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Design of Water Treatement Plant

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Abstract
Water is an essential natural resource required for human survival, economic development, and environmental sustainability. Due to rapid urbanization and industrialization, natural water sources are becoming polluted and unsuitable for direct consumption. This study presents the design of a water treatment plant for a small town to provide safe and potable water.
The treatment process includes aeration, coagulation, flocculation, sedimentation, filtration, and disinfection. The design is based on population forecasting, water demand estimation, and raw water quality analysis. The treated water meets drinking water standards and ensures public health safety.
The study concludes that a properly designed water treatment plant is essential for sustainable water supply and improved living standards.

KEYWARDS: Water Treatment Plant, Filtration, Disinfection, Sedimentation, Public Health, Water Supply

1. INTRODUCTION

Water is one of the most important natural resources essential for the survival of all living beings. Human life, agriculture, industries, and economic development depend on the availability of safe and adequate water supply.
In earlier times, people relied directly on natural water sources such as rivers, lakes, and wells. However, due to rapid urbanization, industrialization, and population growth, these sources have become polluted. Raw water contains impurities such as suspended solids, organic matter, bacteria, viruses, and harmful chemicals.
A water treatment plant is a facility where raw water is treated using physical, chemical, and biological processes to make it safe for drinking. Proper design of a treatment plant ensures continuous supply of potable water and protects public health.

2. LITERATURE REVIEW

Current research emphasizes the evolution of water treatment from basic sand filtration to advanced membrane technology. Studies by organizations like the WHO and EPA establish the maximum contaminant levels (MCLs) allowed in drinking water. Recent literature also discusses the impact of industrial runoff and the need for more robust chemical removal processes.

2.1 Data Collection

Data related to population, water demand, and raw water quality are collected.

2.2 Population Forecasting

Future population is estimated to determine water demand for the design period.

2.3 Water Demand Estimation
Water demand is calculated based on per capita consumption (135–150 LPCD).

2.4 Selection of Treatment Process
Suitable treatment processes are selected based on the quality of raw water.

2.5 Design of Treatment Units
Various units such as intake structure, sedimentation tank, filtration unit, and disinfection unit are designed using standard guidelines.

Water treatment involves several steps to remove impurities and make water safe for drinking.

3. METHODOLOGY
The methodology adopted for the design of the water treatment plant involves systematic planning and analysis.

3.1 Intake Structure
It collects raw water from the source and removes large debris using screens.

3.2 Aeration
Aeration removes dissolved gases and improves taste and odor of water.

3.3 Coagulation and Flocculation
Chemicals like alum are added to form flocs, which help in removal of fine suspended particles.

3.4 Sedimentation
Heavy particles settle down due to gravity in sedimentation tanks.

3.5 Filtration
Water is passed through sand filters to remove fine impurities.

3.6 Disinfection
Chlorination is used to kill harmful microorganisms and make water safe for consumption.

4. RESULT AND DISCUSSION
The designed water treatment plant effectively improves the quality of raw water. Each treatment unit performs a specific function in removing impurities.

Aeration removes dissolved gases, coagulation and flocculation remove fine particles, and sedimentation reduces turbidity. Filtration further improves water clarity, while disinfection eliminates harmful microorganisms.

The treated water meets drinking water standards and is safe for domestic use. The design is economical, efficient, and suitable for small towns.

The system also contributes to public health improvement and sustainable water resource management.

5. CONCLUSION
This study presents the design of a water treatment plant for providing safe and potable water. The treatment processes effectively remove impurities and ensure water quality.

A properly designed water treatment plant reduces water-borne diseases and improves public health. The project highlights the importance of proper planning and design for sustainable water supply systems.

REFRENCES
1. World Health Organization (WHO). Guidelines for Drinking-water Quality.

2. American Water Works Association (AWWA). Water Treatment Plant Design.
3. Environmental Protection Agency (EPA). The Safe Drinking Water Act (SDWA) Standards.
4. CPHEEO Manual on Water Supply and Treatment
5. IS 10500:2012 – Drinking Water Quality Standards
6. Peavy & Row – Environmental Engineering
7. Garg, S.K. – Environmental Engineering
8. Fair, G.M. – Water Supply and Wastewater Engineering
9. Lecture Notes and Class Materials