Proceedings of Conference on Advances on Trends in Engineering Projects (NCTEP-2019)
In Association with Novateur Publications IJIERT-ISSN No: 2394-3696
ISBN. No. 978-93-87901-03-2
February, 15th and 16th, 2019

PAPER ID: CE 118

ANALYZING THE EFFECT OF USING TREATED WASTE WATER ON STRUCTURAL CONCRETE

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ABSTRACT— This paper focuses on the study of usage of treated waste water in the preparation of concrete so that the shortage and cost using potable water can be mainly reduced to certain extent. In this research paper, effects of treated waste water are studied which are developed on concrete properties as well as strength and durability of the concrete. We studied various reference papers on different source of wastewater are used in concrete to check various effects on structural concrete properties. We also studied the various properties of concrete and cement which reacts with water and get more or less compressive strength, flexural strength, and also tensile strength. The study of mechanical properties of concrete cube specimens using M20 grade concrete with potable water and treated waste water is carried out.

Keywords: Treated waste water, Potable water, Compressive strength, Water absorption.

I. INTRODUCTION

In India the construction industry is rapidly developing because of continues increase in population. In Construction industry there is no substitute for concrete [4]. It seems to be very important part of structure. Concrete needs potable water for mixing and curing but now a day's specially in summer season the scarcity of water is a major global problem, so alternative to it use of treated waste water can be considered for curing and mixing of concrete. Now days we are losing million liters of waste water and there is no provision to use this water except for farming purposes. After testing waste water in a lab, if it is give similar result to that of potable water then we can implement the use of this waste water for construction purpose. In waste water there exist more proportion of bacteria and there is possibility of killing this bacteria in heat of hydration process, so we can easily use concrete for construction purpose. The benefit is to save millions liters of waste water which we dispose in the river. Treated waste water have analyzed physical and chemical properties in laboratories i.e. pH, alkalinity, hardness, chlorine. Portland cement concrete is the most widely used for manufacturing purpose. Judging from the modern trends, the future of concrete looks brighter because for most purposes it offers suitable engineering properties at low cost combined with energy savings and ecological benefits.

The most widely used construction material is concrete, commonly made by mixing Portland cement with sand, crushed rock (aggregates) and water. Normal concrete consists about 70% aggregate, 20% cement and 10% mixing water by mass approximately [8]. Concrete industry is engrossing near about annually 1 billion tons of mixing water in the world. Moreover large quantity of potable water is used for curing of concrete. Nowadays ground water is depleting in a fast manner and lot of money is required and spent for search of water in the vicinity of water source so the used water can be recycled and used for industrial activities like construction purposes, if the water is found to be suitable. The partially treated water consists of lot of total dissolved solids which affect water so much. The waste water even if stored unused it will create major pollution problem to the environment.

The concrete industry has serious impact on the environment with reference to consumption of water. Thus there is a need to study alternative to potable water for mixing and curing of the concrete. Almost 80% of the water used for domestic purpose comes out as waste water. Impurities in water used for mixing concrete not only effects on strength but also effects on setting time, certain optional limits may be set on chlorides, sulfates, alkalis, solids in mixing water or certain laboratory tests can be performed to find out the effects that impurity can

have on various properties. So an attempt is made to utilize the polluted water for construction purposes by making primary treatments. In addition to this, ground water as well as cultivable lands are also polluted. If the water is utilized for some other domestic purposes it leads to a lot of human illness in their study have given the impact of this problem in detail. To minimize these problems the waste water can be used for construction work without affecting the surrounding environment. By implementation of this water, water scarcity can be reduced.

II. LITERATURE REVIEW

Ramkar A.P. The effect of different source of treated waste water on properties of concrete i.e. compressive strength, tensile strength and flexural strength of concrete has checked. The treated waste water has been collected from waste water treatment plant situated at shirdi. They have used PTWW (primary treatment waste water) and STWW (secondary treatment waste water) process and also they have checked the chemical properties of collected treated waste water in laboratories. After determining the properties of collected sample from treatment plant they have cast the cubes using M30. [1]

K. Nirmalkumar carried out study on Tannery industry waste water used for construction purpose. The main aim of the study to save the potable water and also to solve the problem of disposal of waste water. They come to know that when untreated waste water has been used for casting purpose, then weight of concrete cube has been increased due to maximum sulphate attack. Considering this to reduce the sulphate attack they have used concare admixture. Whether chlorine attack remains same in both conditions. [2]

K.S. Al-Jabri carried out study on treated waste water for concrete mix then they have checked which effects are developed on properties of high strength concrete. The sample was collected from three car washing stations in Muscat area. They have cast different types of samples for testing purpose i.e. first six cubes are cast in size 150 x150 x 150, second three cylinders are cast in size 300 x 150 diameter and last three prisms are cast in 100 x 100 x 500 dimension. They have determined the compressive strength, tensile strength and flexural strength at 28 day of curing. And also compressive strength of cubes checked for 7 day curing. They have conclude that when curing period increases the compressive strength of concrete is also increases using waste water there is no significant difference. It may be also concluded that from this study that the use of waste water produced from car washing stations has negligible effect on the strength of concrete. [3]

Asif Rashid sheikh Main aim of this study is to determine the quality of water which was used for mixing purpose for concrete. They have the waste water collect from waste water treatment plant at Kuwait. They have used M20 grade of concrete. They have concluded that comparison between potable water concrete and treated waste water concrete are giving nearly similar results. [4]

P. Rama Mohan Rao carried out the study on treated waste water for preparing concrete mix are suitable or not suitable and also studied which exactly effect are developed on concrete by using treated waste water. They have also checked what exactly happen when waste water used in reinforcement concrete. They have concluded that treated waste water is suitable for construction activity without compromising strength of concrete. [5]

H. Vijay mainly focused on the reuse of treated waste water effluent in place of potable water in plain concrete. They have also studied the effect of physic-chemical characteristics of this non fresh water on concrete. They were used water sample from four source which are treated domestic sewage water, service station water (garage), Dairy waste water and potable water. After sample collecting they were analyzed all sample for pH, total dissolved solids, chloride, hardness, alkalinity, and sulfates. This study concluded that use of treated effluents auto service station (garage) water and dairy wastewater has no noticeable side effect on the strength of concrete. [6]

Himashu Sharma carried out study on effect of alkaline substance present in mixing and curing water on the compressive strength of concrete is assessed under the laboratory conditions. They have used two type of grade for mixing purpose i.e. M25 and M30. The concrete mix prepared with additional two concentrations of NaOH i.e. 40ml/l and 80ml/l in mixing and curing of water. Compressive strength of concrete was checked for 14, 28 and 90 days. They conclude that compressive strength of concrete decrease with 40ml/l concentration of NaOH as compared to cube cast with normal water when tested for 14, 28 and 90 days. The compressive strength of concrete increase with 80 ml/l concentration of NaOH as compared to cubes cast with normal water when cubes tested at 14 and 28 days but it is decreases the compressive strength of concrete again when cube tested at 90 days. So they conclude that some amount of the effected of NaOH on compressive strength of concrete. [7]

Shrilatha carried out study on the primary treated waste water used for concrete mix which was analyzed for chemical properties in laboratories. The waste water sample collected from MYLSANDRA waste water treatment plant. The grade of concrete which they have used is M20. The potable water was replaced with the primary treated waste water in different dilution ratios of 20%, 40% and 100%. They also conclude that the results obtained from treated effluent, compressive strength of concrete is increased by 10.68% till 28 days as compared to potable water. [8]

S.P.Kale This study has evaluated the use of treated waste water for concrete mixing is seen to favorable for strength development. It also seen that reduction in long term strength of concrete including it may possible to use treated waste water in mixing and curing of concrete. However there is Risk of corrosion of steel reinforcement in concrete. [9]

K.J.Kucche studies carried out are based on impurities present in water reacts differently with different constituent of cement. These mostly affect the setting time, compressive strength and cause straining of concrete surface. They also conclude that it difficult to draw a

common conclusion for use of water. It seen that there is a long term reduction in strength of concrete. [10]

III. IMPURITIES

Wastewater is any water that has been affected by human use or by product of domestic, commercial, agriculture and industrial activities, storm water, surface Runoff and any sewer inflow.

Table No. 1: Effect of Impurities on Concrete

Impurities in Waste water	Effect on Concrete
1.Dissolved solids	Reduces compressive strength by 10 to 30%
2.Zinc chlorides	Retards setting time of concrete
3.Excessive chlorides	Cause dampness, surface efflorescence and increase corrosion
4.Algae	Reduces bond between aggregate and comet paste and lowers strength of concrete
5.Sugar	Retards the setting time of cement
6.Vegetable oil	Detrimental effect on strength of concrete, at later ages
7.Acids and alkaline water	Increases corrosion
8.Organic impurities	Affects setting time and hardening may cause deterioration

Wastewater can contain physical, chemical and biological impurities. Types of wastewater are domestic wastewater from households, municipal wastewater from communities or industrial wastewater from industry. Households may produce wastewater from flush toilets, sinks, dishwashers, washing machines and showers. Industrial waste water may produce Industrial site drainage like silt, sand, alkali, oil and chemical residues.

It may also produce extreme pH waste from acid and alkali manufacturing industry and some other biological pollutants like bacteria, viruses, protozoa and parasites. Wastewater is a turbid appearing liquid containing solid material in suspension. When it is gray in color, can said as a fresh and has a musty, unpleasant odour. Presence of impurities in wastewater for concrete mix tends to decrease in structural properties of concrete i.e. strength and durability to a large extent. Concrete is affected by the effluents that are coming out from the sewerage works, sugar and the fertilizer industry, gas works, paint and textile industries. The high content of chlorides present in water tends to show surface efflorescence, dampness and makes the reinforcement steel prone to corrosion.

IV.CONCLUSION

Our study has evaluated that the treated waste water is beneficial for construction activity without any compromising in strength of concrete. We also come to know that the treated waste water is suitable for mixing and curing purpose of concrete. It has been seen that the scarcity of water is increasing. Providing potable water for construction purpose is not preferable, so usage of treated waste water can be beneficial. The use of treated waste water for concrete mixing is seen to favorable for strength development. Sometimes it is seen that in long term the strength of concrete gets reduces. But with the help of proper mixing and compaction it is possible to overcome this defect and it will be possible to use treated waste water for mixing and curing.

ACKNOWLEDGEMENT

It is our greatest pleasure to take this opportunity to extent sincere thanks and best compliments to our Principal, Dr. S. B. Ingole, Dr. D. Y. Patil College of Engineering And Innovation, Varale, Talegaon, Pune.

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