

# Structural Behaviour of Self Healed RC Beam by Endolithic Bacteria and Calcium Carbonate

P.Mugilvani, Anish.C, K. Sathish kumar

**Abstract:** From the olden days the major problem facing by each element like beams, columns, slabs, walls in the structures is cracking. In Civil engineering it is a great challenge to get rid of these problems and applying innovative and cost-effective methods for both curing and strengthening of concrete.

In present day days there are various techniques applied in development field itself about fortifying of cement and for fix of breaks in concrete. One approach to get around expensive manual support and fix is to fuse a self-ruling self-mending system in concrete. One such an elective fix system has been presently being examined, for example a novel method dependent on the application in biomineralization of microbes in concrete.

From this exploration, utilizing microorganisms and calcium carbonate by 5, 10, 15, 20 rates in 3D shapes and improved an incentive for RC pillars are utilized for the data about expanding the quality and the all out toughness of the solid utilized in the present day will be assembled.

**Keywords:** Endolithic Bacteria, Calcium Carbonate, Self-healing, Biomineralization.

## I. INTRODUCTION

### A. General

Concrete is a significant segment in the development Industry as it is modest, effectively accessible and helpful to cast. Yet, the fundamental disadvantage of these materials is that it is frail in pressure and causes splits under continued stacking and because of forceful natural specialists which at last diminish the life of the structure which are constructed utilizing these materials which is a mix of Cement, Coarse total, fine total, and water. The nearness of breaks, because of mechanical burdens or time subordinate impacts (shrinkage, creep... ) is one of the main considerations which can influence toughness and functionality of solid structures as far as opposition, porousness and move properties. It would be a tremendous favorable position if this idea could be meant our building materials, for example, concrete. Accordingly, bacterial incited Calcium Carbonate (Calcite) precipitation

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has been proposed as another option and ecologically amicable break remediation and henceforth the improvement of solidarity of building materials. This wonder is known as 'autogenously mending' or 'self-recuperating' of cement. [1]-[8] The  $\text{CaCO}_3$  sets on the split surface, along these lines fixing it up. MICP (Microbially Induced Crack Remediation) is exceptionally attractive in light of the fact that the Calcite precipitation actuated because of microbial exercises is without contamination and furthermore regular no mischief to people. The system can be utilized to improve the compressive quality and solidness of split solid examples.

## II. RESEARCH SIGNIFICANCE

The examination goes on correlation of compressive quality and flexural quality of both bacterial cement with calcium carbonated actuated in concrete. Oneself mending of cement has additionally been seen where the solid has been influenced. This makes financially savvy in the support and quality improvement of a structure. Consequently, it will valuable in numerous territories where the works can't be put for upkeep over and over like Bridges, Tunnels, Highways and so on.,[9]-[17]

## III. EXPERIMENTAL SETUP

### A. Compression Strength Test

The cubical Molds with the size 150mm x 150mm x 150mm were cleaned and checked against the joint development. A layer of oil was applied to the internal surface of the Molds which is kept prepared for the cementing activity. In the interim the necessary amounts of bond, fine total and coarse total (going through IS sifter of 20 mm size and held on 4.75 mm) for the specific blend are weighed precisely for cementing.



**Fig 1:Compressive testing machine**

IV. RESULT AND DISCUSSION

Table -1: compressive strength test with Calcium Carbonate[18]-[26]

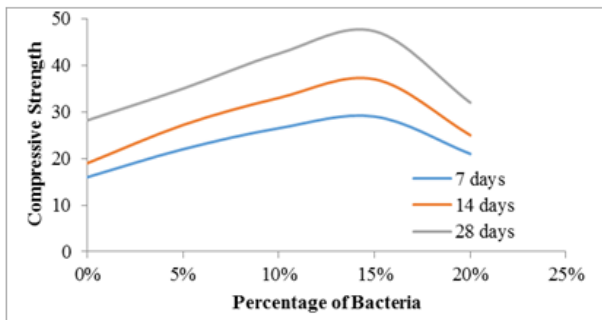
Calcium Carbonate	7 Days	14 Days	28 Days
0%	16	19	28.2
5%	21	24.5	31.1
10%	24	28.6	34
15%	19	25.6	31.2
20%	16	23.2	28.5

Table -2: compressive strength test with Bacteria

Bacteria	7 Days	14 Days	28 Days
0%	16	19	28.2
5%	22	27.2	35
10%	26.5	33	42.5
15%	29	37	47.3
20%	21	25	32

GRAPHS

Graph 1: Compressive strength with Bacteria



Graph 2: Compressive strength with Calcium Carbonate

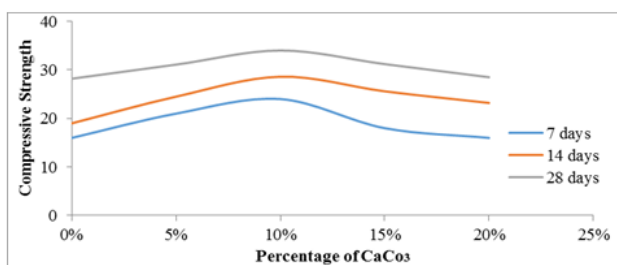
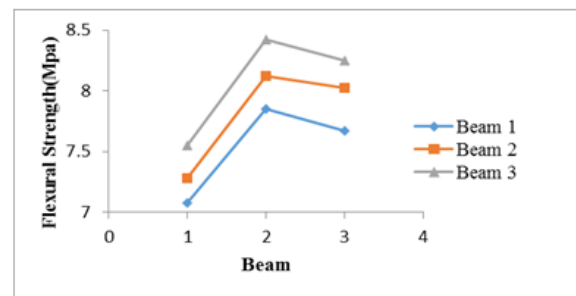


Table -3: flexural strength test results

	Conventional	Bacterial	Calcium Carbonate
Beam 1	7.08	7.85	7.67
Beam 2	7.28	8.12	8.02
Beam 3	7.55	8.43	8.25

Graph 3: flexural strength for beam



V. CONCLUSIONS

The microorganism confirmed to be proficient in improving the properties of the solid by accomplishing a high introductory quality increment and subsequently we can infer that the delivered calcium carbonate has involved some level of void volume in this way making the surface increasingly minimized and resistive to release. At the point when bacterial cement is completely settled, it might yet turn into another elective technique to supplant OPC and its perilous impact on ecological contamination. Consequently it tends to be utilized for development as it has impervious to consumption also. When contrasted with different techniques this is one of the creative strategies and the application will be exceptionally simple. It is a prudent technique.[27]-[34]

REFERENCES

1. Iyappan L., Dayakar P., Identification of landslide prone zone for coonoortalukusing spatial technology, International Journal of Applied Engineering Research, V-9, I-22, PP-5724-5732, Y-2014.
2. Kumar J., Sathish Kumar K., Dayakar P., Effect of microsilica on high strength concrete, International Journal of Applied Engineering Research, V-9, I-22, PP-5427-5432, Y-2014.
3. Dayakar P., Vijay Ruthrathi G., Prakesh J., Management of bio-medical waste, International Journal of Applied Engineering Research, V-9, I-22, PP-5518-5526, Y-2014.
4. Swaminathan N., Dayakar P., Resource optimization in construction project, International Journal of Applied Engineering Research, V-9, I-22, PP-5546-5551, Y-2014.
5. Venkat Raman K., Dayakar P., Raju K.V.B., An experimental study on effect of cone diameters in penetration test on sandy soil, International Journal of Civil Engineering and Technology, V-8, I-8, PP-1581-1588, Y-2017.
6. Saritha B., Chockalingam M.P., Photodradation of malachite green DYE using TiO<sub>2</sub>/activated carbon composite, International Journal of Civil Engineering and Technology, V-8, I-8, PP-156-163, Y-2017

7. Shendge R.B., Chockalingam M.P., Saritha B., Ambica A.,Swat modelling for sediment yield: A case study of Ujjani reservoir in Maharashtra, India,International Journal of Civil Engineering and Technology,V-9,I-1,PP-245-252,Y-2018

8. Chockalingam M.P., Balamurgan V.,Modernisation of an existing urban road-sector in Chennai, a case study report,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1457-1467,Y-2017

9. Saritha B., Chockalingam M.P.,Adsorption study on removal of basic dye by modified coconut shell adsorbent, International Journal of Civil Engineering and Technology,V-8,I-8,PP-1370-1374,Y-2017

10. Saritha B., Chockalingam M.P.,Adsorptive removal of heavy metal chromium from aqueous medium using modified natural adsorbent,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1382-1387,Y-2017

11. Chockalingam M.P., Palanivelraja S.,Retrospective analysis of a theoretical model used for forecasting future air quality near the north Chennai thermal power plant,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1457-1467,Y-2017

12. Saritha B., Chockalingam M.P.,Photodegradation of methylene blue dye in aqueous medium by Fe-AC/TiO<sub>2</sub> Composite,Nature Environment and Pollution Technology,V-17,I-4,PP-1259-1265,Y-2018

13. Shendge R.B., Chockalingam M.P., Kaviya B., Ambica A.,Estimates of potential evapotranspiration rates by three methods in upper Bhima Basin, In Maharashtra, India,International Journal of Civil Engineering and Technology,V-9,I-2,PP-475-480,Y-2018

14. Shendge R.B., Chockalingam M.P.,The soil and water assessment tool for Ujjani Reservoir,International Journal of Mechanical Engineering and Technology,V-9,I-2,PP-354-359,Y-2018

15. Shendge R.B., Chockalingam M.P.,A review on soil and water assessment tool,International Journal of Mechanical Engineering and Technology,V-9,I-2,PP-347-353,Y-2018

16. Sachithanandam P., Meikandaan T.P., Srividya T.,Steel framed multi storey residential building analysis and design,International Journal of Applied Engineering Research,V-9,I-22,PP-5527-5529,Y-2014

17. Meikandaan T.P., Ramachandra Murthy A.,Study of damaged RC beams repaired by bonding of CFRP laminates,International Journal of Civil Engineering and Technology,V-8,I-2,PP-470-486,Y-2017

18. Meikandaan T.P., Ramachandra Murthy A.,Retrofitting of reinforced concrete beams using GFRP overlays,International Journal of Civil Engineering and Technology,V-8,I-2,PP-423-439,Y-2017

19. Meikandaan T.P., Ramachandra Murthy A.,Flexural behaviour of RC beam wrapped with GFRP sheets,International Journal of Civil Engineering and Technology,V-8,I-2,PP-452-469,Y-2017

20. Meikandaan T.P., Murthy A.R.,Experimental study on strengthening of rc beams using glass Fiber,International Journal of Civil Engineering and Technology,V-9,I-11,PP-959-965,Y-2018

21. Meikandaan T.P., Hemapriya M.,Use of glass FRP sheets as external flexural reinforcement in RCC Beam,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1485-1501,Y-2017

22. Saraswathy R., Saritha B.,Planning of integrated satellite township at Thirumazhisai,International Journal of Applied Engineering Research,V-9,I-22,PP-5558-5560,Y-2014

23. Saritha B., Ilayaraja K., Eyyaabal Z.,Geo textiles and geo synthetics for soil reinforcement,International Journal of Applied Engineering Research,V-9,I-22,PP-5533-5536,Y-2014

24. Ambica A., Saritha B., Changring G., Singh N B., Rajen M., Salman Md.,Analysis of groundwater quality in and around Tambaram taluk, Kancheepuram district,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1362-1369,Y-2017

25. Arunya A., Sarayu K., Ramachandra Murthy A., Iyer N.R.,Enhancement of durability properties of bioconcrete incorporated with nano silica,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1388-1394,Y-2017

26. Ilayaraja K., Krishnamurthy R.R., Jayaprakash M., Velmurugan P.M., Muthuraj S.,Characterization of the 26 December 2004 tsunami deposits in Andaman Islands (Bay of Bengal, India),Environmental Earth Sciences,V-66,I-8,PP-2459-2476,Y-2012

27. Ilayaraja K.,Morphometric parameters of micro watershed in Paravanar sub-basin, Cuddalore District,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1444-1449,Y-2017

28. Ilayaraja K., Singh R.K., Rana N., Chauhan R., Sutradhar N.,Site suitability assessment for residential areas in south Chennai region using remote sensing and GIS techniques,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1468-1475,Y-2017

29. Ilayaraja K., Reza W., Kumar V., Paul S., Chowdhary R.,Estimation of land surface temperature of Chennai metropolitan area using Landsat images,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1450-1456,Y-2017

30. Chitra R.,Experimental study on beam using steel fiber and latex,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1395-1403,Y-2017

31. Chitra R.,Analysis of traffic and management at Kovilambakkam intersection,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1433-1443,Y-2017

32. Aswathy M.,Experimental study on light weight foamed concrete,International Journal of Civil Engineering and Technology,V-8,I-8,PP-1404-1412,Y-2017

33. Aswathy M.,Wastewater treatment using constructed wetland with water lettuce (Eichornia Crasipies),International Journal of Civil Engineering and Technology,V-8,I-8,PP-1413-1421,Y-2017

34. Kiruthiga K., Anandh K.S., Gunasekaran K, Assessment of influencing factors on improving effectiveness and productivity of construction engineers, 2015, International Journal of Applied Engineering Research, V - 10,I -17,p -13849-13854.

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