Ecofriendly offshore Concreting

Ganesan.R[1], Saideepesh.M.R[2], Rinosh Ahamed.R[3], Ajay Prawin.S.K[4], Kishore Kannan.V[5]

[1]Professor Department of Civil Engineering, [2,3,4,5] UG Final Year Students

Velammal Engineering College, Chennai, Tamil Nadu ,India

Abstract

Wealth of aquatic ecosystem is measured by the presence of organisms such as Coral reef, fishes, algae etc., The ecosystem and concrete does not meet together. Either of one present in an area. If concrete is present the green cover is reduced and in case of presence of organism, the concrete may Detroit. In this paper an innovative technique of usage of bio enhancing admixture is adopted to sort out this problem of bipolar activity of concrete and Organism on each other. The bio enhancing admixture basically consist of E.coli , Protein , Carbohydrates molecule, Lipids and Calcium molecule in appropriate percentage. Each material is chosen to help the growth of concrete and prevents the disintegration of concrete molecule. The material has been blended with cement to form a composite mixture. Slag based cement have been used in which the percentage of OPC is reduced merely to 50%. Various material test, fresh concrete test and Harden Concrete test are taken.

Keywords:- Concrete , Slag, Proteins ,Bacillus, Lipids, Carbohydrates, Strength

1.Introduction

Concrete is the second most used material used in the world , only after water . Concrete is widely used in construction field. Concrete is the most destructive material.0.8 Tonne of Carbon is produced during the production of 1 tonne of cement. The cement production is expected to increase to $4x10^9$ tonne by 2050. About 35% concrete contain harmful chemical, which may affect the concrete adversely. Concrete are used abundantly in the shore for the protection, but the life along the shore have been diminished due to action of concrete and Sea current. Either ecosystem gets diminishes or concrete gets deteriorated due to action of micro-organism.

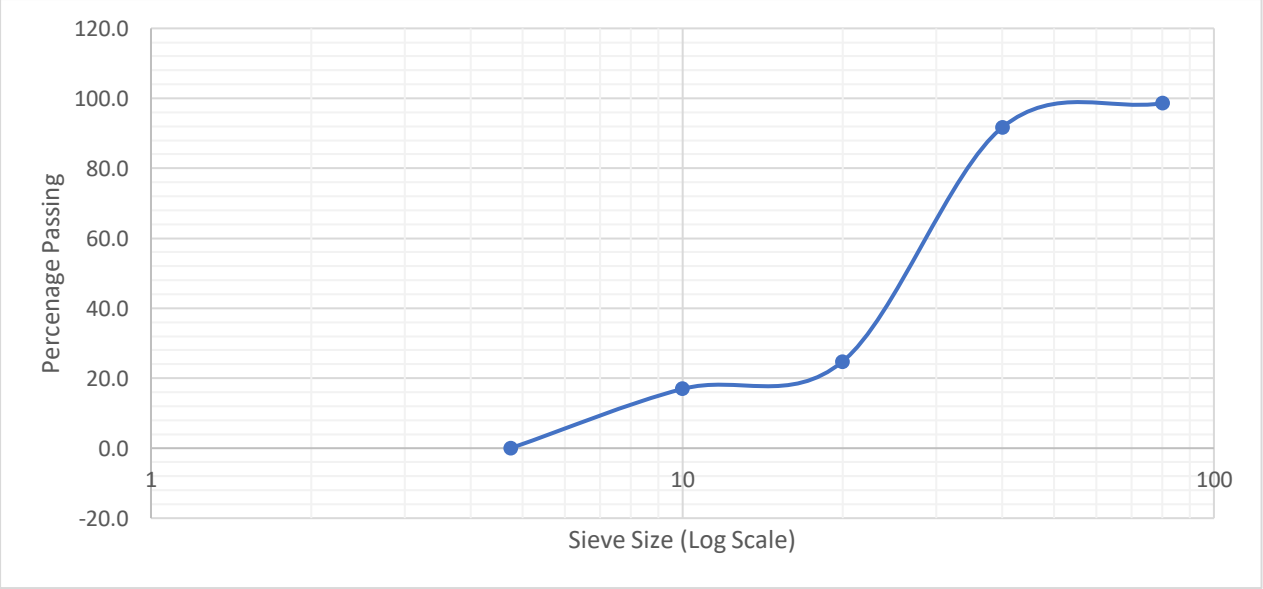
The use of slag-based cement reduces the percentage of usage of cement, which directly reduces the content of production of carbon content. The new innovative material, bio enhancing admixture material is used. In the bio enhancing admixture, Bacillus family bacteria,

Carbohydrates, Proteins, Lipids are used. These material helps the growth of green organism on it, while the bacillus bacterial works on the principle of self-healing concrete. Materials used include slag-based cement, coarse aggregate, fine aggregate and Bio enhancing admixture.

2.Test results

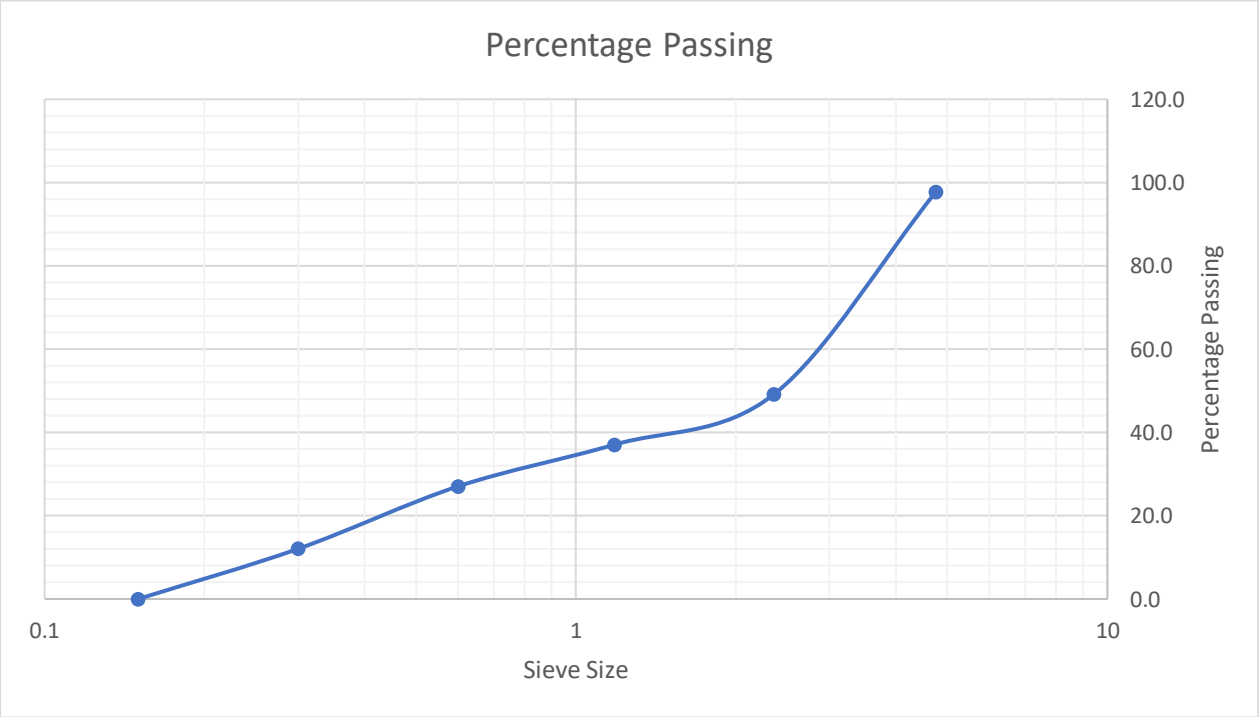
2.1 Sieve Analysis Test for coarse aggregate

IS Sieve (mm)	Weight Retained in g	Percentage Weight Retained	Percentage Weight Passing
80	49	1.40	98.6
40	240	6.86	91.7
20	2345	67.00	24.7
10	273	7.80	16.9
4.75	593	16.94	0.0
TOTAL	3500		



2.2 Sieve Analysis of Fine aggregate

IS Sieve (mm)	Weight Retained in g	Percentage Weight Retained (%)	Percentage of Weight Passing (%)	Cumulative Percentage of Passing
4.75	46	2.3	97.7	97.7
2.36	970	48.5	49.2	146.9
1.18	243	12.2	37.1	184.0
0.6	200	10.0	27.1	211.0
0.3	300	15.0	12.1	223.1
0.15	241	12.1	0.0	223.1
Total	2000	100		223.1



2.3 Consistency Test

The standard **consistency test** is performed on Vicat apparatus in laboratory as per IS 4031 (Part 4)-1988. The **consistency** at which **cement** paste will permit penetration of Vicat plunger having 10 mm dia. and 50 mm length to a depth of 33-35 mm from top of the mould is defined as the Standard **Consistency** of **cement**. In this following results are obtained:-

Setting time	Test Result
Initial Setting Time	22 minutes
Final Setting Time	255 minutes

2.4 Soundness test

The ability of cement to retain its volume after it gets hardened is known as Soundness of Cement. That means the cement should be at minimum volume change after it gets hardened. The test conducted to identify the excess amount of lime in cement is known as soundness test of cement. The following results are obtained using Le-chatelier apparatus is 1.0 mm

2.5 Slump Cone Test

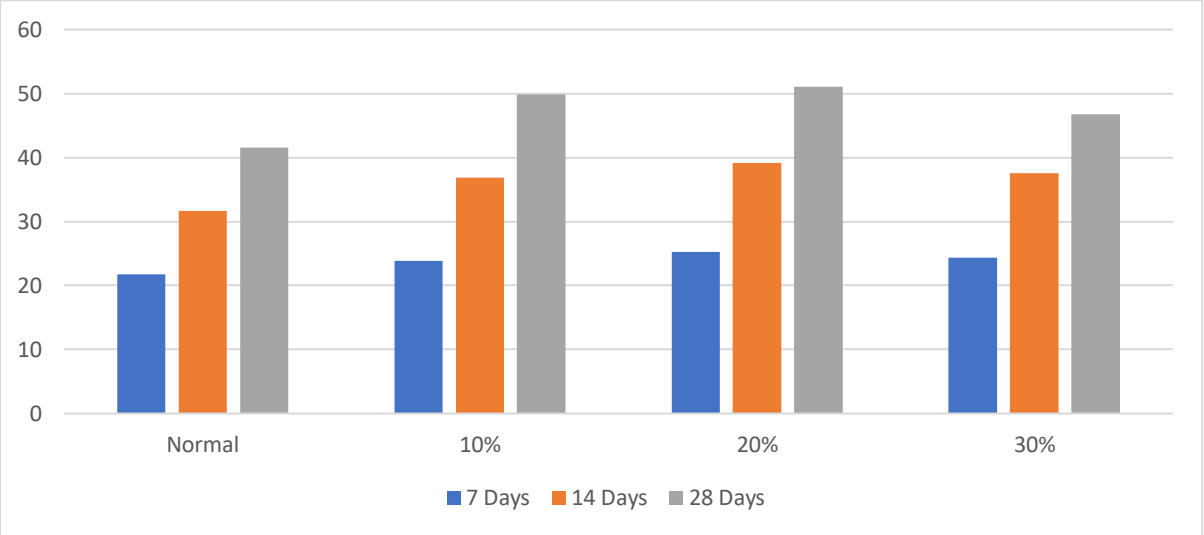
The concrete slump test measures the consistency of fresh concrete before it sets. It is performed to check the workability of freshly made concrete, and therefore the ease with which concrete flows. It can also be used as an indicator of an improperly mixed batch. The test is popular due to the simplicity of apparatus used and simple procedure. The slump test is used to ensure uniformity for different loads of concrete under field conditions. The slump (Vertical settlement) measured shall be recorded in terms of millimeters of subsidence of the specimen during the test.

The Slump cone test is measure as 90mm

2.6 Compressive Strength Test

The compressive test is taken on the concrete cube of dimension 150mmx150mmx150mm volume. The Compressive strength test have been taken for 7days, 14 days and 28 days. On each day three cubes have been tested. The specimen is prepared with normal mix, 10%, 20% and 30 % addition of bio enhancing admixture. Of these four tests 20% showed a better result compared to their counterpart.

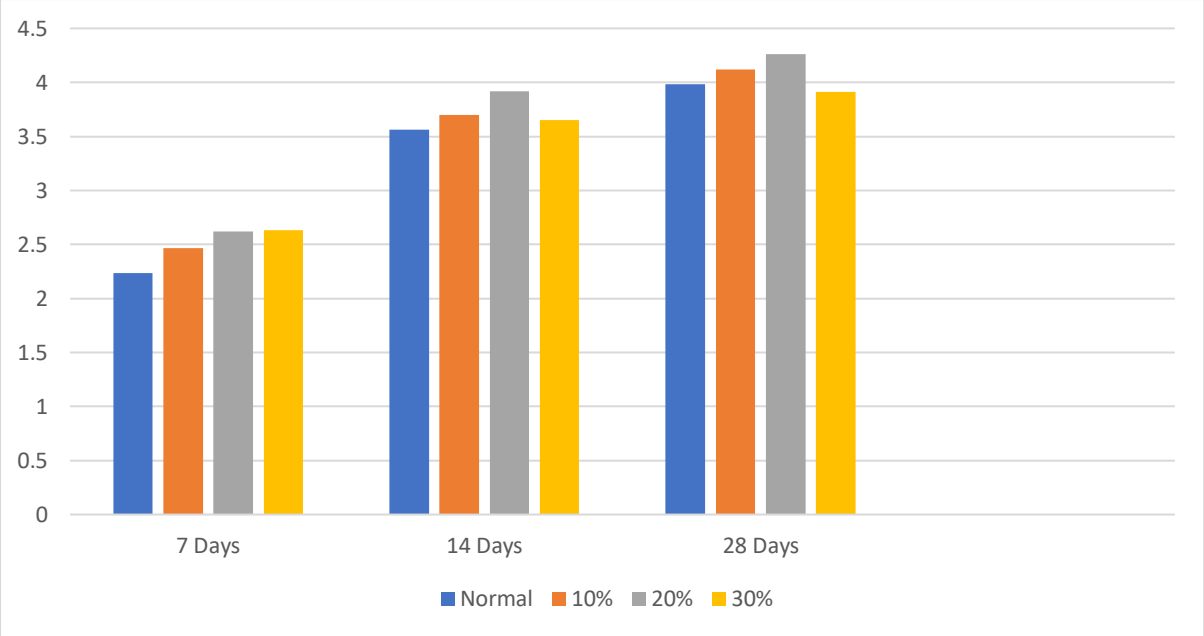
S No	MIX	7 Days	14 Days	28 Days
1	Normal	21.76	31.68	41.6
2	10%	23.8	36.83	49.86
3.	20%	25.23	39.13	51.03
4.	30%	24.36	37.56	46.76



2.7 Split Tensile Strength Test

The split tensile test has been taken on cylinder of 150mm diameter and 300 mm height. The cylinder specimen is casted and tested on 7days, 14 days and 28 days. The load is applied along the circumference on the cylinder. The specimen is prepared with normal mix, 10%, 20% and 30% mix of the bio enhancing admixture.

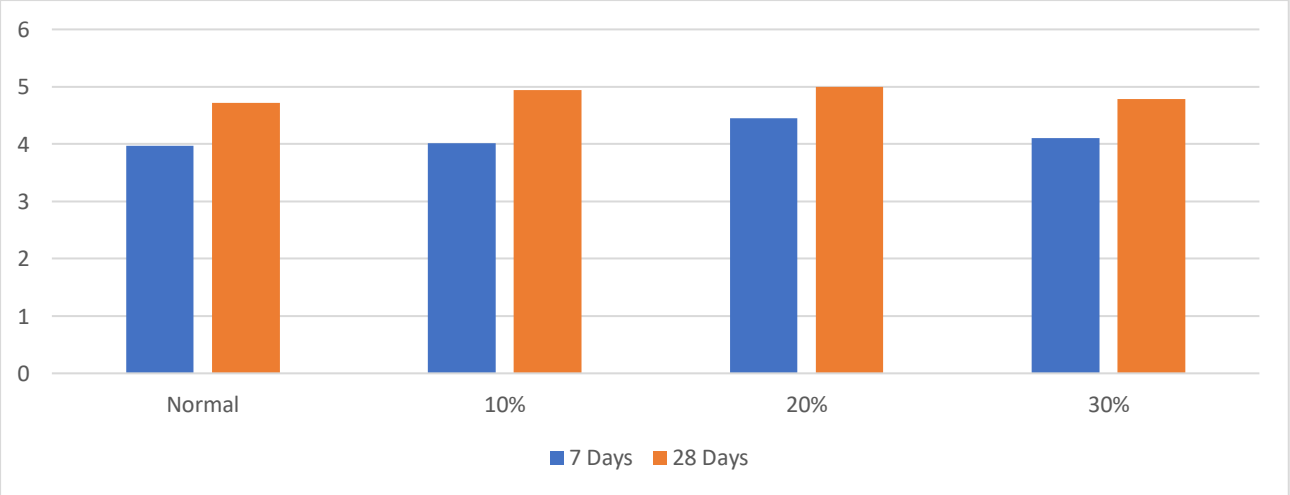
S No	MIX	7 Days	14 Days	28 Days
1	Normal	2.235	3.564	3.986
2	10%	2.468	3.698	4.12
3.	20%	2.62	3.92	4.26
4.	30%	2.63	3.65	3.91



2.8 Flexural Strength test

Flexural strength is tested using the beam of dimension 500 mmx100mmx100mm. The beam is casted and tested on 7 days and 28 days. One-point load is used to test the strength. Out offeror mix, the 20% mix is better than the other mix.

S No	MIX	7 Days	28 Days
1	Normal	3.965	4.72
2	10%	4.014	4.943
3.	20%	4.451	5.000
4.	30%	4.105	4.786



3. Summary

In this, the slag-based specimen has been casted and test with varying percentage of bio enhancing admixture. The 20 % mix showed the satisfactory result as compared to the counterpart. The compressive strength test , tensile test strength and Flexural strength have been taken on all the specified days.

4. Conclusion

The Concrete is widely used in various places , this can be changed to match the earth Environment .This can help to restore the underwater environment under specified condition. As the time goes, the green layer formed act as a bio protection and increases the strength of the concrete. So, this kind of concrete can be used for shore protection and building purpose protection .

5. Future Scope

The Cement content can be reduced by blending the mycelium-based material in the concrete, which makes the material more resistant against the destructive material. The pollution resistant material out of these principles have to be developed to be used in places like Chennai.

6. Reference

1.EConcrete: - Tide Armour product guide

2.Jswcements.in

3.https://www.researchgate.net/publication/331859622_Ecofriendly_Green_Concrete_A_rvw

4.https://scialert.net/fulltextmobile/?doi=ajaps.2014.205.214

5. IS 10262-2009

6. IS 455-1989

7. IS 456

8.Influence of Bio Admixture on Mechanical Properties of Cement and Concrete – Asian Journal of Applied Science.

9. MacArthurM.NaylorL.A.HansomJ.D.BurrowsM.T. BoydI. - Ecological Enhancement of Coastal Infrastructure.