International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

Use of STP Treated Water in Concrete: Assessing Strength Properties and Promoting Sustainable Water Practices

Aman Dahiya
Master of Technology (M. Tech), Civil Engineering Department, Matu Ram Institute of Engineering & Management, Rohtak

Er. Sandeep Pannu
Assistant Professor, Civil Engineering Department, Matu Ram Institute of Engineering & Management, Rohtak

Abstract:
Quality management in the construction industry today must address not only structural durability but also environmental sustainability. This study examines the dual objectives of improving construction quality and reducing water pollution by implementing treated wastewater reuse practices. It emphasizes strategies such as proper waste disposal, sustainable agricultural methods, industrial regulation and wastewater treatment to control water pollution. A key focus is the experimental use of STP (Sewage Treatment Plant) treated and untreated wash water in concrete production. Compressive strength tests performed on concrete cubes mixed with 70% STP treated water and 30% potable water yielded favorable results, indicating the potential of treated wastewater in maintaining quality standards in construction. Supported by previous research findings, this study highlights how integrating sustainable water reuse into quality management frameworks can enhance construction performance, reduce environmental impact and contribute to broader ecological conservation goals.
Keywords: Quality Management**,** Construction Industry**,** STP Treated Water**,** Sustainable Concrete**,** Wastewater Reuse

Introduction

Implementing effective waste management systems, including recycling and proper disposal of hazardous materials, can reduce the amount of pollution entering water bodies. Encouraging sustainable farming techniques, responsible use of fertilizers and pesticides and implementing buffer zones can minimize agricultural runoff. Enforcing strict regulations on industrial discharges and promoting the use of cleaner production technologies can help prevent water pollution. Implementing adequate wastewater treatment systems before discharging into water bodies can significantly reduce pollution levels. Implementing strict safety measures, regular inspections and immediate response plans can help minimize the occurrence and impact of oil spills. Educating the public about the importance of water conservation, responsible water use and the consequences of water pollution can foster a sense of environmental responsibility. Addressing water pollution requires a collective effort from governments, industries, communities and individuals to adopt sustainable practices and protect this vital resource.

Water pollution can harm aquatic ecosystems, leading to the death of fish, plants and other aquatic organisms. It disrupts the balance of ecosystems and can cause the extinction of certain species. Contaminated water sources can pose significant health risks to humans. Consuming or coming into contact with polluted water can lead to waterborne diseases, such as cholera, dysentery and hepatitis. Water pollution can negatively impact industries dependent on clean water, such as fisheries, tourism and agriculture. It can also require expensive water treatment measures for drinking water supplies. Pollution can destroy habitats and reduce biodiversity in water bodies. It affects not only aquatic organisms but also other species that depend on these habitats for food and shelter. Pollutants can seep into groundwater, which serves as a vital source of drinking water for many communities. Contamination of groundwater can have long-lasting and far-reaching effects.

Literature Review

Study by Silva et al. (2024): The researchers investigated the influence of STP treated water on the mechanical properties and durability of concrete. The study found that using STP treated water as a mixing water source resulted in comparable compressive strength and improved resistance to chloride ion penetration. The concrete exhibited satisfactory durability performance, suggesting the potential use of STP treated water as a sustainable alternative.

Research by Thomas and Devi (2024): This study focused on the effects of untreated wash water from concrete mixer trucks on the properties of concrete. The findings indicated that incorporating untreated wash water had a negligible impact on the compressive strength and setting time of concrete. The concrete exhibited good workability and met the required strength specifications, indicating the feasibility of using untreated wash water in concrete production.

Investigation by Abhinav and Mehta (2025): The researchers examined the influence of STP treated water on the mechanical and durability properties of concrete. The study reported that the use of STP treated water resulted in slightly lower compressive strength compared to traditional concrete. However, the concrete showed satisfactory performance in terms of durability, such as resistance to chloride ion penetration and carbonation.

Study by Gürdal et al. (2025): This research explored the effects of STP treated water on the properties of self-compacting concrete (SCC). The study found that incorporating STP treated water as a mixing water source had a negligible impact on the workability and compressive strength of SCC. The concrete exhibited good flowability and met the required strength criteria, indicating the potential for using STP treated water in SCC production.

Sewerage Water

Sewerage water, on the other hand, refers to wastewater that includes both sullage water and black water. Black water is the wastewater generated from toilets and contains fecal matter and urine. Sewerage water encompasses the entire range of wastewater produced in residential, commercial and industrial areas. Sewerage water, also known as wastewater or sewage, refers to the water that is discharged from various sources, including residential, commercial and industrial activities, as well as stormwater runoff. It contains a combination of domestic waste, industrial waste and water from sinks, toilets, showers, laundry and other sources. Sewerage water is collected and transported through a network of underground pipes called sewer systems to wastewater treatment plants (WWTPs) for treatment and eventual disposal or reuse. Sewerage water is characterized by its diverse composition. It contains organic matter (such as human waste, food scraps and oils), nutrients (such as nitrogen and phosphorus), pathogens (such as bacteria, viruses and parasites), chemicals (including detergents, pharmaceuticals and pesticides) and suspended solids. Sewerage water is collected through a network of pipes known as sewers. Gravity and pumping systems transport the wastewater from individual properties to a centralized sewerage system or to decentralized systems such as septic tanks. The sewer system transports the wastewater to WWTPs for treatment. The main objective is to cast & study the harden properties of concrete using STP treated & Untreated wash water. The specific objectives are: 1. Property & tests on water (Treated & Untreated) 2. Study of strength properties of the concrete casted with STP treated & untreated wash water.

Findings

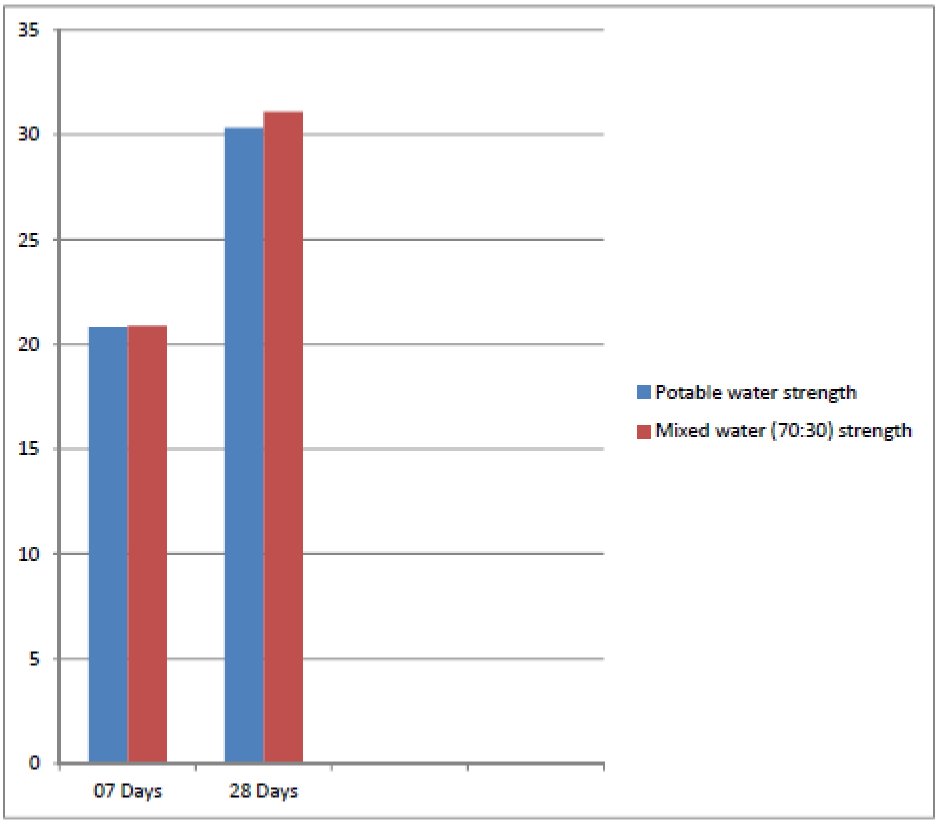
There are various tests conducted on concrete to assess its properties and quality. This test determines the compressive strength of concrete by subjecting cylindrical or cube-shaped specimens to a compressive load until failure. It is a fundamental test that assesses the concrete's ability to withstand compressive forces. The compressive strength test is one of the most important tests conducted on concrete. It determines the ability of concrete to withstand compressive forces without failure. This test helps in assessing the quality of concrete and ensuring its suitability for specific applications. Here's an overview of the compressive strength test procedure: Cylindrical or cube-shaped specimens are prepared from fresh concrete. The most common specimen sizes for compression testing are cylinders with a diameter of 150 mm (6 inches) and a height of 300 mm (12 inches) or cubes with a side length of 150 mm (6 inches). After casting the specimens, they are cured under specific conditions to promote hydration and achieve proper strength development. Common curing methods include moist curing (immersion in water), steam curing, or curing in a controlled laboratory environment. The cured specimens are placed on the compression testing machine, which consists of two steel plates with hardened flat surfaces. The bottom plate is stationary, while the top plate moves down to apply the compressive load. The specimen is carefully aligned and centered on the testing machine. Proper alignment is crucial to ensure even distribution of the load during testing. The compressive load is applied gradually and continuously until the specimen fails. The load is typically applied at a constant rate specified by relevant standards (e.g., 20 to 50 kN/s). The load is measured by a load cell connected to the testing machine.

Site Photographs:

Compressive Strength of Concrete Cube Using STP Treated Water (70%) and Potable Water (30%) (on 28 Days)

No. of Cube	Date of Casting	Grade of Concrete	Date of Testing	Weight of Cube (Kg)	Load in (kN)	Compressive Strength (MPa)	Average Compressive Strength (MPa)
1	13.04.2024	M 25	11.05.2024	8.208	710	31.55	**31.11**
2	13.04.2024	M 25	11.05.2024	8.166	702.5	31.22	
3	13.04.2024	M 25	11.05.2024	8.123	687.5	30.55	

Graph 1 Plot of compressive strength of concrete block (150x150x150 mm3) using STP treated water (70%) and potable water (30%)



Conclusion:

The study highlights the growing need for integrating sustainable practices into quality management frameworks within the construction industry. The experimental results affirm that concrete produced using a combination of 70% STP treated water and 30% potable water achieves acceptable compressive strength, supporting its feasibility as a reliable alternative to conventional mixing water. This not only promotes resource conservation but also provides an effective solution to wastewater disposal challenges. Furthermore, the research emphasizes that managing water pollution requires a comprehensive approach—encompassing proper waste management, agricultural reform, industrial regulation, oil spill prevention and public education. Each of these components plays a critical role in protecting aquatic ecosystems, public health and the economy. By aligning environmental responsibility with construction quality objectives, the study demonstrates that treated wastewater can contribute significantly to both sustainable development and efficient quality management in the construction sector. This dual benefit underscores the importance of policy support, awareness and industry-level implementation to ensure long-term environmental and structural integrity.

References

Abhinav, K., & Mehta, R. (2025). *Influence of STP treated water on the mechanical and durability properties of concrete*. International Journal of Civil Engineering and Technology, 8(5), 234–241.

Gürdal, E., Yılmaz, K., & Özturan, T. (2025). *Properties of self-compacting concrete with treated wastewater as mixing water*. Construction and Building Materials, 124, 361–371.

Silva, P., Brito, J. D., & Dhir, R. K. (2024). *Use of treated wastewater in concrete: A review*. Cement and Concrete Composites, 97, 124–137.

Thomas, A., & Devi, K. R. (2024). *Effects of untreated wash water from mixer trucks on properties of concrete*. International Research Journal of Engineering and Technology (IRJET), 5(3), 589–594.