology
Mumbai, India

Tanmay Rewgade
(Author)
Dept.Instrumentation Engineering
Vidyavardhini's College of Engineering and Technology
Vasai, India

Takshil Patel
(Author)
Dept .Instrumentation Engineering
Vidyavardhini's College of Engineering and Technology,
Mumbai, India

***Abstract*— Wastewater from homes and industries, without suitable treatment, when released into water source can cause impairment to aquatic life and distract the pH of water causing water pollution. In India, water treatment plants are located across several cities. Proper control and monitoring of these plants can help us progress the productivity thereby limiting scarcity of water as expert use of water can be achieved. Automation in various parting techniques like bar screening, sedimentation, grit removal, chlorination, Oxidation etc. is being carried out by using programmable logic controller. The use of PLC and SCADA in sewage water treatment plant is implemented. The found purified water is used for domestic and agricultural purpose. Modifications can be made by using float sensors model which would well provide the correct level but cost would increase and vibration of the sensor might disrupt the outcome, our model effectively counters those shortcomings.**

I. INTRODUCTION

Everyone causes wastewater. Typical residential water practice is from 75 to 100 gallons per person per day. Seventythree percent of the population is associated to a centralized (municipal) wastewater collection and treatment system, while the enduring 27percent uses on-site septic systems. Water is not used up. When people are through with water it turn out to be wastewater better known as sewage that must be gutted up before it is returned to the environment for reuse. In one way or another, all water stands recycled. In the past, people had the idea that wastewater was something that could be liable of it would just disappear. This idea has produced many people to assume that when they dispose of the wastewater they also dispose of any difficulties 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 covers, what problems it may cause, and what it takes to clean it up. In count to water that we want to recycle, wastewater contains pathogens (disease organisms), nutrients such as nitrogen and phosphorus, solids, chemicals from cleansers and purifiers and even hazardous substances. Given all of the workings of wastewater, it seems justly obvious that we need to treat wastewater not only to recycle the water and nutrients but also to defend human and environmental health. Many people, however, are not very worried about wastewater treatment until it hits home. They can ignore it till bacteria or nitrates show up in their drinking water, the lake gets green in the summer and the beach is closed, or the zone begins to smell like sewage on warm days.

Sometimes inhabitants discover they can't get a building permit or sell their home-based without a septic inspection or upgrade, or they find out there is no room on their possessions for a new or replacement septic system. Often when one homeowner has a sewage treatment problem, others in the neighbourhood have the same delinquent. Ultimately, people using water are accountable for treating and recycling their own wastewater. As persons and members of a larger community, everybody must take accountability for wastewater generated in their community. Around 71% of Earth's surface is covered by water out of which only 2.5% is suitable for feeding by humans. Out of this, 1.7% in groundwater, 1.7% in glaciers at Antarctica and Greenland, 0.001% in air as vapour, cloud and causes. Drought in India has resulted in tens of millions of expiries over the course of 18th, 19th and 20th centuries. Indian agriculture is heavily reliant on climatic conditions. A water scarcity problem rises due to inadequate water treatment facilities, rapid growth in human population, and lack of savings in treatment plants. Wherever amenities are available, they are not maintained properly. ○ OBJECTIVE:

Avoid wastage of water by recycling water settled from homes, businesses, and industries and reduce water pollution, for use in agricultural sector and domestic drive.

- NEED OF AUTOMATION:

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 has monetary effects as cost included and all the more imperatively as reserve funds. Accurate information can be obtained, real time operation and better process control is done

II. SYSTEM COMPONENT DESCRIPTION

The system can be divided into four main parts:-

2.1 Level Sensor

2.2 PLC(Programmable Logic Controller)

2.3 Pump and Motor

2.4 HMI(Human Machine Interface)

These are the four main modules of the system. The level sensor communicates the current level of the tank to the PLC. The PLC agrees whether to turn the motor ON or OFF. The position of the system is communicated to the computer by MPI and is watched and remotely controlled by the user through the HMI.

2.1 Level Sensor

Inductive proximity sensors were used to sense the of presence of water in the tank. These sensors detect magnetic loss due to eddy currents that are produced on a conductive surface by an external magnetic field. An AC magnetic field is generated on the detection coil, and variations in the impedance due to eddy currents generated on an object are detected. When the object arrives this electromagnetic field which seems at the active face of the switch, the field gets reduced and the switch turns ON or OFF. The key advantage of this sensor is that it can sense the object without poignant it, so this sensor can be outside the water . The image of sensor is given below:

2.2 PLC (Programmable Logic Controller)

This serves as the main control unit of the system. The ladder logic is prewritten on a non- volatile recollection. The ladder logic was applied in Wecon . On basis of this judgment the PLC takes its decisions. In our project WECON LX2E0806MT-A2 was used. The LX2E-0806MT-A2 enables spacesaving and modular configurations .In a single-tiered configuration, wecon can support 256 I/O, and in multi-tiered configurations up to 1024 I/O. In distributed configurations with PROFIBUS DP,65536 I/O connections are possible. The slots are freely addressable, that is, there are no slot rules. If deployed in an industry can automate and monitor a large number of tanks. The PLC was interfaced by to the computer via IM Maintaining the Integrity of the Specifications

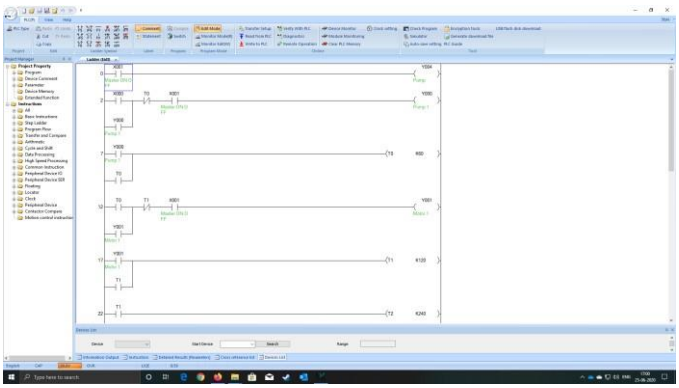
2.Pump and Motor

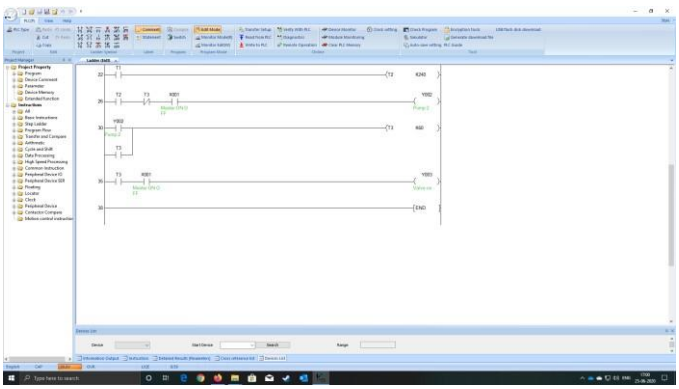
A pump is a device that moves fluids , by mechanical action. The motor on the other hand was used to pump the water from the underground tank to the overhead tank. The relay converts the DC output of the PLC into a signal compatible to effectively control the motor being used. Image of a pump is given below:

2.4 HMI (Human Machine Interface)

The Human Machine Interface is the interface through which the operator interacts with the system. The present status of the system is communicated to the user by resources of a GUI. The user can also turn ON or OFF numerous functions from the interface. The HMI was made by Wecon . Tags were used to enable communication between the WINCC and the SIMANTIC Manger.

Ladder diagram:





III. ADVANTAGES:

1. Maximize vigor savings through integrated, real-time process and equipment information and synchronized, enterprise-wide energy management programs

2. Achieve higher productivity, summary operating costs, and better utilization of staff with advanced process automation, communication, and data management

3. Reduce potential environmental difficulties such as overflow, with early finding of failures and weather warnings.

4. Track and control manpower costs through a central monitoring and control system that reduces the amount of time
and energy that personnel must devote on auxiliary equipment operation and maintenance.

IV. LIMITATIONS:

1. Although cost of PLC is one time investment it can be a issue because of weak financial support.

2. Multiprogramming is not possible in PLC as it is capable of holding one program at a time.

3. Skilled labour workforce is needed to operate the newly designed automated system.

V. CONCLUSION :

This paper has been done using a process control and monitoring of a Sewage water treatment plant. It has been introduced to implement and skilled system in the total control of the process and has been supplemented. This has revealed in real time the operation state of the process, which lets us to monitor the process, solve the errors if any. The decision of a PLC as a control instrument supports us in transferring the control signals to several field devices, it increases compatibility of various equipment through interfaces and protocols. The PLC WECON LX2E-0806MT-A2 also offers many Input Output ports. Hence this sole system can single handedly control as many as 50 tanks making it efficient and cost effective.

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