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To Study the Effect of Untreated Algae, Kitchen and Garage Wastewater on Strength Characteristics of Concrete as Curing Water's

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Abstract- **In construction industry, the cement concrete is most important and widely used material .The concrete is the conventional mixture of cement, sand, coarse aggregates and water in a mix proportion. The strength of concrete is more in the hardened state. Concrete is preferred more in the construction industry due to its versatility and mouldability properties and also easy in manufacturing process. For manufacture and curing of concrete, water is the most essential constituent. The main sources of water are river, lake, pond and well water etc. Due to rapid growth of industrialization and construction activity water is depleting day by day. Hence, we must take one step forward towards conservation or reuse of water in the construction industry. By reusing or recycling the water or waste water in construction industry we can minimize water scarcity problem and wastewater disposal problem. The major sources of waste water is from domestic, industrial and commercial area .In the construction industry water is required in a huge amount as a curing waters for cement concrete structures. so an attempt has been made to study the effect of untreated algae, kitchen and garage wastewater on the strength characteristics of cement concrete as curing water's. For the present study the dissertation work is carried out on M20 grade of concrete, the curing of these specimens was carried out by using Algae, Kitchen And Garage Wastewater for a period of 28 and 60 days. An attempt is made to study the strength characteristics of M20 grade of concrete. This study will motivate and help for utilization of Kitchen wastewater and Algae wastewater in the construction industry as a curing water's effectively. Hence we can reduce the water scarcity problems and also reduce the usage of Potable water in the construction industry.**

Key Words: *Algae wastewater, Kitchen wastewater, Garage wastewater, Potable water concrete.*

1. INTRODUCTION

1.1 General

The widely used material in the construction industry is concrete. The usage of concrete has been widely used in the construction industry for construction of bridges, canals, dams, roads, embankments and other major structures. Due to increase in the construction of the infrastructure the development of the cities taking place with high rate due to which the use of concrete also increasing in the construction industry.

It is estimated that the present consumption of concrete in world is 10 billion tons which is next to consumption of water resources due to its versatility nature concrete can be moulded in any shape or size and due to its economy in making, the consumption of concrete also increases on the earth. When compared to the usage of iron, steel, plastic, wood etc its usage is twice then the other materials.

2. LITERATURE REVIEW

G.Murali, *et al.,* (2012), in their paper entitled "*Influence of various industrial effluents on concrete structure* ". Due to increase in the population with urbanization results in the scarcity of water. Due to industrialization the waste water is generated in a large manner for utilization of this waste water appropriate measures are taken place. An attempt

has been done in utilization of this industrial waste in construction industry. The Concrete blocks of M25 grade has been moulded and used for strength analysis, so indicating that these effluents can be used in the curing sector of construction industry. E1 and E2 have been made beneficially but it can be used in a lesser manner depending upon the availability.

Pavita.G,(2002), in her paper entitled "*Effect of copper slag waste water on the mechanical properties of concrete*". They studied the effect of copper slag waste water, when it used for curing of concrete by 40% replacement with waste water. They reported that there is a increase in the compressive and flexural strength but there is decrease in the tensile strength and also the setting time was beyond the limit. The workability and durability of the concrete yield the better result.

Tay,*et al.,* (1987), in their paper entitled *" Use of Waste Water in Concrete Mix".* They made an attempt to use waste water in concrete mix instead of portable water and they mixed the waste water in various proportions such as 0%, 25%, 50% and 100% to cast the cubes of mix proportion 1:2:4 and after this they studied on long and short term effect of concrete. But after 28 days they got an compressive strength of 1.5% increase then by using with portable water.

Giaou Leong, *et al.,* (2008), in their paper entitled *"Use of RMC waste water as curing water's".* In their research, they used a waste water product from the RMC plant for the purpose of curing of concrete for the period of 14 and 28 days after this curing period they did the investigation on the strength of concrete and they got an desirable values on the compressive, split tensile and flexural strength of concrete compared to the curing with portable water for the same period.

Suresh G Patil, *et al.,* (2001), in their paper entitled *" Use of Domestic waste water as curing waters".* In their study they used a Domestic waste water as curing water's for M20 grade concrete for a period of 7, 14 and 28 days. After curing for 14 and 28 days, they got a marginal increase in the Compressive strength, Split tensile strength and Flexural strength. But for 7 days of curing period they got an 1.12% decrease in the Compressive strength, 5.32% decrease in Split tensile strength and 6.52% decrease in Flexural strength.

3. MATERIALS AND METHODOLOGY

3.1 Materials Used For Preparation Of Concrete:

a) Cement

In this project work, ordinary portland cement of 53 grade ultratech cement confirming to IS 12269-1987 has been used. The physical properties of cement has been obtained by conducting the test and their result have been given below in table 3.1

Table 3.1 Physical properties of Cement

Sl.No.	Material Properties	Cement	
		Obtained Values	Requirement As per IS 12269
1.	Initial setting time	65.00min	Not less than 30min
2.	Final setting time	284.00min	Not more than 600min
3.	Specific gravity	3.12	

b) Fine Aggregate

i. Natural Sand:

The sand used in my project is locally available from the market which is obtained from Bhima river. The physical properties of sand obtained by conducting specific gravity and sieve analysis test are given in table 3.2

Table 3.2 Physical properties of Fine Aggregates

Specific Gravity	2.55
Water Absorption	0.5%
Fineness Modulus	2.72
Zone	III

c) Coarse Aggregate

The stone of 20mm down size is used in the project work. The coarse aggregate is brought from the crushers located near Shahabad road, Gulbarga. The physical properties of the coarse aggregate are given in table 3.3

Table 3.3 Physical properties of Coarse Aggregates

Specific Gravity	2.75
Water Absorption	1.0%
Fineness Modulus	5.65

d) Water

Portable water is used for mixing purpose in the preparation of concrete as per the specification of IS: 456-2000.

e) Waste Water

In my project work, for curing purpose the waste water has been utilized. The three types of waste water has been used, they are:

a) Algae waste water

In my project work, the Algae wastewater was brought from the water body of VTU Regional College, Kusnoor road, which was used for curing of concrete specimens.

b) Kitchen waste water

Kitchen wastewater was collected from the hotels and was used for curing of concrete specimens.

c) Garage waste water

Garage wastewater was collected from the water servicing centers and was used for the curing of concrete specimens.

Mix design of M20 grade concrete

MIX PROPORTIONS

Cement = 425.74 kg/m^3
Fine Aggregate = 634.03 kg/m^3
Coarse Aggregate = 1164.24 kg/m^3
Water = 191.58 liters
Water/Cement ratio = 0.45
∴ MIX PROPORTION = 1 : 1.489 : 2.734

4. RESULTS AND DISCUSSIONS

4.1 Slump and Compaction Factor Results

Table 4.1 Slump and Compaction Factor Results of M20 grade

Sl.No	Slump (mm)	Compaction Factor
1)	75	0.895

Table 4.8 Compressive Strength test results for M20 grade concrete

Sl.No	Designation	Compressive Strength N/mm^2	
		28days	60days
1.	Normal Concrete	26.79	31.60
2.	Algae Waste Water	26.99	33.47
4.	Kitchen Waste Water	27.83	37.49
3.	Garage Waste Water	23.53	26.54

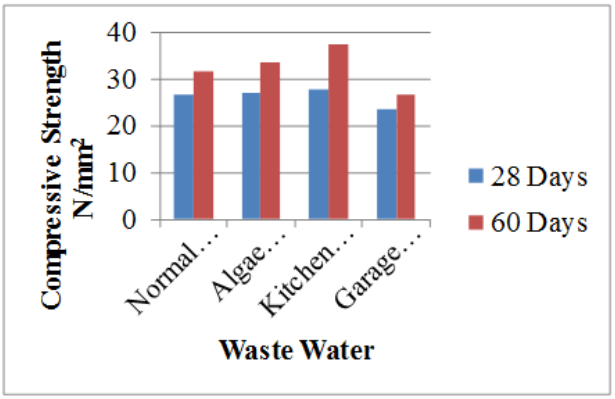

Fig 4.1 variation in compressive strength of M20 grade concrete.

Table 4.13 Split Tensile Strength test results of M20 grade concrete

Sl.No	Designation	Split Tensile Strength N/mm^2	
		28 Days	60 Days
1.	Normal Concrete	2.70	3.53
2.	Algae Waste Water	2.59	3.13
3.	Kitchen Waste Water	3.43	4.37
4.	Garage Waste Water	2.37	3.33

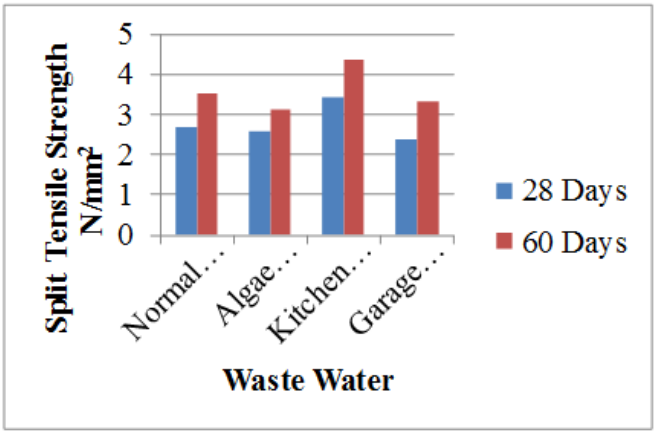

Figure 4.2 Variation in Split Tensile Strength of M20 grade concrete

Table 4.18 Flexural Strength test results of M20 grade concrete

Sl.No	Designation	Flexural Strength N/mm²	
		28 Days	60 Days
1.	Normal Concrete	3.47	3.456
2.	Algae Waste Water	3.99	4.48
3.	Kitchen Waste Water	3.59	4.23
4.	Garage Waste Water	3.08	3.39

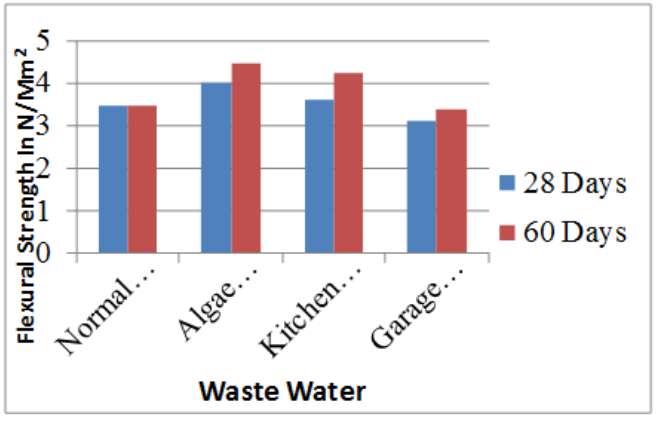

Figure 4.3 Variation in Flexural Strength of M20 grade concrete

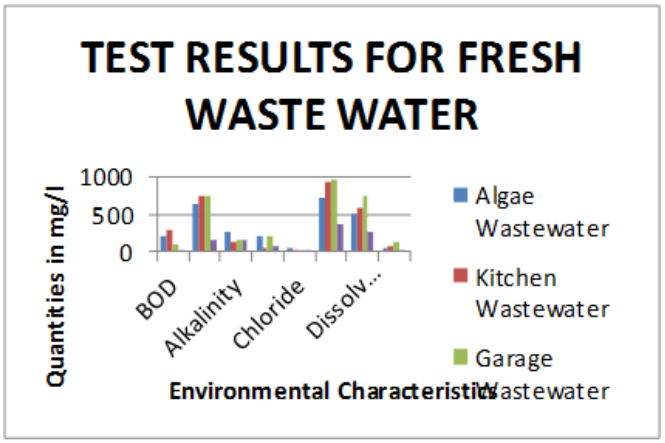

Figure 4.13 Graph Showing Environmental Characteristics For Fresh Wastewater

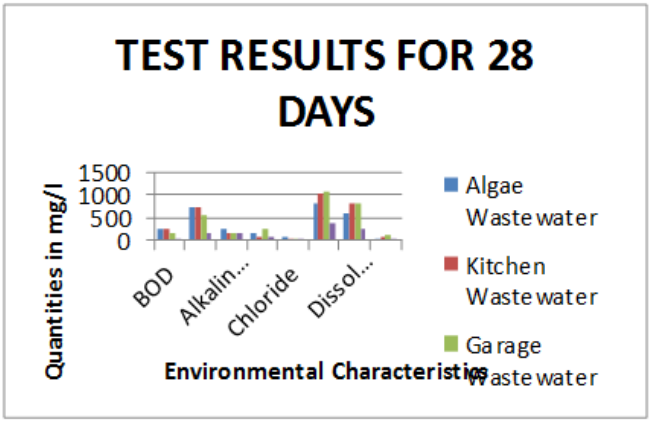

Figure 4.14 Graph Showing Environmental Characteristics of Wastewater for 28 days of curing period

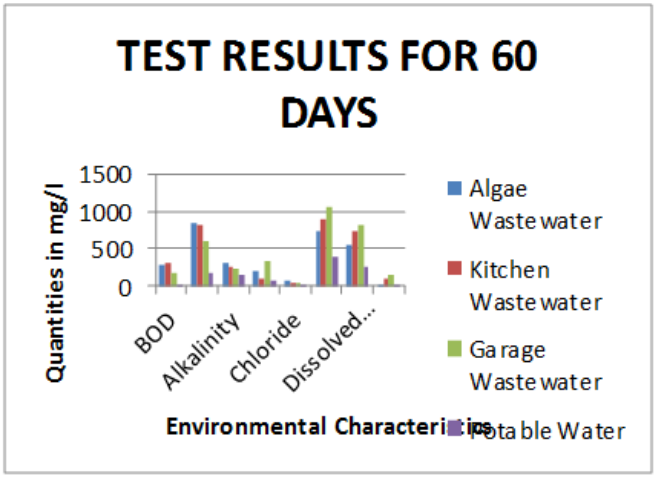

Figure 4.15 Graph Showing Environmental Characteristics of Wastewater for 60 days of curing period

3. CONCLUSIONS

From the above experimental work it is concluded that:

1. From the above test results, kitchen wastewater used for curing of concrete structures shown considerable increase in a compressive strength compared to algae, garage and potable curing water's for a period of 28 and 60 days.
2. From the above test results, kitchen wastewater used for curing of concrete structures shown considerable increase in a split tensile strength compared to algae, garage and potable curing water's for a period of 28 and 60 days.
3. Algae wastewater used for curing concrete structures has shown considerable increase in a flexural strength compared to kitchen, garage and potable curing water's for a period of 28 and 60 days.
4. The above analysis shows that, there is an decrease in compressive strength, split tensile strength and flexural strength by using Garage wastewater as a curing waters for a period of 28 and 60 days compared to the potable water, Kitchen wastewater and Algae wastewater.
5. With the above study, the mean target strength of M20 grade cement concrete is achieved by curing with Algae, Kitchen wastewater and Potable water for 28 and 60 days of curing period.
6. From the present study we can conclude that the curing with wastewater can be done in the construction industry with more efficiency, and also it can be used when there is a scarcity of potable water.
7. From the above test results, kitchen wastewater and algae wastewater can effectively used for curing concrete structures instead of potable water.
8. As a marginal increase in a mechanical strength parameters of a concrete was observed, hence kitchen and algae wastewater can be used for curing where they are sufficiently available.
9. From the above study we conclude that, the Garage wastewater is not preferable for curing of concrete, because of the presence of higher oil contents in the Garage waste water, it is deteriorating the concrete strength.
10. We can conclude that, there is increase in BOD and COD values for fresh kitchen wastewater. Alkalinity and chloride are the only parameters which are highest for fresh algae wastewater and other parameters such as acidity, total solids, dissolved solids and oil & grease test are highest for fresh garage wastewater.
11. We can conclude that, the total solids, dissolved solids, acidity and oil and grease test are highest for garage wastewater for a curing period of 28 days and BOD, COD, alkalinity and chloride are highest for algae wastewater for a curing period of 28 days.

We can conclude that, oil and grease, dissolved solids, total solids and acidity are highest for garage wastewater for 60 days of curing period and BOD value is highest for Kitchen wastewater and alkalinity, COD and chloride are highest for Algae wastewater for 60 days of curing period.

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