International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 03, March-2019

A STUDY ON COMPATIBILITY OF CONCRETE WITH USAGE OF TREATED DOMESTIC WASTE WATER IN CONCRETING.

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Abstract-
The water that is nonheritable from the biodegradable pollution treatment plant is termed as treated domestic sewer water. Where, because the water that traditionally used for drinking and different construction purpose is noted as normal or potable water. Rather than of potable water that is employed for concrete, we have a tendency to replacement the treated domestic sewer water. Superplasticizer is additional as a chemical admixture to that. The addition of superplasticizer to concrete imparts high strength and workability to that, even at terribly smaller water-cement ratios. The explanation behind the employment of superplasticizer was to attenuate the amount of treated domestic sewer water so as to attenuate the adverse effects if any. However to urge the most have the benefit of this integration of concrete and superplasticizer, the incompatibility issues between these 2 ought to be studied. With in the gift work, the aim is to seek out the optimum dose for various superplasticizers, for a specific grade of cement, victimisation Marsh Cone check and comparison of compressive strength between the cubes solid with each traditional and treated domestic sewer water. Conjointly completely different attenuate w/c ratios are taken to indicate the compressive strengths with the addition of superplasticizer in concrete.

KEYWORDS: Compatibility, Marsh cone, Treated domestic sewer water, Superplasticizers.

I. INTRODUCTION

The term compatibility refers to the required impact on performance once a particular combination of cement and therefore the chemical admixture is employed. The advanced interaction between cement and chemical admixtures in concrete mixtures typically ends up in the unpredictable performance of concrete within the field that is usually outlined as concrete incompatibilities. Common issues throughout concreting together with flash setting, delayed setting, rapid slump loss, improper strength gain, excessive cracking, bleeding etc. arise thanks to incompatibility between cement and chemical admixtures. These problems, in turn, have an effect on the hardened properties of concrete primarily strength and durability. Modern concrete i.e. ready-mix concrete, high strength concrete, high performance, self-compacting concrete etc. nearly always possess some additives, within the mineral kind or chemical kind.

Underneath bound circumstances, compatibility between admixtures and cement could also be of great concern. Predicting the compatibility of admixtures together with cement is associate in nursing virtually not possible exploit to perform by chemical analysis alone. Admixtures and cement are each complexes in their nature. Portland cement and chemical admixtures are multi-component materials, that bear advanced chemical reactions throughout the association of hydraulic cement paste.

In a trial created made to solid concrete with treated domestic sewer water with one among the popularly used super-plasticizer as a chemical admixture, excessive bleeding was determined. The explanation behind the employment of superplasticizer was to attenuate the adverse impact if any. Therein case, a matter was raised regarding the compatibility of the superplasticizer with treated domestic sewer water in concrete. So as to research the compatibility issue, a study was conducted for cement and superplasticizer at completely different proportion of superplasticizer dose so as to seek out the optimum dose of superplasticizer.

Within the gift state of affairs there's a inadequacy of potable drinkable water in several areas of the country. Therefore the method of utilization encompasses a heap of importance. Getting decent drinkable water with acceptable quality underneath circumstances of lack, like drought, may be a huge challenge in drought-prone areas of the country. During a scenario like this utilization of the potable water for the development, the aim are an enormous burden for them and usage the treated domestic sewer water will be an effective alternative.

The inadequacy of water is turning into a essential environmental issue worldwide. Within the previous few decades, there has been an incredible increase within the quantity of each domestic sewer water and industrial sewer water generated thanks to the rising of population and accelerated pace industrialisation. Within the coming back years, Asian nation is goes to face an enormous drawback during an agitate reduced freshwater availableness and reduced sewer water thanks to raised population and industrialisation. There's associate in nursing increasing trend of considering water recycle as a necessary element of water deficient areas, however within the water luxuriant areas still. As long because

the treated domestic waste is underneath permissible limits as prescribed by the Is code, it may be used as a replacement for potable water within the concrete production.

II. OBJECTIVES OF STUDY

The objectives of the this experiment study are,

1. The main objective is to compare the compressive strength results of concrete which are cast by using normal water as well as treated domestic sewer water.
2. The compatibility is a parameter in case of superplasticizer is used as a chemical admixture in concrete, it is achieved by use of an optimum dose of superplasticizer.
3. The optimum dose of superplasticizer is determined by the use of Marsh cone apparatus.

III. MATERIALS AND METHODOLOGY

A. ORDINARY PORTLAND CEMENT

Most commonly used cement is OPC and it is having grades of 33, 43, 53, grades. The grades indicate the compression strength of concrete that will attain after 28days of setting. Here we used OPC 53grade KCP cement. Which is conforming to IS 12269:1987.

Physical Properties of Cement

Property	Result
Specific gravity	3.12
Fineness	3%
Normal consistency	35%
Initial and final setting time	55 and 425 minutes

B. Coarse aggregate:

Coarse aggregate is which is retained in IS sieve 4.75mm. It may be crushed gravel or stone, uncrushed gravel or stone or partially crushed gravel or stone. The minimum particle size of coarse aggregate is 4.75mm and the maximum particle size is 75mm if the size is more than 75mm then the aggregate is called cyclopean aggregate. In this, we choose aggregate passed from IS sieve 20mm & is an an angular shape.

Physical Properties of Coarse Aggregates

Property	**Result**
Specific gravity	2.76
Fineness modulus	2.28
Bulk density (loose)	1449 kg/m^3
Bulk density(compacted)	1716kg/m^3

C. Fine aggregate

Fine aggregate is the aggregate which is passed from IS sieve 4.75mm. It may be natural sand, crushed stone sand or crushed gravel sand. The minimum particle size of fine aggregate is 0.075mm and the maximum partial size is 4.75mm. The material having particle size varying from 0.002 to 0.06mm is termed as silt and still smaller particles are called clay. In this study, we choose the aggregate which is passed from IS sieve 2mm & is in a rounded shape.

Physical Properties of Fine Aggregate

Property	**Result**
Specific gravity	2.65
Fineness modulus	3.02

D. Normal water

Water is one of the essential ingredients of concrete, which when mixing it with cement forms a paste which binds the aggregate. Water available in the college conforming to the requirements of water for concreting and curing as per Is 456:2000.

E. Treated domestic wastewater

Treated domestic wastewater is collected from the Sewage treatment plant of 40MLD at Vambay colony, Vijayawada. The results are confirming to the water requirements of water for concreting as per IS 456:2000.

Properties of treated domestic wastewater

S.no	Tests	Results
1	pH	6.87
2	Alkalinity (mg/liter)	85
3	Total Hardness (mg/liter)	395
4	Permanent hardness (mg/liter)	58.33

F. Chemical Admixtures

We choose Polycarboxylate ether (PCE) based superplasticizer because the effectiveness of superplasticizer depends on various factors such as chemical nature and molecular size of the polymer, particle size and composition of the binder. PCE's are generally more effective than other generation of superplasticizer due to a large number of long side chains with high molecular weight. PCE based superplasticizer is acquired by B&B specialties India Private Limited. Mahanadu, Vijayawada.

Properties of Admixture

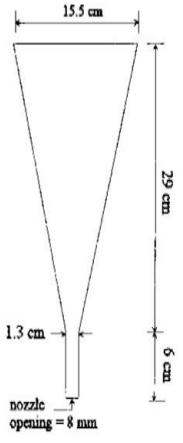
s.no	Particulars	Description
1	Type of superplasticizer	Polycarboxylic ether (PCE)
2	Specific gravity	1.05
3	pH	6.0
4	Chloride content	Nill
5	Standards	IS 9103
6	Dosage suggested by the manufacturer	0.5 to 3L per 100kg of cement

G. METHODOLOGY

Determined the optimum dosage of the superplasticizers by using Marsh cone apparatus. Casted cubes with normal water & treated domestic wastewater without superplasticizer, and with the optimum dose of superplasticizer & W/C ratio of 0.35 and 0.30**.** Conducted compressive strength test on concrete cubes using CTM & comparing results.

H. MARSH CONE

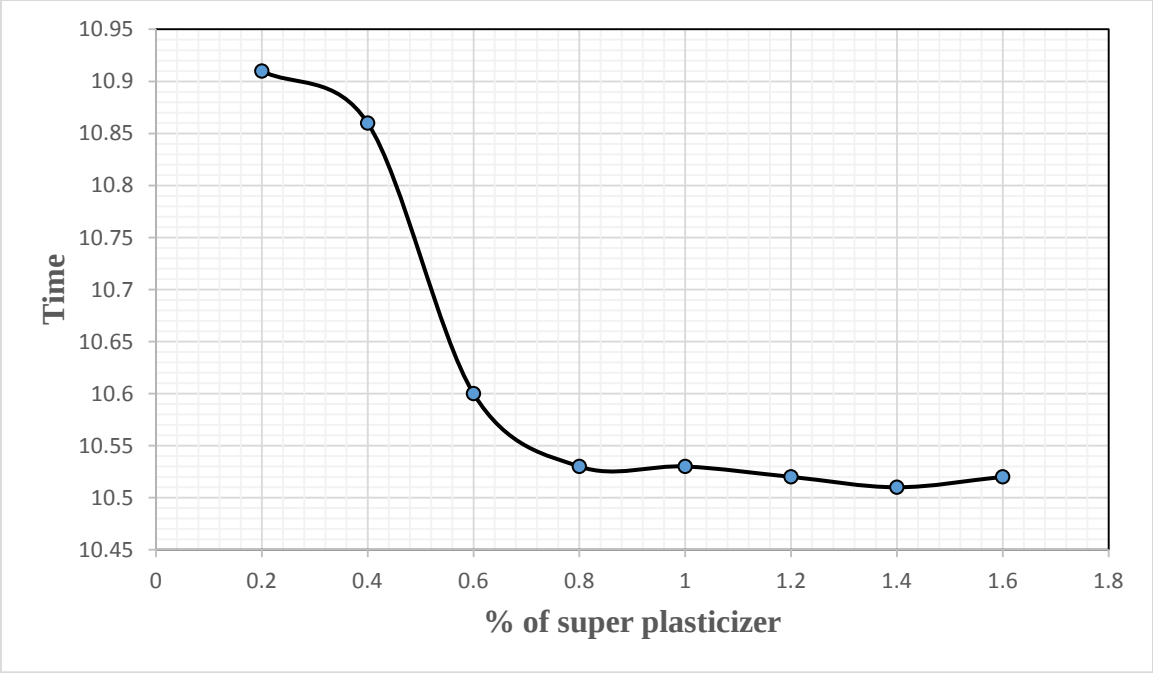
Marsh cone test is a reliable and simple method to study the rheological properties of cement and mortars. Flow time of cement is an indicator of viscosity which depends upon cement & superplasticizer compatibility. It is widely used to study cement superplasticizer compatibility and to determine the optimum dose for specific cement and superplasticizer.



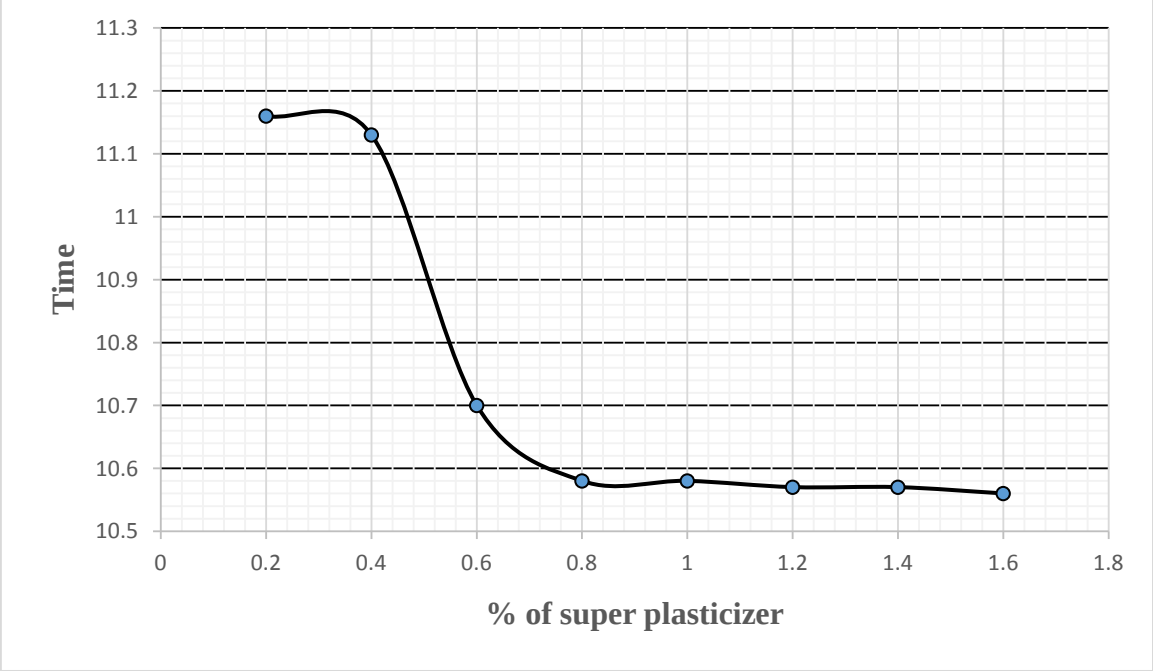
IV. LABORATORY INVESTIGATION

A. MARSH CONE

Graph on Optimum dose of superplasticizer using normal water

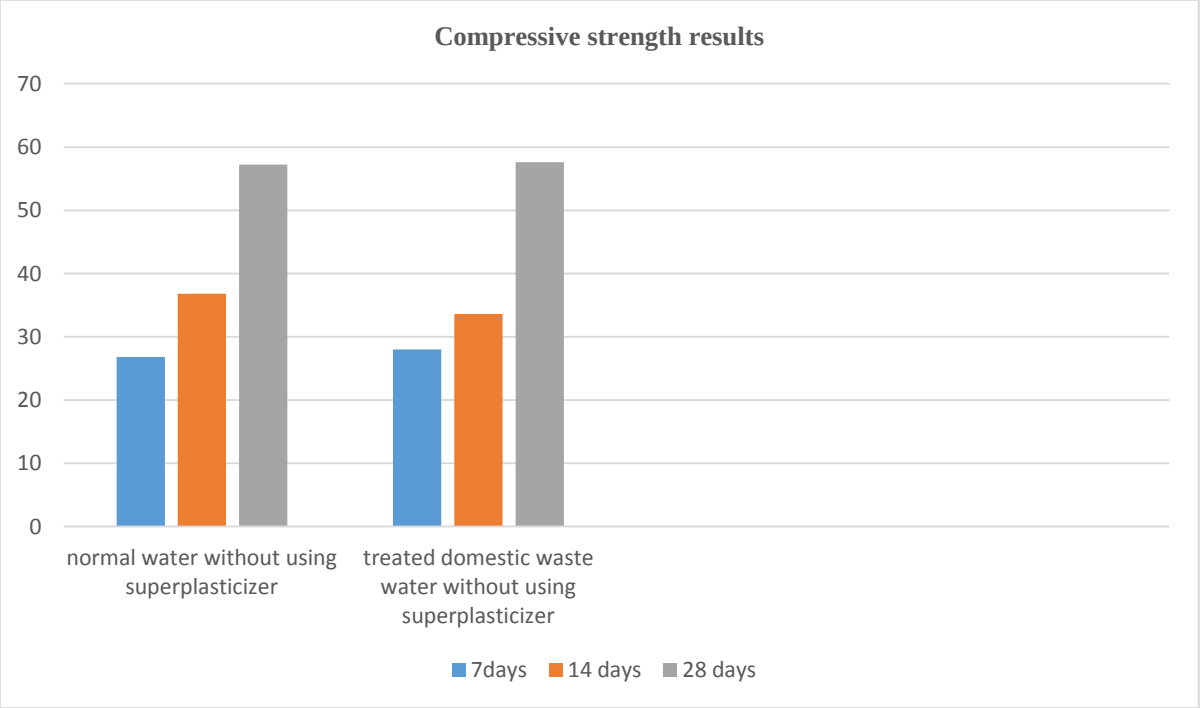


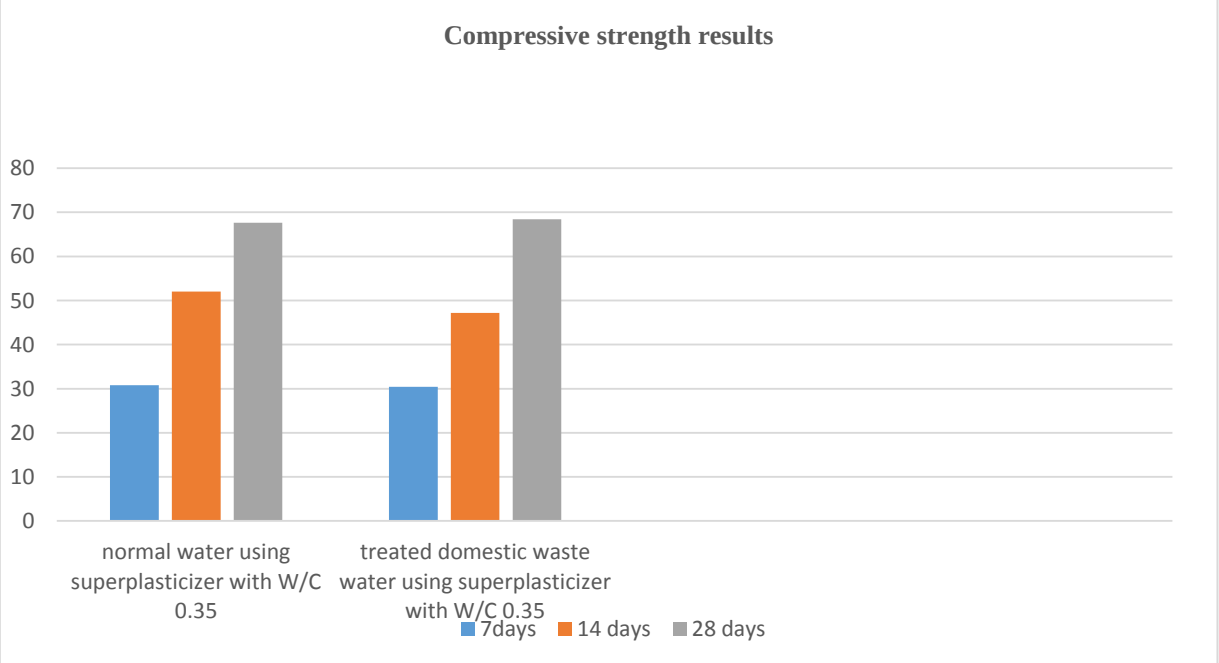
Graph on Optimum dose of superplasticizer using treated domestic waste water

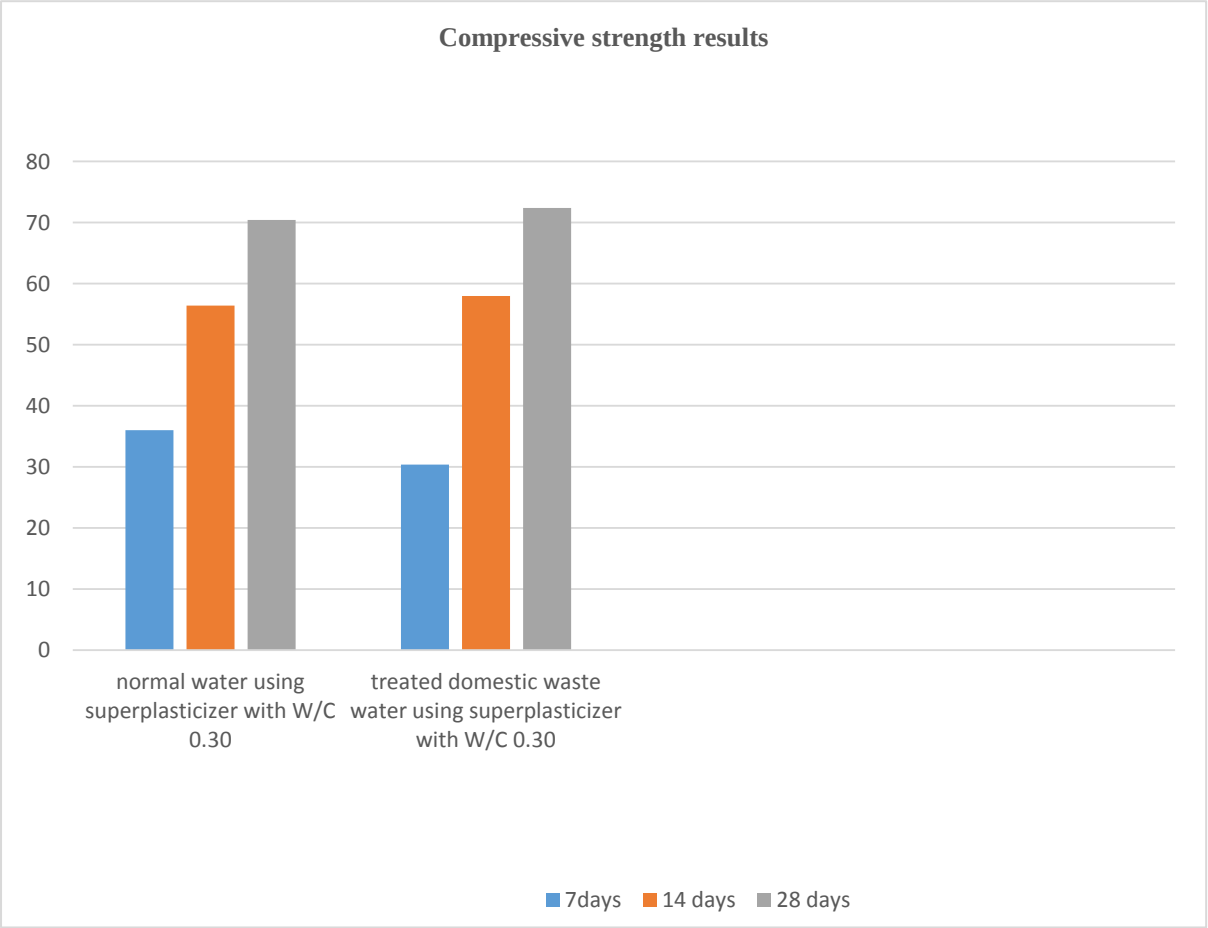


From the above graphs the optimum dose of superplasticizer for the particular cement and superplasticizer is 0.8% for both normal water and treated domestic waste water.

B. **COMPRESSIVE STRENGTH RESULTS**


Compressive strength results
70
60
50
40
30
20
10
0
normal water without using superplasticizer
treated domestic waste water without using superplasticizer
7days
14 days
28 days


Compressive strength results
80
70
60
50
40
30
20
10
0
normal water using superplasticizer with W/C 0.35
treated domestic waste water using superplasticizer with W/C 0.35
7days
14 days
28 days



CONCLUSION

From the Marsh cone and compressive strength results the conclusions are as follows:

1. From the Marsh cone the optimum dose for both the treated domestic sewer water and the conventional water is 0.8%.
2. From the first set of samples of cubes i.e., casted without superplasticizers, the compressive results of cubes which are casted with conventional water having less results compared with treated domestic sewer water.
3. From the second set of samples of cubes i.e., casted with superplasticizer optimum dose and w/c ratio of 0.35, the compressive strength results of cubes for treated domestic sewer water having higher results than cubes casted by conventional water.
4. The third set of cubes casted with w/c ratio of 0.30 with superplasticizer optimum dose also suggested the same results as above.
5. From all the compressive strength results we observed that the treated domestic waste water can be used as a best alternative for the conventional water without any compatibility issues.

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