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Analysis and Simulation of Waste Water Treatment Plant by Using GPS-X Software

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Abstract: ***Kerala is rich in water resources, which helps to achieve the state to meet most of the water requirements. Due to increased population, most of the water resources are getting depleted. Among the types of water generated according to source , there is a big gap in the treatment of water. The proposed work present is planning to do a review about the modeling of water treatment plants with the help of GPS – X simulation softwares available in the industry . Also it focuses on the role of simulation tools for a better understanding of the treatment process and major trends emerging in the field of water treatment process .water supply and treatment often received more priority than waste water collection and treatment. However, water treatment deserves greater emphasis and should receive greater attention. The purpose of this project is to study the efficiency of the waste water Treatment Plant at karanthoor markaz, calicut This is done by monitoring the main physical, chemical water quality parameters, and comparing them with standards for effluents discharged into surface water. And simulation with the GPS-X software is used and results shows the performance of water treatment plant. In addition, with the software GPS-X, we are trying to improving capacity, operating efficiency and effluent quality by properly optimizing the existing facility can be obtained. This program has a clear-cut graphical interface and uses a specialized translator that converts the graphical process into material balance equations, based on dynamic models. These models allow, besides the kinetic descripton of the treatment process carried out at the water treatment plant, to simulate new scenarios towards the study of critical parameters for the process as well as optimization and control of the water treatment plant. For the modelling of the process it was necessary to collect historical data related to the water treatment plant's performance over the last 3 years. This data was used as input values for the influent characterisation and as output values to achieve the treated effluent characterisation. Since the first simulation did not lead to the desired output results, it was necessary to proceed to the model calibration, by means of a more detailed study concerning the nutrient and organic fractions of the influent.***
Keywords: water characterization, effluent recycling, water treatment, GPS-X software, simulation

I. INTRODUCTION

Human activities create wastewater that can be catastrophic to the environment and also cause loss of water (in the form of wastewater which is 99% water by weight) in places where water is scarce. When wastewater contaminates rivers and groundwater tables, it renders the water resource unusable. Therefore, it is imperative that wastewater is treated before it is released into the environment and, if possible, treated it to make it potable. The objective of wastewater treatment is to reduce the pollutants to less than maximum permissible limits to prevent the threat to the environment and human health. To achieve this, wastewater is collected and treated in large plants before it is permitted to be released back into the environment. All the water used in homes that flows into drains or the sewage system is referred as wastewater. Wastewater follows a determined treatment path in order to achieve water quality standards, regardless of whether conventional treatment or advanced treatment systems are used. Wastewater is normally called influent as it passes through the wastewater treatment facility. Wastewater treatment plants help nature to defend water from excessive pollution. The degree and type of wastewater decides the nature of treatment and the engineering scale of the plant. Most wastewater treatment plants consist of primary and secondary treatment.

II. METHODOLOGY

GPS X is a modular, multi-purpose modeling environment for the simulation of waste- water treatment plant. This allows examining the complex interactions between various units processes in the plant interactively and dynamically. The figure below shows the modelling for WASTE WATER TREATMENT PLANT at KARANTHOOR MARKAZ ,CALICUT based on the influent flow, In the figures below shows the process of WWTP design starting with the influent flow going to aeration tank, clarifer1 and clarifier 2 ending up to effluent flow. The results were calculated from the detailed sampling, after that GPS-X models were developedand calibrated to the plant data.

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This calibration effort involved detailed review and analysis of the plant data and development of influent fractions for the model .For better purification performance and for providing essential operating rules to get better technically and scientifically operation base of the WWTP, thus the simulation with the GPS-X software is used and the results showed significant and satisfactory control performance of the WASTE WATER TREATMENT PLANT. Results indicate a good functioning of WWTP along the studied period where almost all measured parameters were below the standards. Moreover, the GPS-X is utilized for improving capacity, operating efficiency and effluent quality by the existing facility can be got. Based on the GPS X analysis, in the above figures they represent the systematic diagram of the extended aeration process. This process is started with the influent going up to the aeration tank ending with the effluent part. The program can be used to find appropriate control methods to minimize effluent concentrations from an activated sludge process. Basically, our design criteria are started with preliminary treatment through secondary treatment ending up with the effluent of the conventional wastewater treatment plant. The results indicate a good functioning of WWTP along the studied period where almost all measured parameters were below the standards. Moreover, the GPS-X is utilized for improving capacity, operating efficiency and effluent quality by the existing facility can be got. Based on the GPS X analysis, This process is started with the influent going up to the aeration tank ending with the effluent part. The program can be used to find appropriate control methods to minimize effluent concentrations from an activated sludge process. Basically, our design criteria are started with preliminary treatment through secondary treatment ending up with the effluent of the conventional wastewater treatment plant. the variation in the amount of TSS is considered with the variation of the time of the simulation. The time is specified in this analysis, but the effluent flow is considered with deliberation of the time of treatment process, the modeling results indicated that the increasing the time of simulation increased the removal of TSS, so the overall efficiency of the treatment system is enhanced too. the correlations between TSS values and influent flow, which is clarified an increasing with the TSS values with flow values. But, the time of simulation is 20 days instead of 5 days. Additionally. An enhancement in the amount of TSS is represented based on our analyses with the flow values at the simulation day 5. Meanwhile, an increasing in the amounts of TSS with the flow values at the 20 days simulation. It can predict that at time 5 the TSS showed reduction while at time 20, the amount of TSS showed enhancement in it amount. The improvement of TSS increased with increasing the time of simulation. However, at time 5, the TSS is significantly reduced. process of plant. The COD value indicates the amount of oxygen, which is needed for the oxidation of all organic substances in water in mg/l. At mixed liquor suspended solid, The mixed liquor is discharged into settlings tanks and the treated supernatant is run off to undergo further necessary before final discharge. Part of the sludge is returned to the aeration tank system to re-seed the new sewage entering the tank.

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IV. CONCLUSION

This project is undertaken to design a wastewater treatment plant with some particular data for KARANTHOOR MARKAZ AT CALICUT, The data calculation is based on the population of KARANTHOOR MARKAZ

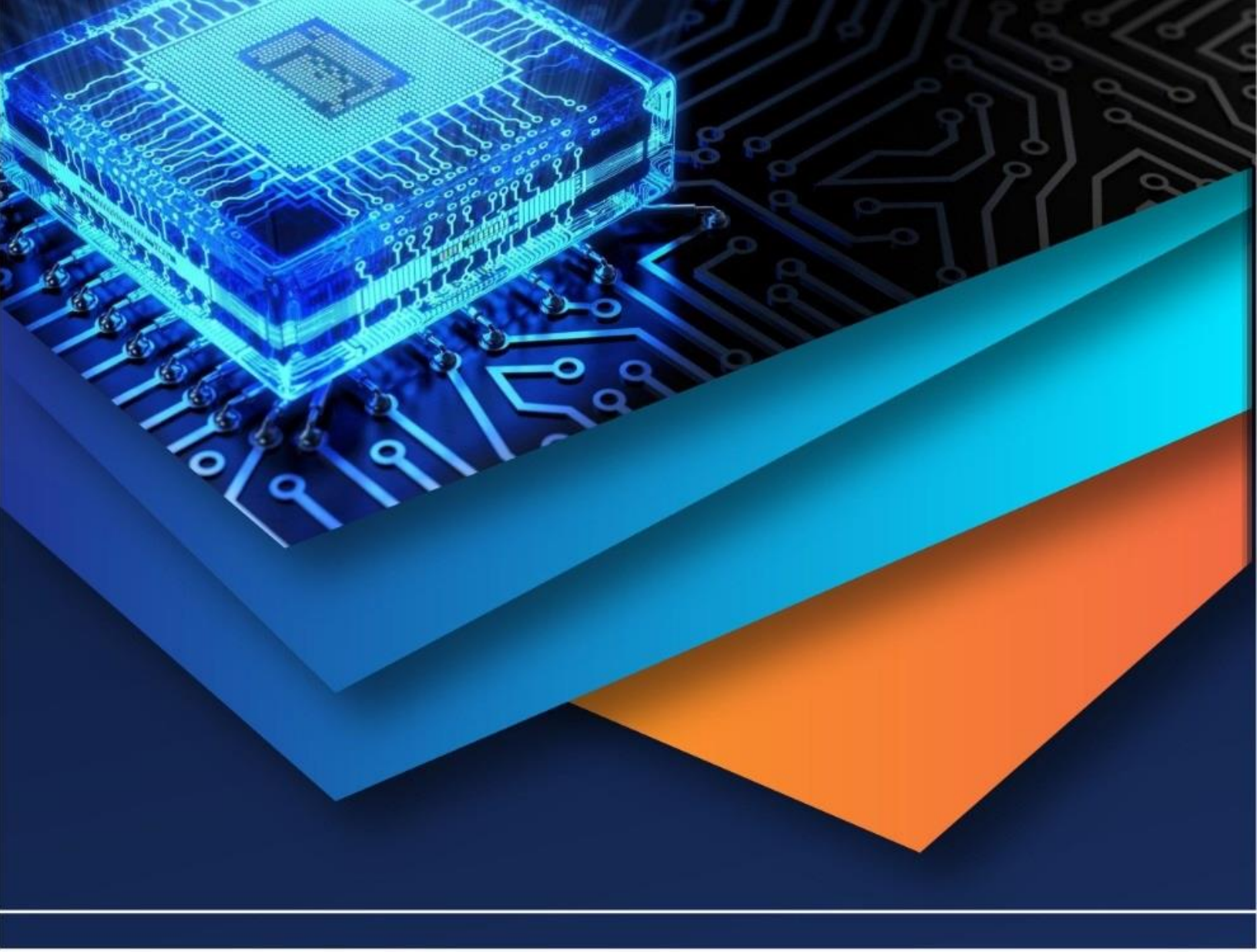
starting from 2006. The grit chamber, equalization basin, screens, oil and grease removal, aeration tank, secondary settling tank, drying beds, and Chlorination tank have been designed. Then the values for volume of aeration tank, hydraulic retention time (HRT), return sludge flow rate, sludge production and oxygen requirement have been calculated. Some criteria have been made during designing the WWTP. Particularly, the recommendation is to reduce these assumptions as many as possible to achieve the more accurate and reliable results. In addition, this designing process is suitable for this particular situation, and it cannot be followed for every situations. Designing a waste-water treatment plant depends on the characteristics of the wastewater so the designing process should be analysed carefully because even a small mistake can be fatal the variation of principal parameters concentration of effluent of wastewater is given by GPS X analysis. After design calculation, the data are analysed too by GPS X program. The design is applied and GPS-X modelling has been applied to the simulation of the WWTP scale. some critical parameters that affect the performance of the treatment plant were predicated.Modeling for KARANTHOOR MARKAZ WWTP has been done with extended aeration process, that one is started with the influent flow, aeration tank and two secondary tank (clarifier tank) ending with the effluent flow. Simulation is exhibited at 5 days and then at 20 days.There are some recommendations for better performance regarding to the design criterion, man-agement and operational issues. The excess flowrate must be treated by introducing a new concept that can help to improve in the removal of organic and nutrient of the plant. Besides that, at thebeginning of the treatment, a flow meter should be installed to control the process. For operational denitrification, sufficient anoxic volume, proper carbon and mixed liquor recirculation are needed. Finally, monitoring and maintenance activities should be conducted and the operator maintaining the treatment plant should have aware ofthe unit processes in case of the failure of these units

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