

Utilization of Waste Water in Concrete

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ABSTRACT

The concrete is the most important material in construction industry. Concrete is mixture of cement, fine and coarse aggregate with water. At the present situation water scarcity is fast becoming a major issue in the world wide environment. Concrete is the second large water consuming industries in the world

So, this project is focused to preventing the environment degradation and thereby reducing the water shortage. It is focused on the concrete is prepared by using waste water instead of using portable water. Water sample were collected from the sources of waste water treatment plant from (Chennai)

All the samples of water are analysed for p^H , total dissolved solids, chloride, hardness, and its alkalinity. This project is going to the present the reuse of treated waste water and portable water in concrete. the mixing proportion is M50 grade of concrete for both waste water and portable water concrete mix. In the waste water concrete setting time were found to increase and workability of slump and flow table test result were equal as compared to portable water concrete. To conduct test on the material properties of cement , fine aggregate, coarse aggregate. At the age of concrete 7th day, 14th day and 28th day were conduct the durability test on concrete are compression test, tensile test, acid resistant test, sulphate attack test In the case of possibilities of steel corrosion is prevented by using epoxy coated with reinforcement and increase the cover thickness .finally it is found to be suitable for mixing in

concrete has no any adverse effects it is suitable for construction industry

KEY WORDS: Treated water, portable water, durability strength, acid resistant test

I. INTRODUCTION

In a present day ground water scarcity is the major problem. Lot of money required and spent more investment on research for it. Water is mainly used for agriculture, drinking, washing, transportation, chemical uses heat exchange, fire exchange, recreation, industrial food processing and medical uses etc.

Day by day clean and safe drinking availability become very less because due to the water scarcity issue So, the reuse of this waste water in the industrial activities like construction purpose and other many more industries.

Concrete is the second large water consuming industries in the country. Demand of fresh water by the construction section sector are expected to overcome it approximately 150 litres required for per cubic meter of concrete mix in concrete water is required for both preparing and curing process.

The efficient water is one of the most important requirement and the uses of this type of water used for the mixing did not affect the concrete slump and density. Because of scarcity of portable water it is very important to use this treated waste water in concrete in our industry.

To overcome this problem, I choose the sustainable approach side that means in this paper we used treated waste water in concrete instead using ordinary portable. Using of waste water in

the construction sector without affecting the surrounding our environment. By the utilization of this waste water in the construction section can be reduced the water scarcity

The source of waste treated water available from the water treatment plant (Chennai). This waste water can be used for construction purpose after suitable treatment. Which gives the best result, the waste water is also used for concrete it is suitable concrete industries. The result also more or less equal when compared portable water

ADVANTAGES OF WASTE WATER IN CONCRETE

- 1) When concrete is mixed with waste water instead of using portable water is to increase the setting time of concrete.
- 2) The density of the concrete is increased in waste water concrete.
- 3) Workability of the waste water concrete are almost same as the ordinary portable water mix in concrete.
- 4) Compression strength of concrete very slightly increased or same with age of concrete.
- 5) It reduces the water scarcity issues, Easily available, It is economical.

DISADVANTAGES OF WASTE WATER CONCRETE

Possibilities of steel corrosion is increased in case using primary treated waste water and secondary treated waste water

- 1) Treatment process is needed near the construction zone
- 2) To prevent the corrosion , corrosion coating is required

II. LITERATURE REVIEW

1) Cebeci. O Z, Saatci. A M (September 1989) (8)

“domestic sewage as mixing water in concrete” these authors reviews the characteristic of domestic sewage and used in this study as mixing water .setting time, air content, specific gravity, and strength tests were performed on cement paste, mortar and concrete specimens made with distilled water showed that untreated domestic sewage increase the initial setting time, entrains air and reduce the strength of mortar and concrete. average biologically treated domestic wastewater is indistinguishable from distilled water when used as mixing water

2) Ooi et.al (2001) (25)

The studied of this paper said that the treated effluent from sewage treatment plant in

Malaysia is currently being waste through direct discharge into water ways. They conduct two tests were carried out in the concrete they are compressive strength test and setting time to determine the feasibility of using against the treated effluent for concrete mixing. The test of this result were compared with control specimen who prepared with portable water

3) Buquan Miao (may 2002) (7)

“effect of wash water and underground water on properties of concrete” this study deals with the effects of different types of mixing water on properties of mortar and concrete such as compressive strength, setting times and workability. he wash water from ready mix concrete plant. The concrete mixed with bottom wash water gave a shorter setting time and a lower flowability since bottom wash water contains some residual cement. neither top and middle wash water nor underground water significantly affected slump of fresh mortar and he concluded with the compressive strength of concrete mixed with wash water and underground water is as good as that with tap water

4) Ibrahim-Al-Ghusan and Mohammed J Terro (30 January 2003) (12)

The title is “Uses of waste water for concrete mixing in Kuwait” studied paper clearly explain about the slump and density of concrete that means workability of concrete do not affect the concrete is mixed with the different types of waste water he conducted the experimental test with compressive strength test on the waste water on concrete and spilt tensile test on waste water concrete and finally he concluded the result of both test, that there is no greater difference between these two parameters of waters

5) B Mohammed, A AWaziri and B A Umdagas (1 january 2005) (21)

“concrete mixing and curing :The influence of waste water on the characteristic strength of concrete” this study was an attempt to study the possibility of recycle waste water for concrete production/ curing as well as determining the influence of waste water on the compressive strength of concrete. waste water samples from four different sources. The cubes were subjected to crushing and the loads obtained were used in calculating their compressing strength shows closeness for portable water

6) K. Nirmalkumar and v. sivakumar (January 2008) (24)

“A study on the durability impact of concrete by using recycled waste water” these authors take the research about the waste water from tannery industry can be used for the construction purpose and the basic properties of treated and untreated water from the tannery industry were tested and then mechanical properties of the concrete were to be conducted and he concluded some deviation compared to specimens casted using potable water and so chemicals in form of inhibitors were used and the results were found to be satisfactory.

III. MATERIAL USED.

1) Cement

Cement is the binding material used in concrete. In our project I use ordinary Portland cement of grade 53.

2) Coarse Aggregate

The size of coarse aggregate (20mm) was free from clayey matter, silt and organic matter.

3) Fine aggregate

Fine aggregate are locally available river sand. This should be clean and dry river sand. And passing through IS 4.75mm sieve will be used for casting all the specimens.

4) Treated water

Treated water means the waste water which have proper treatment process that tends to remove the all unwanted physical, chemical and biological micro organisms is called as treated water.

TABLE : WATER QUALITY PARAMETERS

Parameters	Portable water (mg/l)	treated waste water (mg/l)
PH	6.6	7.49
Chloride content	250	59.98
Alkalinity	280	480
Sulphate content	200	70
Calcium content	200	1.72
Total hardness	300	100



Fig; Treated water.

TABLE : TEST RESULT ON MATERIALS PROPERTIES

s.no	Test description	Values
1	Specific gravity of cement	3.15
2	Specific gravity of fine aggregate	2.73
3	Specific gravity of coarse aggregate	2.62
4	Water absorption of fine aggregate	0.4
5	Water absorption of coarse aggregate	0.3
6	Moisture content of fine aggregate	1.7
7	Moisture content of coarse aggregate	1.76
8	Grading zone of coarse aggregate	Zone II
9	Grading zone of fine aggregate	Zone I
10	Water cement ratio	0.35
11	Fineness modulus of fine aggregate	5.5
12	Fineness modulus of coarse aggregate	4.593
13	Bulk density of coarse aggregate	1.548
14	Bulk density of fine aggregate	1.873
15	Flakiness index of coarse aggregate	11.35%

MIX PROPORTION OF CONCRETE

Mix design	Portable water	Treated water
W/c ratio	0.35	0.35
Cement content in (kg)	422	422
Fine aggregate in (kg)	621	621
Coarse aggregate in (kg)	706	706
Water content in (kg))	147.6	147.6

MIX RATIO OF CONCRETE

Design mix	Cement	Fine aggregate	Coarse aggregate
M50	1	1.472	3.043



Fig : This figure shows dry mix on concrete.

IV. RESULT AND ANALYSIS

1. WORKABILITY TEST ON SLUMP

Types of water	Slump value
Portable water	120 mm
Treated water	118. mm

2. WORKABILITY TEST ON COMPACTION FACTOR TEST.

Types of water	Portable water	Treated waste water
Compaction factor value	0.99	0.98

3. COMPRESSIVE STRENGTH

Compressive strength of cubes with different types of waste water in 7, 14 and 28 days are tabulated.

TABLE : COMPRESSIVE STRENGTH ON CONCRETE

Types of water	7 days (N/mm ²)	14 days (N/mm ²)	28 days (N/mm ²)
Portable water	52.07	58.5	62.52
Treated water	49	56.9	66

FIG; THIS BAR CHART SHOWS DIFFERENCE IN COMPERSSION STRENGTH IN (N/mm²)

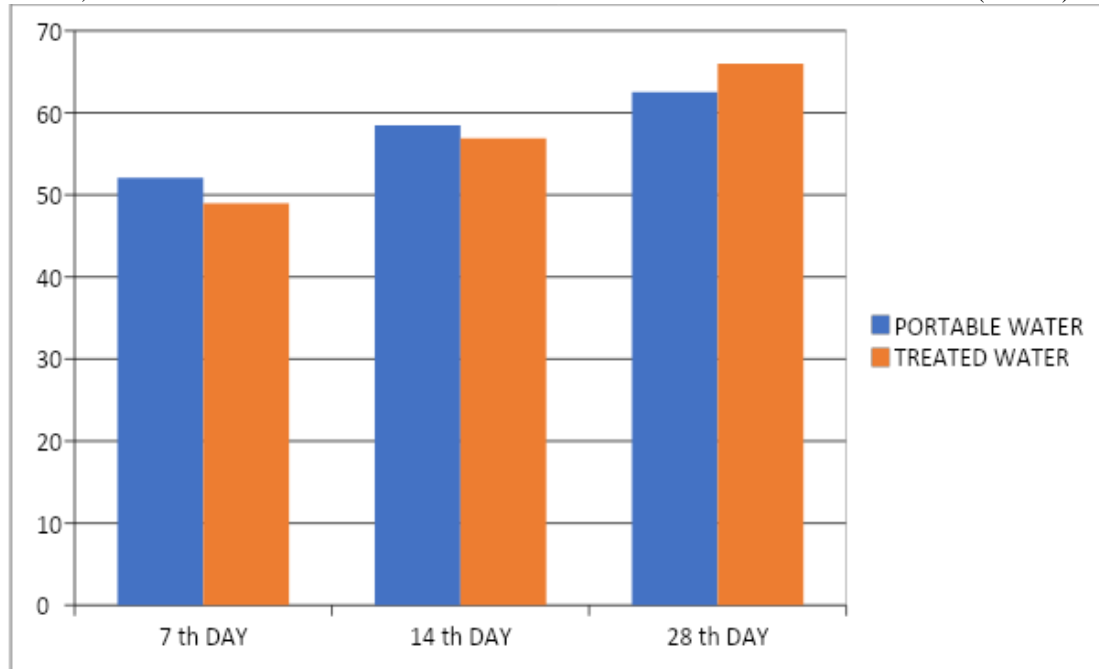




Fig : compression test

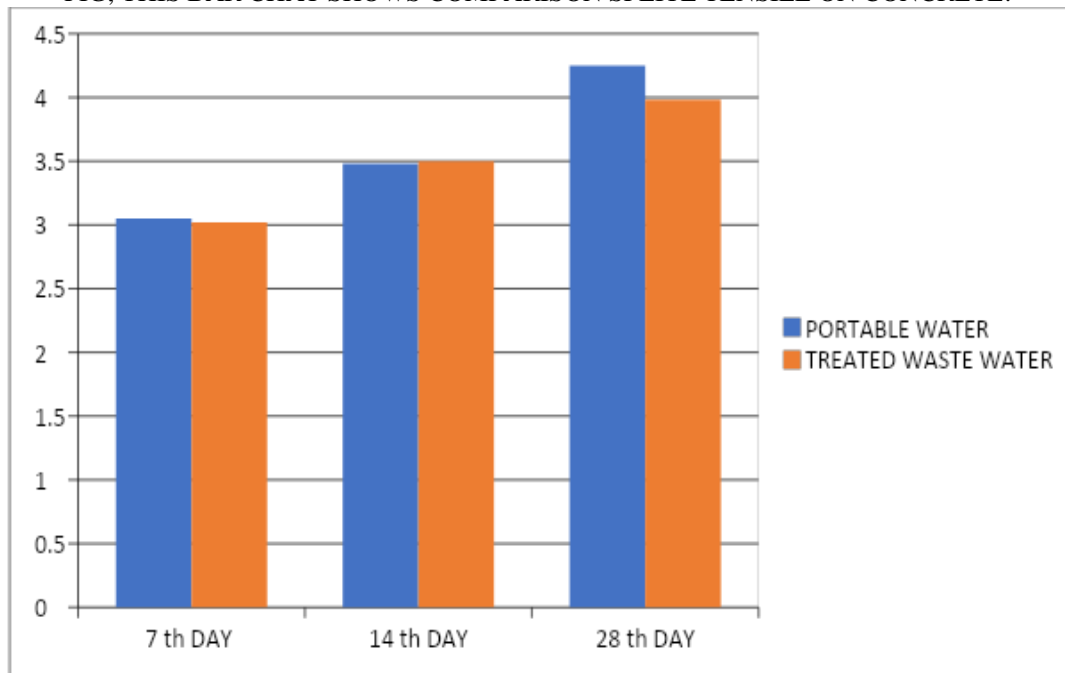
4. SPILT TENSILE TEST ON CONCRETE

The comparison on spilt tensile test of cylinder is casted with portable and treated waste Water.

TABLE : COMPARISON OF SPILT TENSILE STRENGTH

DAYS	PORTABLE WATER	TREATED WASTE WATER
7	3.05	3.02
14	3.48	3.5
28	4.25	3.98

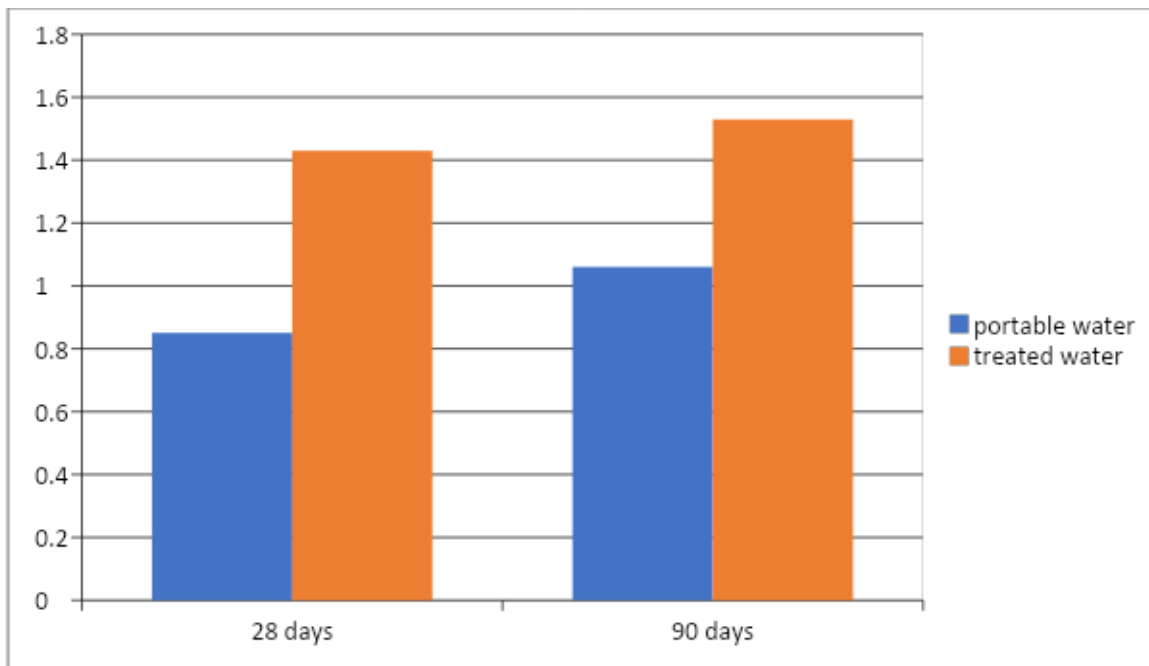
FIG; THIS BAR CHAT SHOWS COMPARISON SPLITE TENSILE ON CONCRETE.



SULPHATE ATTACK TEST

TABLE: Increase in weight due to sulphate for treated and portable water in %

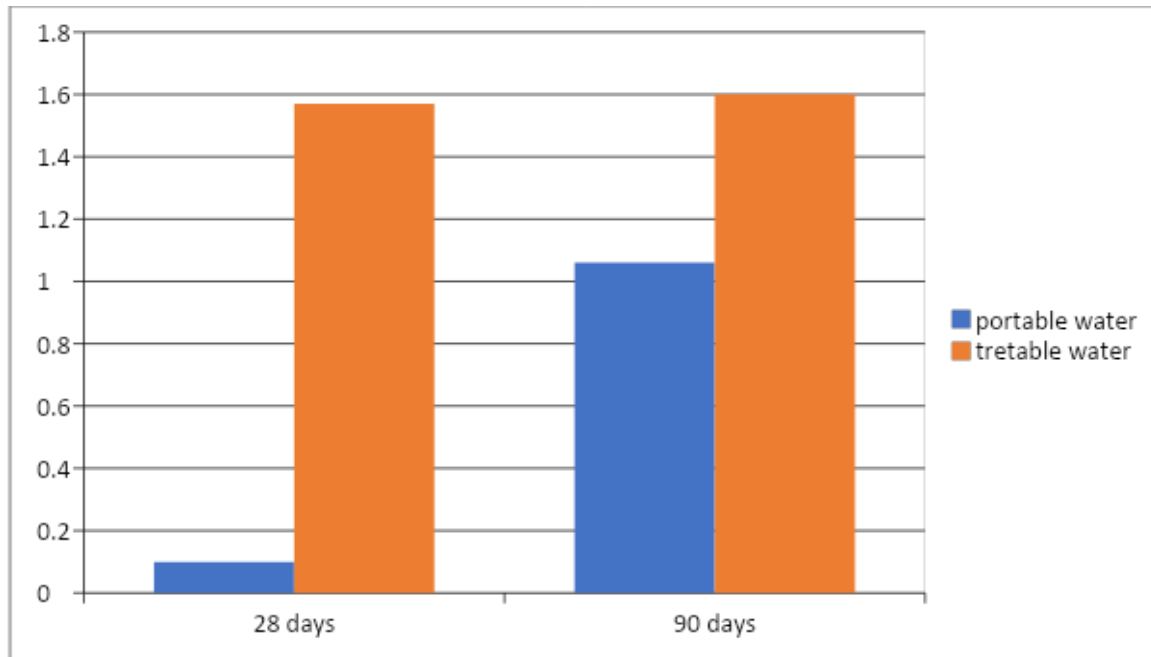
S.NO	PORTABLE WATER	TREATED WATER
28 DAYS	0.85	1.43
90 DAYS	1.06	1.53



CHORIDE ATTACK TEST.

TABLE; Increase in weight due to choride attack for portable and treated water in %

S.NO	POETABLE WATER	TREATED WATER
28 DAYS	0.10	1.57
90 DAYS	1.06	1.67



V. CONCLUSION

The investigation has evaluated the uses of treated waste water in concrete sector. This study has shown that the quality of waste water is suitable for concrete production as per IS code. Workability of concrete is good. The compressive strength of the treated waste water is increased at 28 days when compared with control concrete. The split tensile result shows slightly low or equal to portable water concrete. Durability test is conducted on concrete by using portable and treated waste water. The durability test of acid resistance conducted and its result shows treated waste water concrete value is lower than the normal concrete and its compressive strength also shows low. Sulphate attack test result of treated waste water concrete is lower than the normal concrete. The cost of concrete is reduced because of the use of treated sewage water. This type of concrete is environmental friendly.

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