Research Paper Engineering

Feasibility of Treated Domestic Waste Water for Cement Mortar

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ABSTRACT

The aim of the present study is to evaluate feasibility of treated domestic wastewater (TDWW) as mixing water in cement mortar. The experimental studies demonstrated that treated domestic wastewater may be used as mixing water, even though, organic solids are more than the permissible limits as laid down in IS code 456-2000.

Introduction

Due to rapid industrialization the peoples are migrating to cities, huge volume of wastewater is generating which resulting contaminating and polluting the fresh water resources. Hence, reuse of treated wastewater is greatly utilized where ever possible. However, few researchers were carried out laboratory studies on feasibility of wastewater in concrete and mortar (Cebeci and Saatci 1989, Neville, 2000, Ibrahim and Mohammad 2003, Ramana Reddy 2006). The most of the codes from Indian, American, and European, were given broad guide lines on quality of mixing water in concrete. For example, organic solids limit was given as 200mg/L in IS: 456-2000, but we know that organic solids are further divided into biodegradable and non biodegradable solids. IS 456-2000 was not specified limits of biodegradable and non biodegradable solids in 200 mg/L of organic solids. Sulfates limit were given 500mg/L in I S: 456-2000, literature was revealed that among sulfates, magnesium sulfate is most vulnerable to concrete, but limit of particular sulfate in concrete was not given in sulfates limit of 400mg/L. Though, it is difficult to develop specific guide lines for mixing water. When unknown quality of water is used in concrete or mortar, specific guide lines have to be framed for mixing water of concrete or mortar.

Research Significance

Portable water has been diminishing across the world, especially in developing countries. Greater volume of wastewater is to be utilized, and then only, sustainable development is possible. Even though, Vijayawada was placed on bank of the Krishna River, in and around Vijayawada, people have been suffering with scarcity of potable water, especially in summer season. Huge volume of treated and partially treated domestic wastewater is generating from Vijayawada city. Hence, treated domestic wastewater was tried as mixing water in cement mortar.

Materials and Methods

Materials

53-Grade Ordinary Portland Cement, Ennore sand, portable water (PW), treated domestic wastewater (TDWW) were used in present experimental study.

Methods

The characteristics of used Cement and sand were met as per IS: 12269 and IS: 650. Concentration of total solids, total organic solids and total inorganic solids were determined in portable water and treated domestic wastewater as for producer lay down in APHA-1994. Soundness, consistency, setting times and compressive strength of cement were determined as for producer lay down in IS: 4031 of Part-3, 4, 5 and 6 respectively. Concentration of total organic solids was 400 mg/L in PW and TDWW. Concentration of total inorganic solids in PW and TDWW were 0 and 200mg/L respectively.

Results and Discussion

From the table .1, It is observed that soundness and setting times of PW and TDWW are same. Decrease in compressive strength of TDWW is marginally less than the PW. Decrease in compressive strength of TDWW is 7.12, 2.14, and 2.94% for 3, 28 and 60 days respectively compared to that of PW. Though, the concentration of organic solids is same in PW and TDWW, but compressive strength of TDWW is exhibited less when compared with PW on 28 days. The possible reason is that, concentration of organic solids is same in PW and TDWW but concentration of biodegradable organic solids may be more in TDWW. However, a note in IS 465, BS 3148 and Specifications often used in United States specified that the 28 days compressive strength made with water of unknown quality should be at least 90 percent of that obtained on similar specimens made with potable water. The experimental study ascertains the specifications as mentioned in the codes.

Summary

Concentration of organic solids is 400 mg/L in PW and TDWW, which is more than the permissible limit (200 mg/L) as lay down in IS: 456-2000. Even though, concentration of organic solids is 200 mg/L more in PW and TDWW, compressive strength has attained more than the recommended in IS: 12269. So the authors felt that the usage of TDWW may be used as mixing water in cement mortar. However, to beef the statement some more investigations should be carried out on long term strength behavior and durability aspects.

Table.1: Soundness, Setting times and Compressive Strength

Description	Soundness (mm)	Setting Time (min)		Compressive strength (MPa)				% change in compressive strength			
		Initial setting time	Finial setting time	3 days	7 days	28 days	60 days	3 days	7 days	28 days	60 days

Potable Water(PW)	1.3	170	240	34.9	42.5	55.6	68.0	0	0	0	0
Treated Domestic wastewater (TDWW)	1.3	170	240	32.5	41.5	55.85	66	-7.12	-2.14	+0.44	-2.94

REFERENCES

References 1) Cebeci, O.Z. and Saatci, A.M. Domestic sewage as mixing water in concrete, ACI Material Journal , 1989, Vol, 86. No. 5, pp. 503 -506. 2) Neville A, Water and Concrete- A love – hate relationship, Point view, Concrete International, December 2000, Vol, 22 No. 12, pp 34-38. 3) Ibrahim Al-Ghusain and Mohammad J. Terro., Use of treated wastewater for concrete mixing in Kuwait, Kuwait J. Sci. Engg, 2003, Vol. 30, No.1, pp. 213–227. 4) Ramana Reddy, I.V, Prasad Reddy, N.R.S, Reddy Babu, G, Kotaiah, B and Chiranjeevi, P. Effect of biological contaminated water on cement mortar properties, ICJ, 2006, Vol. 80, No. 2, pp. 13-19.