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Performance Evaluation of Water Treatment Plant: A Review

Mr. Navnath Bapusaheb Ghodake[1], Mr. S. M. Bhosale[2]
[1, 2] *Environmental Science and Technology, Department of Technology, Shivaji University, Kolhapur, Maharashtra, India*

Abstract: ***Water is one of the most crucial components for all forms of life. The need of the day is viable supply of portable water for human utilization so that health and beneficial of the community can be addressed. Furthermore treated of the polluted water and making it safe for drinking and domestic use is the main challenge for the world today. Drinking polluted water can transmit diseases so potable water treatment is one of the most challenging and complex systems in countries. Continuous auditing for evaluation process in water treatment plant is essential. Yet proper designing and grouping of treatment plants to ensure its proper functioning and its requires frequent evaluation of performance of various units of treatment plant. Proper operation of plant and attention to the requirements of the sources of supply and distribution system are equally important to guarantee.***

Keywords: water treatment plant, performance evaluation, turbidity, pH, hardness, alkalinity, DO, MPN, chloride

I. INTRODUCTION

Water is scarce precious source which is the basic requirement for existence of all living things. Local agencies set up water treatment plants to process raw water to convert them suitable for consumption. Due to the chemicals involved in the purification process in the form of coagulants, sludge results as an inevitable by-product of the treatment process. The authority of water utilities is not only limited to the production of safe drinking water, but also efficient and safe disposal of water treatment plant waste. For determining water efficiency and producing water quality, the study of water treatment plant is carried out with all aspects and considerations which includes physical, chemical and bacteriological parameters. Sustained supply of safe and potable water is of paramount significance in promotion of health and well-being of the people. Water is one of the most important components of the physical environment. Safe, adequate and accessible supplies of water are the needs and essential components of primary health care. Inadequate provision of safe drinking water is one of the main origins of communicable diseases and allied health risk. The water may be pre chlorinated to kill microorganisms, control odors and taste, and aid in coagulation and settings. For removing carbon dioxide (CO2) and raises pH, oxidizes iron (Fe) and manganese (Mn), removes hydrogen sulfide (H2S) and aid in flocculation, the water should be aerated. The main objective of water treatment is not only to purify the polluted water but also to make it fit for the human consumption, over the removal and killing of organisms sickness and remove the taste, smell, unpalatable brownish discharge, some access of dissolved metals and a range. The validity of the water for human consumption is not only a some of the purity of water but also related with the water consumption for industrial and agricultural sectors. The supply of safe and potable water is of paramount significance in promotion of health and wellbeing of the people. It is commonly observed in most of the traditional water treatment plant in urban area are unable to perform this task. The common problem along with the unacceptable quality is deficient amount of supply due to rapidly growing population and industrialization.

II. LITERATURE SURVEY

M. A. Eidib and Mahmoud A. Azeem Elbayoumy [1] this research guides for finding investigation of the treatment plant in Dakahlia. He concludes that, the adequate engineering design is essential for successful operating plant after engineering and laboratory investigations. Continuous maintenance and investigation will start to precise evaluation of plant performance and solution of any required modifications. The conclusions of these research can resolve required instructions and highlight modification demands for continuous design and operating schemes.

H M Kalibbala, M. Nalubega, Owahlberg and B. Hultman [2] studied that performance evaluation of drinking water treatment plant in Gopalganj Town of -Bangladesh). He mentions that, Kampala water treatment plant (Ggaba II) was evaluated for of performance, design, operation and maintenance. The evaluation was done across the dry and wet seasons, measuring physical chemical parameters. Receding water level of Lake Victoria combined with poor quality of water at the intakes affected the supply of water in Kampala and the neighboring districts. There was considerable increase in the color of about two fold at the intake works during the period 1997 to 2005 with increased chemical usage to achieve acceptable standards. The conditions of operation and maintenance

were also found to be deficient with some design and construction problems as well. The annual mean color of the finished water was found to be significantly above the National standard value of 15 PtCo with 53.4% of samples not compliant. 21.6% and 9.3% of the samples taken were not compliant with the WHO pH and turbidity values respectively.

A. Ali, H. N. Hashmi, N. Baig, S. Iqbal and K. Mumtaz [3] studied that performance evaluation of the water treatment plants of Islamabad –Pakistan. He conclude that, the water samples from both the treatment plants are within the available water quality guidelines. However due to anthropogenic activities and grazing of animals near the banks of canal leading towards these plants, causes excessive turbidity and microbial contamination are being added. A significant amount of decrease in the microbial contamination and turbidity level can be achieved by providing maximum HRT during the sedimentation process. The overall turbidity removal efficiency of SG-WTP is comparatively better than that of SM-WTP. The decrease in the water quality at the tail of distribution system is mainly due to the existing cracks in the piping networks. The economic evaluation indicates that the cost of SM-WTP is almost 1.5 times more than that of the SG-WTP.

M. H. Mota, Shashiraj S. Chougule, and Yogesh S. Vatkar [4] they are visited and studied a plant in detail with respect to various processes carried out and the of treatments provided. This paper illustrate the method and criteria which is used for the performance evaluation of conventional WTP and its data. Also the researchers discuss the importance of characterization of media used in rapid sand filter beds. He concludes, both the increase in DO and decrease in acidity of water was indicating the proper working of aeration fountain. Performance of the process of coagulation was very poor, as the alum was not added as per need. Proper testing of water per day to finalizing the dose of alum has to be practiced for proper working of flocculation and clarification. The chlorination process was not practiced with proper care. The amount of residual chlorine was not monitored. The need of water softening facility particularly in pre monsoon period was felt demanding such process to be included in process train and practiced.

A. S. Mahinge and Isha. P. Khedikar [5] studied that performance evaluation of water treatment plant at MIDC Hingna Nagpur-A Review. This conclude that for maintaining the proper working of aeration units increase the DO contain in water so that it helps to remove the desirable gases present in the water. Performance of process of coagulation was very poor due the addition of poly aluminum chloride (PAC) should not use required amount to be needed. The decided doses of PAC for the proper working of units Pre chlorination and Post chlorination is necessary to safe drinking water, chlorination is the most commonly used disinfection method in drinking water treatment plants where as for killing pathogen the chlorine is used and oxidises of iron are used for maintaining taste and odour in water.

Z. Ahmadli, M.Fahiminia, S. A. Jang, R. Ansari, M.Savadkouhi, A.Anbaz, Akbar Escandari [6] Studied that performance evaluations of Qom water treatment of plant during 2005-2014,Iran..According to the results, the performance of Qom water treatment to remove turbidity and coliforms from water in the course of ten years corresponded with the National Iran standard. The mean values of recorded parameters show that the treatment system is functioning well. Because of climate desert of Qom and also probable creating flood conditions in some seasons, creating fluctuations in incoming water to the plant and a sudden increasing in turbidity is possible that shows the importance of preparedness of treatment processes to deal with such critical situations. This issue should be considered in the design of water treatment plants in such areas. It should be noted that continuous monitoring of the water treatment plant is essential due to the sensitivity of the public health. Studies in the field of evaluation of water treatment system can improve the performance of processes and shows possible errors in plant.

M. S. Hossain, M.S. Reza, M. A. Halin and Habibur Reza [7] studied that performance evaluation of drinking water treatment plant in Gopalganj town of Bangladesh. He states that, the study revealed that the Madhumati River is considered as the promising option of raw water source due to the high arsenic and iron content in groundwater of Gopalganj town area. However, the quantity of river water fluctuates seasonally and in dry season generally mid-April to mid-June the river water is found to be contaminated with salinity due to insufficient downstream flow across the river and at the same time, upstream flow of sea water. The source water is contaminated with high turbidity, color, TDS and Bacteria. The overall LRV and Efficiency of the treatment Plant were found to be varied in the range of: Physical parameters (2.09 to 2.31) and (99.19 to 99.51%), Chemical parameters (0.16 to 0.96) and (31.15 to 89.13%), Bacteriological parameters (0.83 to 1.08) and (85.22 to 91.67%) respectively. Furthermore, the overall qualitative efficiency of the WTP was found to be 82.66%. The acceptable removal efficiencies for TC and EC should be 100% and consequently, the obtained efficiency is not up to the mark and the treated water can't be considered as safe drinking water.

Meghana. M. and Manjunath N. T. [8] studied that Performance evaluation of water treatment units at Bhadravathi, Karnataka: A Case Study. He states that the performance of individual treatment units and characteristic of the treated water lead to the conclusion that various treatment units considered for study are working satisfactorily and sizes of the units are in confirmation with standard design criteria. However continuous maintenance and monitoring of treatment units is suggested.

A. A. Khan and S. K. Ahmad [9] states that performance evaluation of water treatment plant at Nangloi, New Delhi. A Case Study. He mention in this paper the study show that the WTP has been successfully treating water during peak and lean loads of contaminants and final water meets the standards of drinking water as per IS:10500. Turbidity of treated water always remains within the permissible limit. Consumption of coagulant is more during monsoon due to high turbidity and vice versa. Demand of disinfectant peaked during monsoon due to higher levels of bacteriological load. Dissolved Oxygen increases as the water moves through the various unit operations. TDS and total hardness slightly increases as the water goes through various chemical processes. Water loss during treatment is well within the permissible limit set by CPHEEO. Bacteriological impurities have been taken care of by maintaining chlorine levels of 1.5 ppm in the treated water.

III. CONCLUSION

After surveying all the above research articles, it can be concluded that, performance evaluation of the WTP was difficult task. The deciding appropriate methods for sampling, criteria for performance evaluation and correct analysis of the results obtained was very essential to report on correct problem identification and measures to be implemented in further work.

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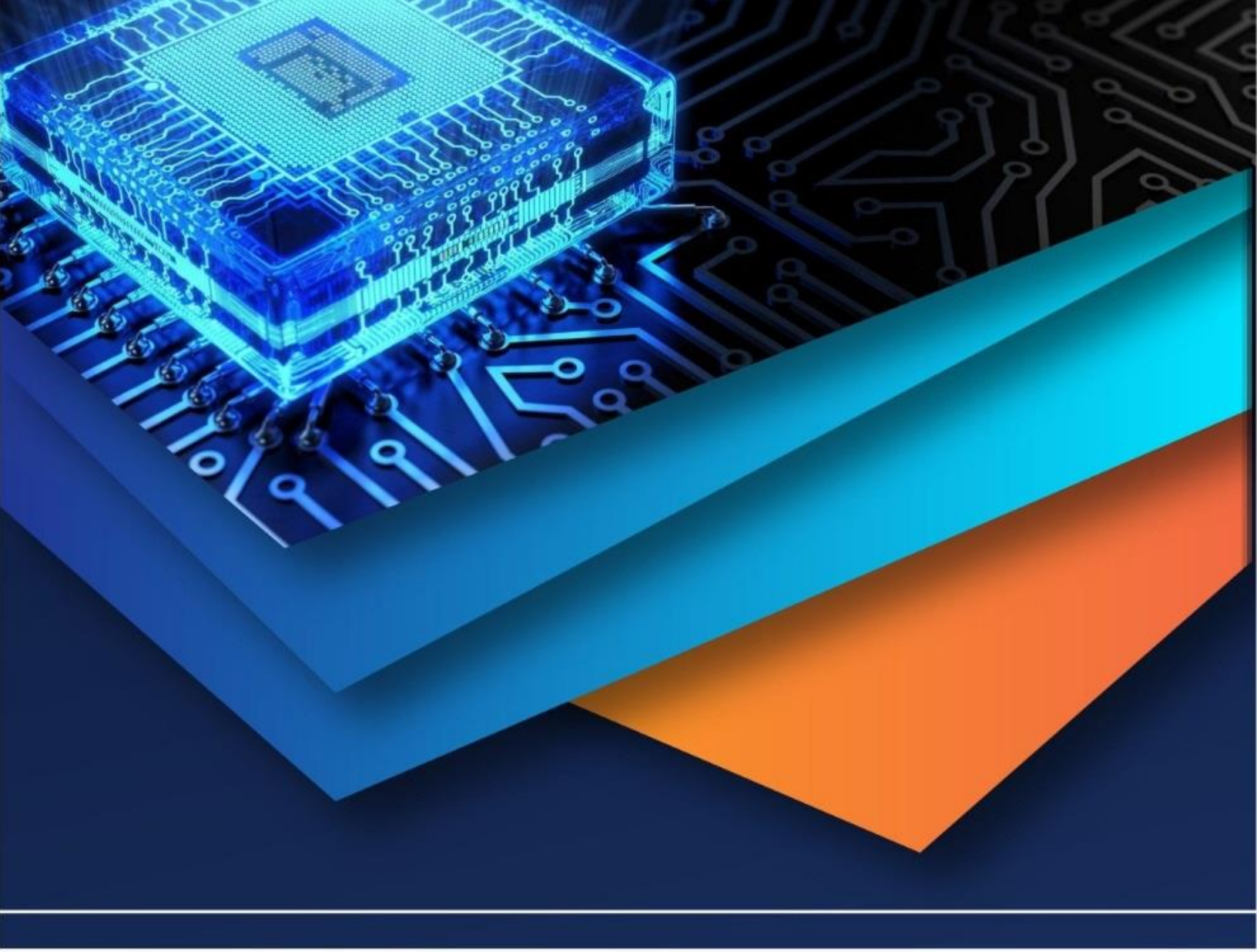

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