South Asian Journal of Applied Sciences Vol.1 (2015) 13–16

FEASIBILITY STUDY ON PARTIAL REPLACEMENT CEMENT BY RMC SLUDGE IN CONCRETE

T.Bragadeeswaran[1], K.P. Saranya[1], G.K.Arunvivek[2]

[1]Department of civil engineering, Nandha College of Technology.

[2] Department of civil engineering, Sri Sakthi College of Engineering and Technology.

Bragadeescivil@gmail.com Saranyapalanisamykm@gmail.com Arun.vivekgk@gmail.com

ABSTRACT

In this study an attempt is made to reuse sludge water as well as dry sludge produced from RMC cleaning opearations, now a days RMC plays a vital role in construction industry. Along with the increasing demand for ready-mixed concrete in the construction industry, also came together is sludge water (sw), a wastewater discharged from concrete mixing plants and agitator trucks. In general the procedure for disposing sludge water in the ready-mixed concrete plants consists of two types of sedimentation ponds. The first pond receives excess concrete and wash water from agitator trucks. Subsequently the sludge water and smaller sediments such as sand and cement materials are transferred to the second pond.

The disposal causes environmental problems due to the waste materials and high alkalinity in sludge water. Instead of being disposed of sludge water it can be recycled and used as mixing water for concrete production if there are no significant effects on mechanical properties of concrete.

1. INTRODUCTION

GENERAL

Concrete is the widely used number one structural material in the world today. Normal concrete contains four components namely cement, coarse aggregate, fine aggregate and water. But now-a-days there has been a great demand for all these basic constituents. So due that there has been a great hike in the price of housing industry. So we are greatly in need of some alternative material to bring down this hike. At The same time such material should be eco-friendly and should not harm the environment at any cost.

Recently, the importance of countermeasures to deal with waste materials has been pointed out, because such materials continue to increases in each and every year.

The high cost of conventional building materials is a major factor affecting housing delivery in India. Ready mix concrete (RMC) plays a major role in construction industry and large amount of washout water & sludge produced in RMC operations.

The use of alternative cement has become necessity for the construction industry because of the economic, environmental and technological benefits derived from their use. These wastes can be used as potential material or replacement material in the construction industry. This will have the double advantage of reduction in the cost of construction material and also as a means of disposal Of wastes. It is at this time the above approach is logical, worthy and attributable.

2. MATERIALS

2.1 CEMENT

Ordinary Portland cement 53grade to be used . The specific gravity of the cement is 3.15. Which meets the requirements ofIS 12269-1987.The properties of cement is shown in table 1.

Sand and Silica	22.61%
Calcium oxide(C_aO)	63.32%
Magnesium oxide(M_gO)	1.59%
Iron oxide ($Fe_2O_{3)}$	3.27%
Aluminium oxide ($Al_2O_{3)}$	6.12%
Loss of ignition(LOI)	0.98%

Table 1 : Chemical properties of cement

2.2 SLUDGE AND WASHWATER

Sludge water is the waste wash water from concrete mixing plants and agitator truck. Readymix concrete plant operations are large consumers of water. Currently, all the batching plants are using a substantial amount of potable water to batch concrete and in the construction industry, huge amounts of wastewater are generated everyday.

Approximately 200litres of water are used to produce one cubic metre of concrete from a central batch unit. Each working day approximately 700-1300litres of wash water are required for a single concrete truck .The series connected sedimental basins procedure for sludge water disposal utilizes two

The properties of dry sludge and washwater is shown in table 2 & 3

Loss of Ignition(LOI)	24.98%
Silica di oxide	10.95%
Calcium oxide(C_aO)	37.93%
Magnesium oxide(M_gO)	6.52%
Iron oxide ($Fe_2O_{3)}$	2.13%
Aluminium oxide ($Al_2O_{3)}$	6.20%

Table 2 : Chemical properties of sludge

2.3 MIX DESIGN *(M_{30} concrete)*

Water	*Cement*	*Fine aggregate*	*Coarse aggregate*
191.58	*375.16 kg/m^3*	*654.59 kg/m^3*	*1168.87 kg/m^3*
0.51	*1*	*1.74*	*3.11*

The design mix ratio is adopted as 1: 1.74: 3.11

2. RESULTS &DISCUSSIONS

Figure 1 shows the 7days compressive strength of dry sludge added concrete

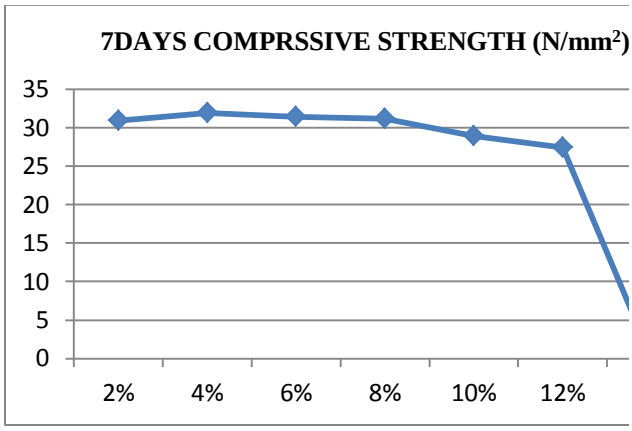


Figure 1: 7days compressive strength

Figure 2 shows the 28days compressive strength of dry sludge added concrete

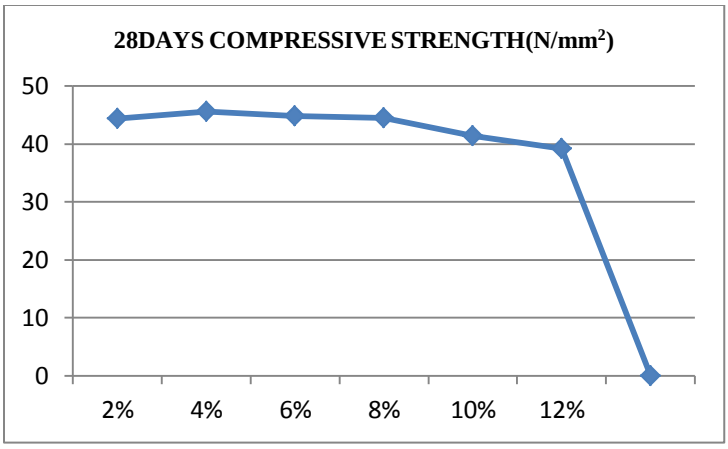


Figure 2: 28days compressive strength

Figure 3 shows the 7days flexural strength of dry sludge added concrete

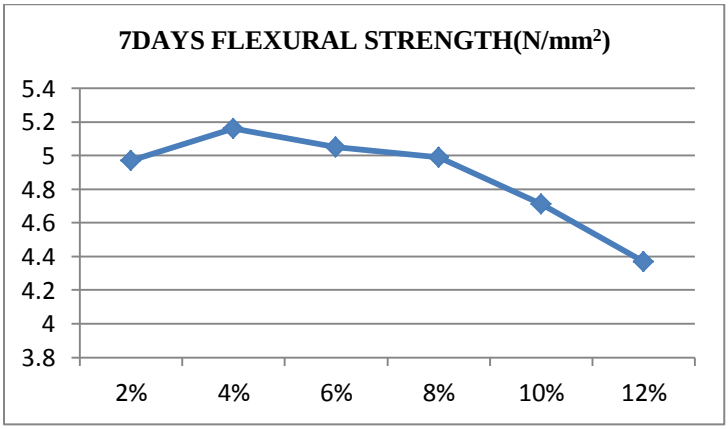
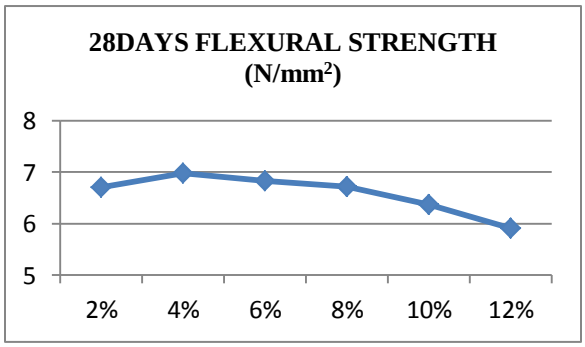


Figure 3: 7days flexural strength

Figure 4 shows the 28days flexural strength of dry sludge added concrete



3. CONCLUSION

Dry sludge powder obtained from RMC plant is added in various ratios for cement replacement and it was found that 8% replacement of cement by dry sludge powder can be added without any reduction in mechanical properties of concrete.

5.REFERENCES

1) Ahmad and Mahaalgam (2011) 'Utilization of cement incorporated with water treatment sludge' Jordan journal of civil engineering .vol 5, pp. 268-277.

2) Chatveera and Lertwattanaruk (2006), ' Effect of sludge water from ready-mixed concrete plant on properties and durability of concrete 'Cement & Concrete Composites, Elsevier publications.vol 28 .pp .441-450 .

3) Franco and Elisa (2000) 'Waste wash water recycling in ready mix concrete plants' Cement and concrete research, Elsevier science publications. vol 31, pp. 485-489.

4) Faseyemi Victor Ajileye (2012) 'Investigations on Microsilica as partial cement replacement in concrete 'Global journal of researches in engineering civil.vol 12, pp. 864-975.

5) Monika,christos (2013)'Reuse of by products from RMC plants for the production of cement mortars' Journal of sustainable development of energy,water and environments , vol 2 , pp. 152-162 .

6) Shetty (2005) 'Concrete technology Theory and Practice'.4th edition, S.Chand& company, New Delhi .

7) Shanmugapriya and Uma (2013) ' Experimental Investigation on Silica fume as partial Replacement of Cement in High performance concrete' The international journal of engineering and science(IJES).vol 5 , pp.40-45.