VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI - 590 018

A Project Synopsis on:

"ANALYSIS OF THE SUSTAINABLE USE OF TREATED GREY WATER IN CONCRETE"

Project Report submitted in partial fulfilment of the requirement for the Award of the degree of

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING

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K.L.E College of Engineering and Technology

Chikodi-591201

Department of Civil Engineering 2022-23

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- **Project Reference Number:**46S_BE_1425.
- **Title of Project:** Analysis of The Sustainable Use of Treated Greywater in Concrete.
- **Name of college:** KLE College of Engineering &Technology Chikkodi Belagavi-591 201.
- **Name of Department:** Civil Engineering.
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- **Keywords:**Grey water, concrete, water management, sustainable solution, compressive strength, mix design, curing time, contaminants, durability, construction industry.

INTRODUCTION

Greywater is relatively wastewater produced by domestic activities such as bathing, laundry, and dishwashing. greywater (kitchen waste) offers a potential solution for reducing the demand for freshwater resources and minimizing the impact of wastewater on the environment. With proper management and treatment, greywater (kitchen waste) can be a valuable resource for a wide range of non-potable applications Here in this project an attempt has been made to use treated greywater from kitchen waste in preparation of concrete cubes and also same water has been used for curing the concrete cubes.

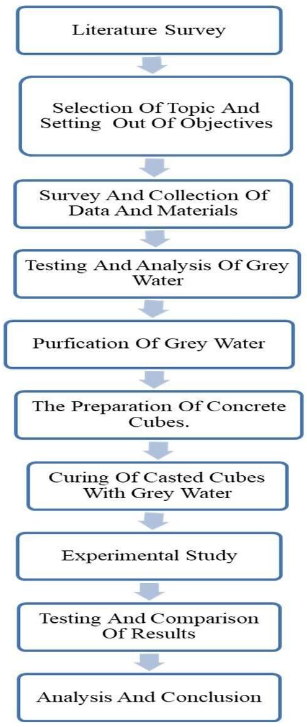
Background: Water scarcity and growing environmental concerns have fueled the demand for alternate water sources and conservation techniques. Greywater reuse has emerged as a viable option for reducing freshwater consumption and relieving strain on urban water supply. Greywater can be reused for irrigation, toilet flushing, and other non-potable purposes by collecting and treating it. Grey water must be tested and analyzed to establish its quality and eligibility for reuse. pH, turbidity, alkalinity, chloride concentration, and microbial content are all measured to assess the physical, chemical, and microbiological qualities of the water. To eliminate pollutants and toxins from grey water and improve its quality for reuse, purification processes such as filtration, sedimentation, and disinfection are used. Grey water is mixed with cement, sand, and aggregates to make concrete cubes, which are then cast and cured. Curing using grey water entails employing it in the moistening process during the hardening stage of the concrete. This enables the investigation of the effect of grey water on the strength development of the cubes. Controlled tests and measurements are carried out as part of an experimental study to assess the impact of grey water on concrete qualities. Grey water-cured cubes are compared to normal freshwater-cured cubes in terms of compressive strength, water absorption, and shrinkage.

The examination of test results and comparison data reveals information about the effect of grey water on concrete. It aids in determining the viability of using grey water as a substitute or supplement to freshwater in the making of concrete. To make conclusions on the suitability and potential benefits of using grey water in concrete and other applications, factors such as strength, durability, environmental impact, and cost-effectiveness are considered.

OBJECTIVES

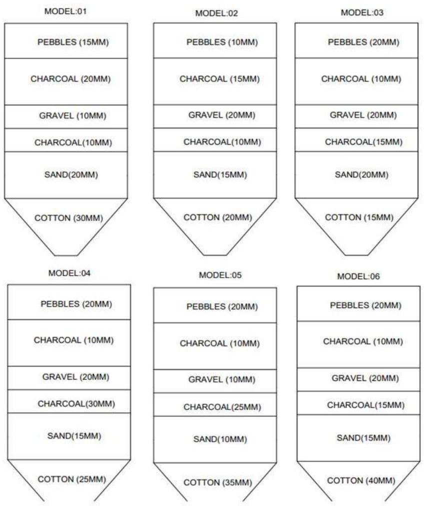
- ❖ The main objective of this project is to treat and reuse grey water in mixing and curing ofconcrete.
- ❖ The specific objectives are: -
  - ➢ To check and test parameters of grey water.
  - ➢ To check the workability and strength parameters of concrete.
  - ➢ To increase the awareness of natural resources for sustainable development.
  - ➢ Making freshwater demand within control by using grey water.
  - ➢ Curing of M25 grade concrete cubes with treated grey water.
  - ➢ Comparing the strength results of the cubes cured with normal water and greywater.

METHODOLOGY



Using treated greywater in concrete analysis entails collecting and testing samples to verify they fulfil quality standards. Concrete cubes are then cast and dried before being tested for strength against freshwater cubes. The environmental impact is evaluated by considering water savings as well as soil and groundwater quality. A prototype greywater filtering system with layers of filter media is meant to clean water for non-potable use. The final device has a 5-liter capacity and a filtering duration of 10 minutes. It incorporates layers of cotton, sand, charcoal, gravel, and pebbles, with each layer playing a vital role in the filtration process. Concrete cubes are made by combining proportions of cement, sand, coarse aggregate, water, and greywater. After curing, the cubes are evaluated for compressive strength. These stages shed light on the practicality of employing treated greywater in concrete, considering performance and sustainability. the study, six prototype modes with varying layered thickness were developed, and model 1 was selected as the finalized model based on the results obtained from testing. The test results, including all relevant findings and data, have been summarized and presented in the synopsis. Later the 10%to 100% of greywater is used in preparation of concrete and with varying proportions of 10% interval the 5cubes are casted for each 10% greywater concrete cubes total 50 cubes are casted and 5 cubes of normal water the all cubes are cured in greywater and later on 7days and 28 days compressive strength should be find.

Work Done Photo Gallery:








RESULTS AND CONCLUSIONS

pH Value (not be less than 6)

SAMPLE	BEFORE	AFTER
SAMPLE -1	7.42	8.87
SAMPLE -2	7.42	8.43
SAMPLE -3	7.42	8.54
SAMPLE -4	7.42	8.97
SAMPLE -5	7.42	8.02
SAMPLE -6	7.42	8.72

Turbidity (NTU) within 71NTU)

SAMPLE	BEFORE	AFTER
SAMPLE -1	24.6	3.6
SAMPLE -2	24.6	61
SAMPLE -3	24.6	16.7
SAMPLE -4	24.6	65
SAMPLE -5	24.6	14.1
SAMPLE -6	24.6	39

Chloride Content (Mg/Liter) (Within 2000mg/Liter)

SAMPLE	BEFORE	AFTER
SAMPLE -1	26.65	10.95
SAMPLE -2	26.65	20.96
SAMPLE -3	26.65	45.92
SAMPLE -4	26.65	28.95
SAMPLE -5	26.65	23.95
SAMPLE -6	26.65	26.95

Alkalinity (mg/liter) (less than 250mg/liter)

SAMPLE	BEFORE	AFTER
SAMPLE -1	11.6	46
SAMPLE -2	11.6	30
SAMPLE -3	11.6	44
SAMPLE -4	11.6	24
SAMPLE -5	11.6	52
SAMPLE -6	11.6	12

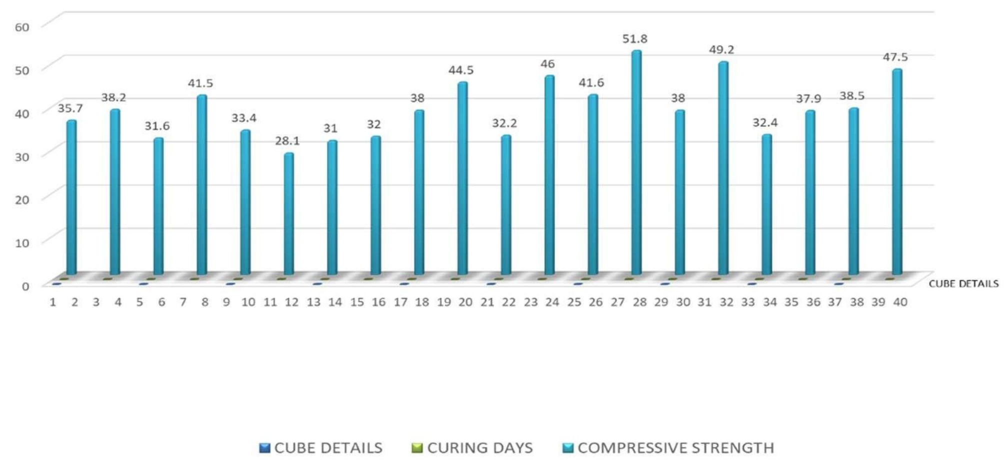
The study discovered that using greywater (kitchen waste) as a partial replacement for freshwater in concrete manufacturing had little effect on the characteristics of the concrete. Compressive strength was marginally lower, but the difference was not statistically significant. The pH, turbidity, conductivity, and alkalinity of the greywater had no effect on the quality of the concrete. Greywater can be a sustainable alternative if its quality and environmental impact are properly considered.

Compression Test on cubes:

A compression test is a standard method used to evaluate the compressive strength of concrete. The test involves casting 15cm x 15cm x 15cm cubes of M25 grade concrete and curing them for a specified period. After the curing period, the cubes are placed in a compression testing machine, and a compressive load is applied until the cubes fail. The load at which the cubes fail is recorded as the compressive strength of the concrete.

CUBE DETAILS	CURING DAYS	COMPRESSIVE STRENGTH
Normal cubes	7 days	20.2 N/ ^{2}
	28 days	25.7 N/ ^{2}
10% of grey water used cube	7 days	35.7 N/ ^{2}
	28 days	38.2 N/ ^{2}
20% of grey water used cube	7 days	31.6 N/ ^{2}
	28 days	41.5 N/ ^{2}
30% of grey water used cube	7 days	33.4 N/ ^{2}
	28 days	28.1 N/ ^{2}
40% of grey water used cube	7 days	31.0 N/ ^{2}
	28 days	32.0 N/ ^{2}
50% of grey water used cube	7 days	38.0 N/ ^{2}
	28 days	44.5 N/ ^{2}
60% of grey water used cube	7 days	32.2 N/ ^{2}
	28 days	46.4 N/ ^{2}
70% of grey water used cube	7 days	41.6 N/ ^{2}
	28 days	51.8 N/ ^{2}
80% of grey water used cube	7 days	38.0 N/ ^{2}
	28 days	49.2 N/ ^{2}
90% of grey water used cube	7 days	32.4 N/ ^{2}
	28 days	37.9 N/ ^{2}
100% of grey water used cube	7 days	38.5 N/ ^{2}
	28 days	47.5 N/ ^{2}

COMPRESSIVE STRENGTH BAR CHART



In conclusion, the utilization of grey water in concrete mixing and curing processes presents a promising opportunity for sustainable water management in the construction industry. The study demonstrated that properly treated grey water can be effectively used in concrete, with minor adjustments to the mix design and curing time. The analysis of the grey water's properties revealed acceptable levels of contaminants for concrete use, and its incorporation did not significantly impact the concrete's compressive strength. In fact, certain mixes even exhibited improved strength.

We tested concrete cubes with greywater (kitchen waste) ratios ranging from 10% to 100%, and the cube with a 70% greywater (kitchen waste) content that had been cured for 28 days and had 51.8 N/mm^2 of strength was the best performer, 70% greywater (kitchen waste) cube is the best cube.

However, it is crucial to emphasize the importance of adequate treatment and monitoring of grey water to avoid compromising concrete quality. Further research is necessary to determine optimal mix designs, curing durations, and the long-term durability of structures made with grey water concrete. This ongoing investigation can contribute to more sustainable water management practices and cost savings in the construction industry.

SCOPE OF FUTURE WORK

There are various areas of research and development that can further study and improve the use of treated greywater (kitchen waste) in concrete manufacturing in the future. To begin, research into the long-term durability and performance of concrete built using treated greywater would be beneficial. This includes evaluating characteristics such as chemical deterioration resistance, freeze-thaw cycles, and the potential for reinforcement corrosion over time.

Exploring the correct proportion of greywater substitution in concrete mixtures can also provide insights into striking the necessary balance between water saving and concrete strength and durability. This may entail conducting extensive tests with varied percentages of greywater replacement and evaluating the influence on the mechanical and durability attributes of the concrete.

The importance of treated greywater (kitchen waste) in concrete manufacturing may expand beyond water conservation in the future. It can help contribute to making the construction sector more sustainable by reducing freshwater consumption, reducing wastewater output, and supporting circular economy ideas. Continued study, technological developments, and public knowledge of the potential benefits and problems of greywater utilization will be critical in maximizing its long-term use in concrete production.

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