Water Treatment Scheme

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Abstract-

The village of Galapur faces significant challenges in accessing clean and safe drinking water due to contaminated water sources, inadequate sanitation, and limited access to healthcare facilities. The community's reliance on untreated water sources has led to a high incidence of water-borne diseases, affecting the health and well-being of residents.To address this issue, a sustainable and efficient water treatment plant is proposed, designed to meet the village's specific needs and provide clean drinking water. The plant will utilize a suitable technology, such as a conventional treatment process or a decentralized treatment system, ensuring ease of operation, maintenance, and affordability.The design will also incorporate environmentally friendly practices, such as using locally sourced materials, minimizing energy consumption, and promoting waste reduction. Community engagement strategies will be implemented to promote long-term sustainability, including training local residents to operate and maintain the treatment plant.The proposed water treatment plant will not only provide clean drinking water but also contribute to the overall improvement of the village's health and hygiene. The design will be tailored to the village's specific needs, taking into account its unique challenges and opportunities.By providing access to clean drinking water, the project will improve the health and well-being of Galapur's residents, reducing the incidence of water-borne diseases and promoting a healthier and more sustainable community. The project's success will also serve as a model for other rural communities facing similar challenges, contributing to the achievement of sustainable development goals.

Key words: water, treatment, sustainability, community, health

1. INTRODUCTION

All cities are growing rapidly so urbanisation of village area is also important for growth of nation. India is one among the country where the process of urbanization is an integral part of the development. According to 2011 census only 31 percent of the population of India lives in urban areas. According to UN's the urban population of India will be less than 35 percent in 2020 and approximately 40 percent 2030, By 2030 another 225 million people will be added to the Indian urban areas, it is more than the population of Japan and Germany combined. This module aims to study the present and past tendency of urbanisation in India. and also growth of cities, metropolitan cities and distribution of urban population in states and UTs of India since 1901 to 2011 Census periods. In India, urbanisation huts been relatively slow during the last century period as compared with many other developing countries. In India, 10.83% of people lived in cities according to the census of 1901. which increased to 31.16% in the census of 2011. As per the World Bank Report 2022, the urban population in India is about 35.87%.

Maharashtra is at good rate of urban population growth but In Maharashtra, there are several villages facing economic challenges and developmental issues. These villages are often considered backward due to factors such as poverty, lack f industrialization, and other developmental disparities.Yavatmal, Gadchiroli, and Chandrapur are among the most backward districts in Vidarbha. These areas are predominamly agrarian, with crops like cotton, jowar, soybean, and pulses as their primary agricultural outpot Additionally, some parts of Vidarbha have been affected by Maoist insurgency.In 2016 chief minister of Maharashtra shri Devendra Fadnavis has announced for public-private partnership schemes to develop 1000 most backward villages of Maharashtra, the work is now on to come up with a draft identifying critical parameters a 'model' village must meet The top priority in Vision Maharashtra is eradication of poverty. Maharashtra, with a total population of 11.25 crore, has 2 crore people in the below poverty line (BPL) category. Per capita income in rural areas is much lower than in urban areas. There are sotal of 48108 villages in Maharashtra and out of that 1533 are in Jalgaon District most of them are almost get developed some of them are still rural. For keeping in mind model village concept, we had taken a village named Galapur to develop it by giving them a design of drainage & sanitation system, water supply and distribution system and good roads for transportation and by getting them aware of various govt. schemes to take advantage of these schemes and get developed in future. Condition of Village and Need for Sanitation and Drainage ---Village has no proper Drainage and Sanitation Facility so for drainage purpose combined system will be good for the village as there are only few houses so there will no more waste generated and if we provide separate system, it will cost more and it can clog also at turning points as no much liquid waste will be generated and in combined system storm water helps the waste to flow in laminar condition. For designing drainage pipes, we had surveyed all local streets from where waste is in be collected, we worked out RLs of all areas from where waste is to be generated which will help us to decide the slope of drainage line in which waste will flow under gravity.

2. LITERATURE REVIEW:

Jayashree Dhoteetal studies today numerous waters resources are pollute by the anthropogenic source including the agricultural and household waste as well as industrial process. Public concerns over environmental impacts of waste water pollution increased. To eliminate the pollutants, many traditional wastewater treatments strategies, such as activated sludge, chemical coagulation and adsorption, have used; however, there're still few limitations, particularly in terms of high operating costs. Because of its low operating and maintenance cost, aerobics waste water treatment as reductive medium is gaining popularity.

Suad Jaffer Al-Lawatietal studies Wastewater treatments and sludge production occur in a variety of economic, social, and technological contexts, necessitating a variety of approaches and solutions. In the most cases, routine as well as environmentally friendly wastewater treatments and sludge management necessitate developments of the practical and enforceable legislation and treatment systems tailored to local conditions. Their paper's main goal is to provide valuable information about Oman's existing wastewater and sludge treatments, managements, legislation, and analysis.

A Singh reported the process of sewage water treatment in a Goa plant. Most commonly used technologies in Goa include EA (extended aeration) and Sequencing batch reactor and in some of the plants use moving bed bio reactors. Jamwal and Mittal [18] examined the suitability of reusing STP based on microbial evaluation with specific reference to 17 STPs in Delhi. The STP process. The treated water is used for agriculture, horticulture and for recreation purposes. The authors recommended the tertiary treatment for reusing water for consumption without any health hazard.

Ajit P. Annachhatre has conducted significant research on water treatment processes, particularly focusing on anaerobic digestion for wastewater management. His work includes the treatment of distillery spentwash, utilizing anaerobic methods to recover clean energy while reducing environmental impact. Additionally, he has explored biological sulfate reduction techniques for treating industrial wastewater, contributing to sustainable practices in environmental engineering. Annachhatre's research aligns with broader initiatives aimed at addressing urban pollution and enhancing wastewater treatment technologies in Asia.

Shyam R. Asolekar is a notable figure in water treatment research, particularly through his book Wastewater Treatment for Pollution Control and Reuse. This work emphasizes the importance of reusing wastewater and includes innovative methods such as natural treatment systems, which are cost-effective and suitable for developing countries. Asolekar's research also covers advanced physico-chemical treatment methods, including membrane technologies, and discusses decentralized systems and sludge management. His contributions aim to enhance sustainable waste management practices and address urban pollution challenges effectively.

Dr. Vinod Tare is a prominent researcher in water treatment and river basin management, serving as the Founding Head of Ganga. His work emphasizes sustainable practices in water resource management and pollution control. He has delivered lectures on Condition Assessment and Management Plans for river basins, focusing on integrated approaches to water treatment and reuse. Tare's research includes the study of physicochemical and biological processes in wastewater treatment, contributing to advancements in sustainable technologies and methodologies for effective water management in India and beyond.

Zahra Aghalarietal collected data according by the exclusion and inclusion criteria as well as by the searching the related keywords in papers publish during years (2008 to 2018) through focus on effectiveness of waste water treatment system in the eliminating bacterial agent. Qualitative figures wascollect by using preferred reporting item for the systematic evaluations and Meta analyzes (PRISMA) standards checklists. After verifying papers' accuracy, information such as the first author's name and the year the report was published, types of analysis, numbers of the sample, purification method, types of the microbial agent, and rates of microbial agent removal was entered into the checklist. Also the removal rate of the microbial agent mention in study was compare with the united states environmental protections agencies (USEPA) standard.

3. METHODOLOGY:

A water treatment plant design project begins with project initiation, where the scope, goals, and deliverables are defined, and stakeholders and their roles are identified. Next, data is collected on the water source, quality, and demand, and site visits and surveys are conducted. The process selection phase determines the treatment requirements and processes, evaluates alternative technologies and approaches, and selects the optimal treatment train.

The preliminary design phase develops an initial design and layout, identifies major equipment and components, and estimates costs and resource requirements. This is followed by the detailed design phase, which creates detailed drawings and specifications, finalizes equipment selection and sizing, and develops operation and maintenance plans.

Permitting and approvals are obtained next, ensuring compliance with regulations and standards. Procurement and contracting involve preparing tender documents and contract awards, purchasing equipment and materials, and awarding construction contracts. Construction and installation oversee site preparation and construction, install equipment and piping, and conduct testing and commissioning.

Finally, start-up and training involve training operators and maintenance staff, starting up and testing the plant, and ensuring smooth operation and performance. The project close-out phase documents lessons learned, evaluates project success, and finalizes project reports and documentation. By following this methodology, a well-structured and comprehensive approach to designing a water treatment plant can be achieved.

3.1 Overview:

In our project of Galapur we are working on a part of model village concept in which we are giving the village design of water supply and water distribution system along with that we are giving them design and estimation of sanitation facility and drainage system which are basic needs of every village and every person to live a healthy life, with that we are also looking after Proper Roads which are a basic facility which everyone must need for safe and effective transportation and to increase their connectivity with cities.

For this we are collecting required data about population and number of houses village have and also the uren of village from the Grampanchayat of the village, there is Group Grampanchayat with Padmalay village which is very near to the village after that have visit the village for two days and collect all the Relevant survey data, we need for designing.

Then have do estimation of the project for its execution and search for various schemes which we can tell them for raising funds for execution of the project and will cover them in the report.

4. RESULTS:

- **Intake Well-**

Total Demand = 3.2 MLD
Rate of Pumping= 1.62 MLD
Adopt minimum depth as 3.0 m

- **Raw Water Gravity Main-**

Diameter of pipe 0.28 m
Velocity = 0.66 m/sec
Design discharge = 0.06 m/sec

- **Sump for Raw Water-**

Depth = 3.5 m
Bottom level of sump = 80.37 m …...From Ground Level

- **Pumping Machine-**

1 pump of 15 Hp and 1 pump of 20 Hp.
And 1 standby 20 Hp Pump.

- **Aerator-**

1.6 m Diameter Cascade type Stepped Aerator

- **Flash Mixer-**

Flash mixer size = 2 m X 2.5 m X 0.76 m

- **Solution Tank-**

size of tank = 0.8 X 0.8 X 1.0 m

- **Clarriflocculator-**

Capacity of clarriflocculator = 72 m
Total height of flocculator = 3.3 m
Detention period = 30minutes

- **Clarifier-**

Capacity of one unit = 360 m
Thickness of the wall = 0.3 m
Outer diameter = 3 + 0.6 = 3.6 m
Water flowing through unit = 0.04 X 24
Water flowing through unit = 0.96 m/hour

- **Rapid Sand Filter-**

2 filtrations unit
Rectangular size of filtration unit 4.0 X 2.6 X 3.0m
Q = quantity of water to be filtered per hour = 2083.33 lit
Details of Filter Media-

Sr. no.	Materials	Effective size	Thickness of layer
1.	Fine sand	3 to 6 mm	15 cm
2.	Medium sand	6 to 12 mm	15 cm
3.	Coarse sand	12 to 20 mm	15 cm
4.	Gravel grade-1	20 to 40 mm	15 cm

Free board 0.6m

- **Size of various pipes: -**

1. Inlet pipe: 20 cm diameter
2. Connecting main below media: 20 cm diameter
3. Diameter of laterals and spacing: 75 mm @ 30 cm c/c
4. Size of strainer and spacing: 8 mm dia. @ 15 mm c/c
5. Dia. Of wash water pipe: 20 cm

6. Dia. Of Compressed air supply main pipe: 20 cm dia.
7. Perforation: 6 mm dia. And spacing of lateral

➢ **Chlorination Tank-**

For One unit = 2.4 Kg / Day
Quantity of gas Kg/hr = 2.4 / 24 = 0.1 kg/hr

➢ **Ground Storage Reservoir-**

2 tanks having 500 m3 capacity each
Tank Size 10 m X 10 m
Depth of water = 5m
0.3 m free board, 45 cm wall thickness

➢ **Elevated Storage Reservoir-**

E.S.R. of Capacity 4 lakhs litres with diameter 10m
Depth = 4m

CONCLUSION:

The water treatment plant scheme is an important project that gives clean, safe, and reliable drinking water to people. By using modern technology and treatment methods, this scheme helps improve public health, gives better quality water, and supports long-term development.

The main goals of this scheme are to supply drinking water that meets safety standards, reduce diseases caused by dirty water, and encourage people to save water.

For the scheme to work well, some things are very important. The treatment plant must be run and maintained properly to clean the raw water effectively. Water quality should be checked regularly to make sure it is safe and to find ways to improve the treatment process. Also, it is important to involve the community and teach them why saving water and using it properly matters.

If these goals are achieved, the scheme will greatly help the people. It will improve health by reducing waterborne diseases, and it will support businesses, farming, and households by giving a steady supply of clean water. The scheme also helps the environment by making sure dirty water is treated properly before it is released, so that rivers and nature are not harmed.

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