Strength Aspect Of Bacterial Concrete With Partial Cement Replacement By Flyash And GGBS

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Abstract :-*The project is carried out to evaluate the strength characteristics of bacteria concrete with partial replacement of cement with fly ash and GGBS (Ground granulated blast furnace slag) in the mix giving the great results and being highly sustainable and eco friendly. From the result of the investigation it has been observed that the performance of blended cement concrete is better than that of the conventional concrete.When water enters through the cracks, it reacts with bacteria and forms precipitates of calcium carbonate, as a by product, which fills the cracks and makes crack free concrete.*

1 INTRODUCTION

As concrete is strong, durable and relatively inexpensive it is the most used construction material worldwide. However, the presence of cracks may reduce the durability of concrete structures. Micro cracks are almost unavoidable features of ordinary concrete. If micro cracks form a continuous network they may substantially contribute to the permeability of the concrete, thereby reducing the concrete's resistance against ingress of aggressive substance. Never less, not all initial micro cracks develop into harmful or unstable cracks.For crack repair, a variety technique is available but traditional repair system having number of disadvantages aspects such as different thermal expansion coefficient compared to concrete and environmental and health hazards. Therefore, bacterially induced calcium carbonate precipitation has been proposed as an alternative and environmental friendly crack repair technique.

2 OBJECTIVE AND SCOPE

1. Develop bacterial concrete by introducing the bacteria belonging to Bacillus family (BacillusMegaterium).

2. Influence of organic matters and bacteria content characteristics on the

overall strength and durability properties of bacterialconcrete.

3. To compare the strength characteristics of bacterial concrete made with fixed percentage of Fly ash and varying percentages of GGBS and Poly propylene fiber with conventionalconcrete.

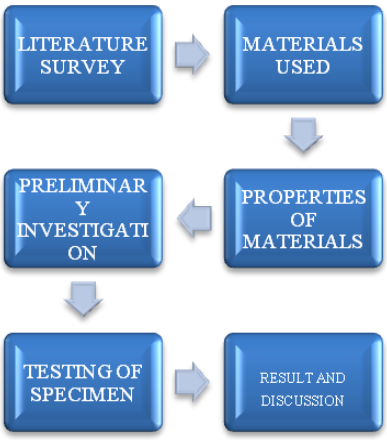
Scopes:-

1. It can be used for underground construction where surface treatment isdifficult.

2. Partial replacement of cement by Fly ash and GGBS promote low cost construction and quantity of CO_2 liberated can bereduced.

3. Self-healing bacterial concrete can be used for sectors such as tunnel lining, structural basement walls, highway bridges, concrete floors and marinestructures.

3. METHODOLOGY



MATERIALS USED :

1. Cement
2. Sand
3. Coarse aggregate
4. Flyash
5. GGBS
6. Bacteria(bacillus megaterium)

4. LITERATURE REVIEW

P Gosh and S Mandan (2006),in their paper titled "*Development of bioconcrete material using an enrichment culture of novel thermophilic bacteria"* studied the status bacteria being anaerobic were grown in sealed pressure gas air vials. Air content in the sealed vial was replaced totally by carbon dioxide using syringe-needle before inoculation. In their study they found out the overall compressive strength of mortar containing live cells was increased substantially compared to controlled specimens at all ages.

Henk M Jokers (2007), in their paper titled *"Crack repair by concrete-immobilized bacteria"* studied the concrete immobilized spores are able to revive and start biomaterial production in cracked and water entrained concrete. The study also focused on the strength

characteristics of bacterial organic compound and control concrete. In their study they found out the application of bacteria as self-healing agent is that a healing event not only revives bacterial cells but also potentially results in the production of fresh spores what resets the viability status.

N De Belie and W De Muynck (2009), in their paper titled *"Crack repair in concrete using biodeposition"* in this study first prepared concrete samples after that standardized cracks were made in concrete samples by introducing copperplates into the fresh concrete then this plates are removed after 24 hours. Crack was repaired by traditional method (epoxy and cement grout) and by biodeposition treatments. In their study they found out the effect of crack repair was visualized with a crackmicroscope.

Kim Van Tittleboom (2010), in their paper titled *"Use of bacteria to repair cracks in concrete"* in this study cracked concrete samples were prepared in two different ways. The first method resulted in samples with standardized cracks while the second method gave rise to more realistic cracked samples. In their study they found out the water permeability measuredwasnotimmediatelyconstantbutdecreasedduringseveraldaysitsduotoincomplete saturation of the specimens and unavoidable existence of air bubbles in the specimen. Ultrasonic measurements were done before and after treatment of the cracks.

VirginieWiktor and Henk M Jonkers (2011), in their paper titled *"Quantification of crack-healing in novel bacteria-based self-healing concrete"* in this study self-healing agent were prepared and also prepared mortar test specimens. In their study they found out oxygen consumptionsmeasurements.

MayurShantilalVekariya and Prof. Jayakumar (2013), in their paper titled *"Bacterial concrete: New Era for construction industry"* in this study various type of bacteria used for calcium carbonate precipitation in concrete. In this study they found out applications of various bacteria in construction area.

M. Dinesh Kumar and G Viswanath (2015), in their paper titled *"Investigation on bacteria cement composites"* studied the status of selection of bacterial species for various purposes. In this study they found out the bacteria such as Bacillus Pasteurii, Bacillus megaterium and

Bacillus subtilis having some disadvantages hence they adopt Bacillus sphaericus and Eschericheria coli have some advantages than above bacteria.

B Naveen and S Sivakamasundari (2016), in their paper titled *"Study of strength parameters of bacterial concrete with controlled concrete and structural elements made with concrete enriched with bacteria"* They observed that control of crack width, curing ways and cracking age on the crack self-healing of cement paste with bio self-healing agent was analyzed by the characterization method of area repair rate.

5 TEST RESULTS

Comparison of cement between flyash and GGBS :-

TEST	CEMENT	FLY ASH	GGBS
FINENESS	2.5%	2.85%	3.14%
SPECIFIC GRAVITY	3.15	2.28	2.7
CONSISTANCY	31%	38%	42%
INITIAL SETTING TIME	30 min	37 min	35 min

Compression Test:

No of days	**Load**	**Compressive strength N/mm^2**
7	550	24.48
28	850	37.77

Tensile strength:

No of days	**Load**	**Tensile strength N/mm^2**
7	220	3.74
28	195	3.82

Flexural strength:

No of days	**Load**	**Flexural strength N/mm^2**

7	15	6
28	18	7.2

CONCLUSION

Material tests are done as per IS Specifications.The properties of cement is comparitively similar to both flyash and GGBS.There foreflyash and GGBS can also used for the partial replacement of cement.There are generally three types of strength tests are done in laboratory.These tests we know that the strength parameters of standard concrete specimen.The value of compressive, tensile and flexure strength are within the existing limit for standard concrete specimen.

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