International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072

TEMPERATURE REDUCING CONCRETE USING CERAMIC WASTE

[1]G.Sugiladevi ,[2]M.Dinesh kumar,[3] T.Karthigeyan

[1] Assistant Professor, Nadar sarswathi college of engineering and technology,Theni, Tamilnadu,India.
[2] UG Student, Nadar sarswathi college of engineering and technology,Theni, Tamilnadu,India.
[3] UG Student, Nadar sarswathi college of engineering and technology,Theni, Tamilnadu,India.

---***---

Abstract - *This project about the suitable replacements of cement as to reduce problems of global warming and to create sustainable environment. In India, 285 distilleries use sugarcane Spent wash. The initial setting time of cement paste was longest at 0.6% sugar content. Spent wash as a partial replacement of Retarders. Cement manufacturing industry is one of the major source of CO2 emission resulting in global warning. In order to reduce these effects on environment, there is need for substitution of other waste material having same major constituents. In this paper cement has been replaced by ceramic waste powder in the range of 5%, 10% by weight for M-25 grade concrete and the compressive strength is calculated. While waste minimization refers to reducing the volume or toxicity of hazardous wastes by water recycling and reuse. The land application of distillery spent wash leads for water pollution control and utilization for agricultural production. Hence, controlled application of spent wash to the land as irrigation water helps in restoring and maintaining soil fertility, increasing soil microflora, improving physical and chemical properties of soil leading to better water retaining capacity of the soil.*

Key Words: **Ceramic powder, Spent wash, Replacement, Utilization, Waste management.**

1.INTRODUCTION

Every year heat of global which increase due to the heat emitting materials. Among that, cement concrete is a heat emitting material in the form of CO^2 in these conditions ordinary concrete may fail to prevent the heat emission. In such cases, admixture is used to modify the properties of ordinary concrete so as to make it more suitable for any situation. Ceramic tile powder is one such admixture. Ceramic waste from factories producing construction industry materials has been accumulating on frequently, creating increasingly large piles. In the present investigation, we made an attempt to use this distillery waste as water reducing admixture in concrete. We also use a spent wash as a Retarders. Spent wash is a waste obtained from sugar industries. Spent wash is anon used liquid waste. It is disposal in various waste resources and it pollute the environment. It is also a type of retarders. Retarders generally slow down the hardening of the cement paste by stopping the rapid set. Retarders can be useful when concreting in hot weather.

1.1 MATERIAL USED

A Ceramic waste

Marble is a metamorphic rock. It has more amount of lime stone hence it has a bonding properties same as a cement property. So we decided to partially replace ceramic powder as a Cement Marble is generally used to improve the aesthetic view of structures.

A. Ceramic powder

Marble is a metamorphic rock. It has more amount of lime stone hence it has a bonding properties same as a cement property, so we decided to partially replace ceramic powder as a cement. Marble is generally used to improve the aesthetic view of structures. Ceramic waste may come from two sources. The first source is the ceramics industry, and this waste is classified as non-hazardous industrial waste.

Fig -1: Marble dust

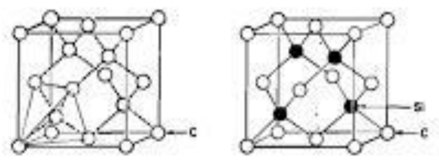

Fig -2: Structure of ceramic

Table -1: Chemical Properties of ceramics

S.no	Oxide compounds(mass)	Cement	Marble power
1	Sio2	21.12	28.35
2	Al2O3	5.62	0.42
3	Fe2O3	3.24	9.70
4	CaO	62.94	40.45
5	MgO	2.73	16.25
6	Density	3.10	2.80

B. Spent wash (Sugar waste water)

Spent wash is the non-used liquid waste obtained during sugar production and it is waste dumped in ground and mixed with water resources. Due to this environment is severely affected.

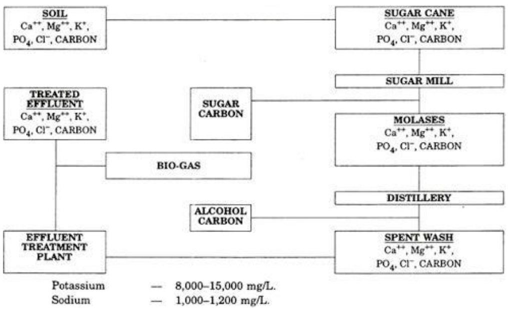

Fig -3*:* Structure of spent wash

Table -2: Properties of spent wash

S.No	Description	Value
1	Specific gravity	1.2
2	Odour	Aromatic
3	Colour	Deep reddish brown
4	pH	7.4
5	Organic carbon	3.7%
6	DO	Nil
7	BOD	51000mg/l
8	COD	82580 mg/l
9	Total solid	86804 mg/l
10	Total nitrogen	927 mg/l
11	Total phosphate	45.6 mg/l
12	Total potassium	61 mg/l

C. Cement

The cement used in this study was OPC 53 grade from Ramco Cement Company which is widely used in the construction industries. The chemical properties of cement are shown in Table. which is given by the supplier. The physical properties of cement were determined by testing the cement as per IS 12269:1987. Specific gravity of cement 3.12

D. Fine aggregate

Fine aggregate shall consist of natural sand or manufactured sand or a combination. Fine aggregates should be selected so as to reduce the water demand hence rounded particles are thus preferred to crush rock fines where possible. The finest fractions of fine aggregate are helpful to prevent segregation. The river sand conforming to zone II as per IS 383-1987 was used. It passes through 2.36mm IS sieve. Specific gravity if fine aggregate 2.63

E. Coarse aggregate

A maximum size of 20mm is usually selected as coarse aggregates used in concrete. Aggregates should be strong and free of internal flaws or fractures. Aggregates should be strong and free of internal flaws or fractures. Aggregates of high intrinsic strength are generally preferred. Granites, basalt, lime stones and sandstones are being successfully used in concrete. Specific gravity of coarse aggregate 2.73.

F. Water

Water is an important ingredient in cement paste, as it chemically participates in the reactions with cement to form the hydration product, C-S-H gel. The strength of cement mortar depends mainly from the binding action of the hydrated cement paste C-S-H gel. For high performance concrete it is important to have the compatibility between the given cement and the chemical and mineral admixtures along with water used for mixing.

2. MIX DESIGN

A Finial mix proportions M25

C	FA	CA	W
1	1	2	0.4
2kg	2kg	4kg	800ml

3.TEST RESULTS

A. Slump cone test

The slump test is perhaps the most widely used, primarily because of the simplicity of the apparatus required and the test procedure. The internal surface of the mould was thoroughly cleaned and free from superfluous moisture and any set concrete before commencing the test. The mould was placed on a metal pan which was smooth, horizontal, rigid and non-absorbent. The mould was carefully filled in four layers, each approximately one quarter of the height of the mould. Each layer was stamped with the tamping rod. The strokes were distributed in a uniform manner over the cross section of the mould and for the second and subsequent layers penetrated into the under lying layer. Slump value for concrete 53mm

B. Compaction Factor Test

The apparatus consists of 2 hopper vessels A and B provided with hinged doors at their bottom. A cylindrical vessel B is opened so that the concrete falls into the vessel B. after this; hinged door of the vessel B is opened so that the concrete will fall into the cylinder C. The surplus concrete from this cylinder is struck off with steel floats. The contents of the cylinder are again filled with the sample in 5 cm layers. The concrete is being compacted by ramming and vibrating and then weighed to find compaction factor.

Table -3*:* Compaction factor test result

S.No	Description	Compaction factor value
1	C + CP(5%)	0.85
2	C + CP(10%)	0.83
3	C + SW(0.5%)	0.85
4	C + SE(1%)	0.87
5	C+ CP(5%)+ SW (0.5%)	0.86
6	C+ CP(10%)+ SW (0.5%)	0.87

7	C+ CP(5%)+ SW (1%)	0.84
8	C+ CP(10%)+ SW (1%)	0.84

C. Compressive strength test for cube

As per IS 516:1959 Compression test was carried out on the three samples in each proportion were tested and the strength was obtained as an average. The individual variation of specimens was not more than ± 15 percent of the average. The specimens stored in water were tested immediately on the removal from grid were wiped off the specimens and any projecting pins removed. The dimensions of the specimens were recorded before testing.

Table -4: For Spent wash (0.5%) replacement by water

Description	Day	Load kN	Strength MPa	Strength mean value MPa
Cement + Spent wash (0.5%)	7	940	41.78	39.8
	7	900	40	
	7	850	37.8	
	28	1040	46.2	51.11
	28	1260	56	
	28	1150	51.1	

Table -5: For Spent wash (1%) replacement by water

Description	Day	Load kN	Strength MPa	Strength mean value MPa
Cement + Spent wash (1%)	7	810	36	39.5
	7	960	42.67	
	7	900	40	
	28	950	42.2	50.52
	28	1250	55.5	
	28	1210	53.78	

Table -6: For Ceramic power (5%) replacement by cement

Description	Day	Load kN	Strengt h MPa	Strengt h mean value MPa
Cement + Ceramic Power (5%)	7	900	40	41.3
	7	960	42.67	
	7	930	41.33	
	28	940	41.78	45.77
	28	1150	51.1	
	28	1000	44.44	

Table -7: For Ceramic power (10%) replacement by cement

Description	Day	Load kN	Strengt h MPa	Strengt h mean value
Cement + Ceramic Power (10%)	7	1020	45.33	44.3
	7	980	43.5	
	7	990	44	
	28	1090	48..4	53.93
	28	1240	55.1	
	28	1310	58.2	

Table -8: For Spent wash (0.5%) and Ceramic power (5%) replacement

Description	Day	Load kN	Strengt h MPa	Strengt h mean value MPa
Cement + Spent wash (0.5%)+ Ceramic power (5%)	7	1080	48	48.6
	7	1020	45.3	
	7	1180	52.4	
	28	1200	53.3	53.4
	28	1160	51.5	
	28	1250	55.5	

Table -9: For Spent wash (0.5%) and Ceramic power (10%) replacement

Description	Day	Load kN	Strengt h MPa	Strength mean value MPa
Cement + Spent wash (0.5%)+ Ceramic power (10%)	7	1250	55.5	49.7
	7	1060	47.1	
	7	1050	46.7	
	28	1230	54.7	56.86
	28	1360	60.4	
	28	1290	57.3	

Table -10: For Spent wash (1%) and Ceramic power (10%) replacement

Description	Day	Load kN	Strength MPa	Strength mean value MPa
Cement + Spent wash (1%)+ Ceramic power (10%)	7	950	42.2	44.8
	7	980	43.5	
	7	1100	48.9	
	28	1150	51.1	55.5
	28	1310	58.3	
	28	1290	57.3	

Table -11: Comparison of 7 days' strength

S.No	Replacement	Strength mean value Mpa
1	SW (0.5%)	39.8
2	SW (1%)	39.5
3	CP (5%)	41.3
4	CP (10%)	44.3
5	CP (5%)+ SW (0.5%)	48.6
6	CP (5%)+ SW (1%)	43.3
7	CP (10%)+ SW (0.5%)	49.7
8	CP (10%)+ SW (1%)	44.8

Table -12: Comparison of 28 days' strength

S.No	Replacement	Strength mean value Mpa
1	SW (0.5%)	51.11
2	SW (1%)	50.52
3	CP (5%)	45.77
4	CP (10%)	53.93
5	CP (5%)+ SW (0.5%)	53.4
6	CP (5%)+ SW (1%)	52.29
7	CP (10%)+ SW (0.5%)	56.89
8	CP (10%)+ SW (1%)	55.5

3. CONCLUSIONS

From this project maximum strength was achieved at a Spent wash (0.5%), Ceramic powder (10%), Ceramic powder (10%) + Spent wash (0.5%) replacement of concrete materials. Replacement of Spent wash (0.5%) concrete cube attained the maximum strength of 51.1 N/mm² at 28 Days. Replacement of Ceramic powder (10%) concrete cube attained the maximum strength of 53.93 N/mm² at 28 Days. Replacement of Ceramic powder (10%) + Spent wash (0.5%) concrete cube attained the maximum strength of 54.1 N/mm² at 28 Days. In this experiment the replacement of Spent wash 0.5% & Ceramic powder 10% gives optimum result. Finally, this experiment concludes when the replacement of percentage of spent wash decreases it reduces the strength and the replacement of ceramic powder increases the strength while increases the replacement of materials. Ceramic powder is good insulating and naturally contains pozzolanas. The spent wash is one kind of superplasticizers and it act like a polymer against the polymerization process to increase the strength. The durability test will provide the health enhancement of structure and the replacement is adopted for semi acid & acid region.

REFERENCES

[1] Akogu Elijah Abalaka (Jan 2011) "Effects of Sugar on Physical Propertiesof Ordinary Portland Cement Paste and Concrete".

[2] Amitkumar D. Raval, et.zl., (June 2013) "Ceramic Waste: Effective Replacement of Cement for Establishing Sustainable Concrete".

[3] Bilaludddin Ahmad, Sabih Ahmad, et.al., (Jan 2016) "Re-Process of Ceramic Waste for The Amplification of Eco-Efficient Concrete".

[4] Dr.M.Swaroopa Rani (July 2016) "A Study on Ceramic Waste Powder".

[5] Fernando Pacheco-Torgal • Said Jalali (April 2010) "Compressive Strengthand Durability Properties of Ceramic Wastes Based Concrete".

[6] G. K. Arunvivek, et.al., (Dec 2013)

"Experimental Study on Plasticizing Effects

Of Distillery Spent Wash in Concrete".

[7] P K Singh, K P Sharma, et.al., (Jan 2010) "Polishing of Biomethanated Spent Wash (Primary Treated) in Construction Wetland: A Bench Scale Study".

[8] Pradeep Kumar Poddar • Omprakash Sahu (Nov 2014) "Quality and Management Of Wastewater In Sugar Industry"

[9] Pratik D Viramgama, et.al., (Feb 2016) "Effect of Ceramic Waste Powder in Self Compacting Concrete Properties: A Critical Review".

[10] Savita Devi, Nitish Gandhi, et.al., (May 2016) "A Review on Cement Replacement in Construction Industry".

[11] Shraddha R.Vaniya (June 2015) "Use of Ceramic Waste Powder In Cement Concrete".

[12] P. Sharma, H. Joshi (July 2015) "Utilization of Electrocoagulation-Treated Spent Wash Sludge in Making Building Blocks".

[13] Shivarajkumar M. Kamble, et.al., (April 2017) "Distillery Spent Wash Production, Treatment and Utilization in Agriculture – A Review".

[14] Vandana Patyal, (May 2016) "Study of Biogas Generation in Treatment of Distillery Wastewater by UASB Method".