

Review Paper on Design and Estimate of Sewage Treatment Plan

**Mr. Bagwan Sahil Sameer¹, Mr. Momin Talha Shahanwaj², Ms. Pathan Shajma Aslam³,
Ms. Mohite Ankita Ashok⁴, Prof. Mr. Vikas Nikam⁵, Prof. R. N. Sapkal⁶**

B.Tech Students, Department of Civil Engineering^{1,2,3,4}

Assistant Professor, Department of Civil Engineering^{5,6}

Arvind Gavali College of Engineering, Satara, Maharashtra, India

Abstract: Sewage treatment is the process of removing contaminants from wastewater both runoff (effluents) and commercial. It includes physical, chemical and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a treated effluent and a solid waste or sludge suitable for discharge or reuse back into the environment. This material often inadvertently contaminated with many toxic organic and inorganic compounds. Sewage implies the collecting of wastewater from occupied areas and conveying them to some point of disposal. The liquid wastes will require treatment before they are discharged into the water body or otherwise disposed of without endangering the public health or causing offensive conditions.

Keywords: Sewage treatment

I. INTRODUCTION

Sewage treatment is the process of removing contaminants from wastewater both runoff (effluents) and commercial. It includes physical, chemical and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a treated effluent and a solid waste or sludge suitable for discharge or reuse back into the environment. This material often inadvertently contaminated with many toxic organic and inorganic compounds. Sewage implies the collecting of wastewater from occupied areas and conveying them to some point of disposal. The liquid wastes will require treatment before they are discharged into the water body or otherwise disposed of without endangering the public health or causing offensive conditions. The treatment of wastewater is accomplished by four basic methods or techniques; physical, mechanical, biological and chemical. The sequencing batch reactor (SBR) is a fill and draw activated sludge system for wastewater treatment. In this system, wastewater is added to a single "batch" reactor, treated to remove undesirable components, and then discharged. Aeration, and settling can all be achieved using a single batch reactor. SBR have components such as Screening chamber, Equalization chamber, Sequencing Batch Reactor (SBR), Decant tank, sludge holding tank, Final Collection tank.

1.1 Objective

Objective of the Work

The objective of this work is to design and estimate domestic sewage treatment plants so as to reuse treated water for domestic uses such as watering plants, cleaning the vehicles and toilet flushing etc. Through the treatment of wastewater, the amount of waste that is released into the environment is considerably reduced, thereby improving the environment's health. This, in turn, reduces the health risk associated with environmental pollution and the nearby water bodies remain uncontaminated.

Wastewater treatment is one of the solutions to the world's water crisis, which will only increase as the world population increases.

1.2 Scope of Project

Sewage water treatment plants can be installed in numerous setups which may be industrial, institutional, in human colonies as well as agricultural lands until there is requirement for safe disposal of waste water generated.

1. Municipal sewage treatment plants: - SBR systems have been successfully used to treat Municipal wastewater and industrial waste water and are uniquely suited to wastewater treatment applications characterized by low or intermittent flows. Because of rapid urbanization the scope of waste water treatment is a large one.
2. Industrial wastewater treatment plants :- Due to the design flexibility and better process control that can be achieved by the modern technology, the use of these SBR process has not been limited to the field of sewage treatment only; it has also found wide acceptance in biological treatment of industrial Wastewater.
3. Landfill leachate treatment plants: Rainwater passes through the waste in the landfill and if the landfill is not properly lined or it is not properly managed, it is at risk of mixing with the groundwater and polluting it near the site. So it is important to provide landfill treatment plant.

II. LITERATURE REVIEW

Edwar Ardern et al. (1914):

Studied the main principles of biological degradation operations using activated sludge in early 1900. They operated fill and draw processes on crude sewage and conceptualized sequencing batch reactors (SBR) technology. It was achieved by utilizing single reactor basin and applying iterative approach of aeration, settlement and discharge of treated water. Sequencing batch reactor technology was capable of attaining very high quality effluent water quality, but this technology faced many operational difficulties. Therefore for a long period of time development of SBR process for wastewater treatment has stagnated. In 1913 - 1914 there were carried out lab-scale experiments at the Manchester Davyhulme wastewater treatment plant. The experiments were prepared and performed by William Lockett according to the Dr. Fowler's recommendations. Sewage from different districts of Manchester was used for those experiments. Lockett and Ardern found soon that the amount of the sediment increased with increasing number of batches. By this technique of repeated batch aeration with the sediment remaining in the bottle Lockett and Ardern were able to shorten the required aeration time for "full oxidation" from weeks to less than 24 hours which made the process technically feasible.

D. Dohare et al. (2014):

Studied that SBR technology is an alternative method for treating waste water. SBR technology differs in various ways from conventional technologies used in biological treatment of wastewater. The most obvious difference is that in SBR technology, the reactor volume varies with time, whereas it remains constant in the traditional continuous flow system. The advantages of SBR technology include the flexibility of operation (change of phase), feasibility of operation at low retention time, control over microbial population and various reactor configurations. SBR process consists of several time oriented periodic steps, characterized by a series of process phases viz. fill, react, settle, decant and idle, each lasting for a defined period during which wastewater is treated. SBR technology is applicable for any municipal or industrial waste where conventional or extended aeration activated sludge treatment is appropriate. The success of SBR technology depends on the great potential provided by the possibilities of influencing the microbial system in the reactor. SBR processes are comparatively easy to operate and cost efficient and this process saves more than 60% of the expenses when compared to conventional activated sludge process.

Aparna Dutta et al. (2015):

Studied the Sequencing batch reactor (SBR) Due to its operational flexibility and excellent process control possibilities, SBR are being extensively used for the treatment of wastewater which is contaminated with newer and more complex pollutants. It is also possible to include different expanding array of configurations and various operational modifications to meet the effluent limits which are also continuously getting upgraded. They provided basic description of SBR process along with its functional and physical variants that lead to improve the removal of nutrients and emerging contaminants. The significance of selectors and various recent advancements in the application of SBR was discussed along with the possibilities held by SBR process in the treatment of wastewater of different origins and composition to produce effluent of reusable quality.

III. METHODOLOGY

3.1 Methodology/Planning Work

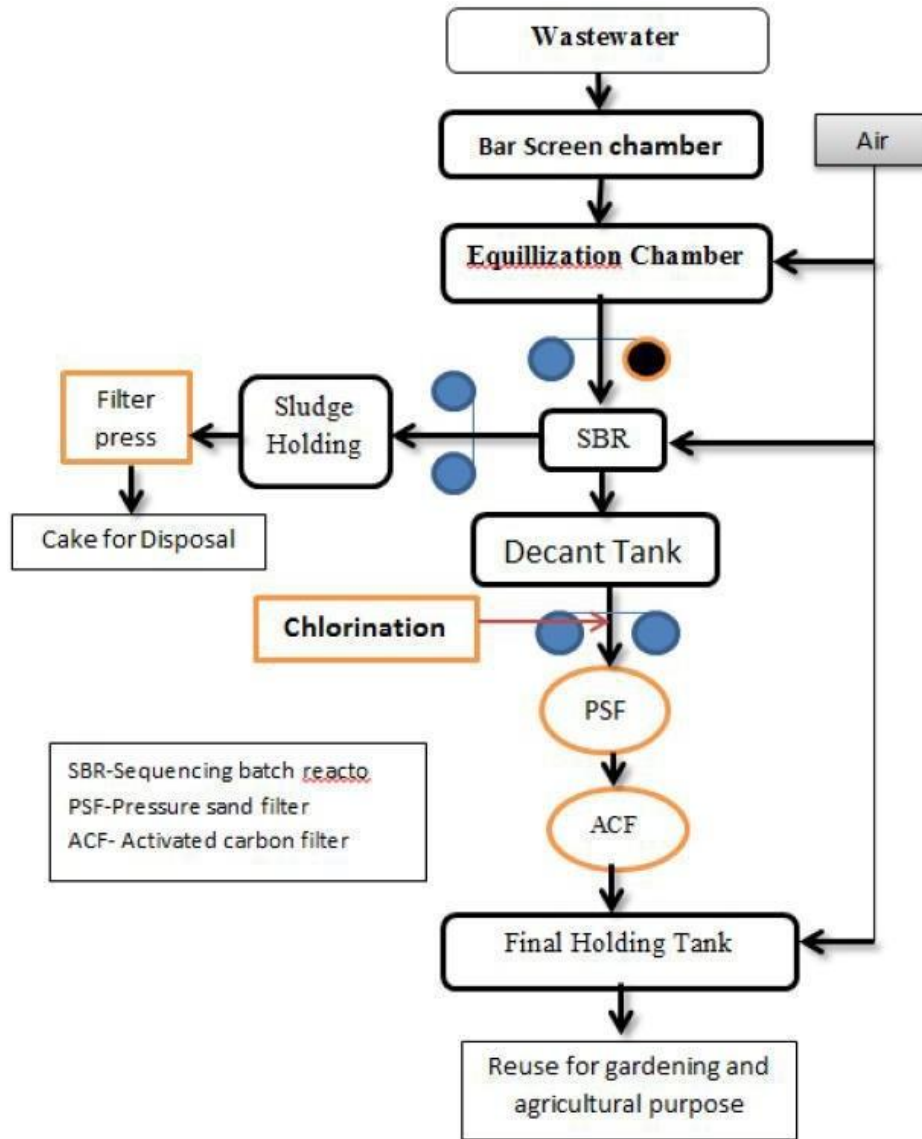


Figure: SBR Flow Diagram

For this work Sequential Batch Reactor (SBR) was selected to treat the sewage. SBRs are a variation of the activated-sludge process. They differ from activated-sludge plants because they combine all of the treatment steps and processes into a single tank. Whereas conventional facilities rely on multiple tanks. SBR is recommended in areas where there is a limited amount of space. In this system, wastewater is added to a single —batch reactor, treated to remove undesirable components, and then discharged, aeration, and settling can all be achieved using a single batch reactor. The various components of SBR sewage treatment plant are bar screen chamber, equalization tank, SBR tank, Decant tank, sludge holding tank, pressure sand filter, activated sand filter, filter press, treated wastewater collecting tank.

- **Bar Screen Chamber:** Bar Screen Chamber is used for removing rags, sticks, and other debris before they can enter the treatment process.
- **Equalization Tank:** The main function of the equalization tank is to act as a buffer: to collect the raw incoming sewage that comes at widely fluctuating rates and pass it on to the rest of the sewage treatment plant at a steady flow rate.

- **SBR Tank:** A sequencing batch reactor works in five steps Fill, React, Settle, Decant, and Idle. It is the Main component of SBR process.
- **Decant Tank:** Effluent coming from Sequencing Batch Reactor through decant mechanism is stored in decant tank.
- **Sludge Holding Tank:** Sludge collected in sbr tank is stored in sludge holding tank
- **Filter:** These Filters are designed to remove turbidity and suspended particles present in the feed water with minimum pressure drop.
- **Activated Carbon Filter:** Activated carbon filter process basically absorbs micro pollutants such as chlorine, methane, organic compounds, and even the taste and odor from water.
- **Filter Press:** Filter Press is fixed volume machine that separates liquids and solids using pressure filtration. A slurry is pumped into the filter press and with the help of recessed plate dewatered under pressure.

REFERENCES

- [1]. Dutta, A.; Sarkar, S. Sequencing Batch Reactor for Wastewater Treatment: Recent Advances. Curr. Pol. Rep. (2015)
- [2]. D. Dohare, Nupur Kesharwani A Review on Wastewater Treatment Using Sequential Batchreactor. (2014)
- [3]. Edwar Arden, William Lockett Oxidation Of Sewage Without Filters (1914)
- [4]. Omar Alagha , Ahmed Allazem , Alaadin A. Bukhari , Ismail Anil and Nuhu Dalhat Mu'azu Suitability of SBR for Wastewater Treatment and Reuse: Pilot Scale Reactor Operated in Different Anoxic Conditions (2020).
- [5]. P. G.Patil , Dr. G. S. Kulkarni ,Ph.D., Smt. S. V.Kore , M. Tech.,Shri. V. S.Kore .M. Tech. Aerobic Sequencing Batch Reactor for wastewater treatment.
- [6]. Debsarkar, A., Mukherjee, S. And Datta, S. (2006).“Sequencing Batch Reactor (SBR) treatment for simultaneous organic carbon and nitrogen removal- a laboratory study”, Jnl. of Environ. Sci. and Engg., 48,
- [7]. S. Venkata Mohan, N. Chandrashekhara Rao, K. Krishna Prasad,B.T.V. Madhavi, P.N. Sharma Treatment of complex chemical wastewater in a (SBR) with an aerobic suspended growth configurations
- [8]. mahvi, a. h. sequencing batch reactor: a promising technology in wastewater treatment. journal of environmental health science and engineering. (2008).
- [9]. Singh M, Srivastava RK. Sequencing batch reactor technology for biological wastewater treatment: a review. Asia-Pac. J. Chem. Eng. (2011)
- [10]. Lavender P., E. Cowley, N.J. Horan, Experiences with activated sludge bulking in UK. In: Rumiwkova I., J.Wanner,eds, Conference Proceedings Poster Papers of the Ninth IWA Specialised Conference on Design,Operation and Economics of Large Wastewater Treatment Plants. Praha, Czech Republic, (2003).