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IMPACT OF ESCHERICHIA (E-Coli) BACTERIA ON PROPRTIES OF FLY ASH

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OBJECTIVES :-

1. To increase compressive strength of concrete.
2. To remediate the cracks develop in concrete.
3. To heal cracks by bacterial precipitation.
4. It is an eco-friendly technique which can be used to prevent metals from deterioration.
5. Development of self healing bio concrete using biological based technique.
6. To increase the life of concrete
7. To increase flexural strength of concrete.
8. To decrease effect of global warming and ozone layer depletion.
9. To decrease maintenance cost.
10. To develop self-healing of bio concrete using biological based techniques.

ABSTRACT :-

Cracks are an issue and create problems in structure such as Shrinkage, mechanical compressive and tensile pressures are all factors that cause cracks in structure. Cracks in concrete structures are a very common parameter in structure. It causes the structure's durability and strength to deteriorate. Escherichia coli is also know as E.coli bacteria solution, e coli is used to strengthen the strength of cement concrete. The goal of this project is to create a new form of concrete by introducing bacteria promote self-healing of cracks. When this bacteria comes into contact with water, it causes CALCIUM CARBONATE (CaCo3) precipitation, which causes self-healing of cracks in concrete and improves all of the qualities of the material. The activity of crack remediation is eco-friendly and natural.

KEY WORDS:- self-healing, Escherichia or E-coli bacteria solution, calcium carbonate, cracks.

INTRODUCTION:-

Self-healing is a substance that produces limestone naturally to heal cracks on the surface of concrete structure. When a concrete structure is damaged, however, water begins to leak through cracks in the concrete. When a specific type of bacteria is combined with concrete during mix proportioning, the concrete can begin to heal. In this case, we used E.coli bacteria to repair the concrete while also providing significant strength over traditional concrete. High strength, durability, and low cost make concrete the most used material in construction industry. Although concrete is strong in compression and can resist high loads, it has lower tensile strength. Because of its low tensile strength in tention,concrete is prone to cracking when subjected to tensile stresses caused by tensile loads, plastic shrinkage, expansive chemical reactions, and other factors.Microcracks affect the durability of concrete structures because larger cracks affect the strength of structural concrete members. The concrete matrix is exposed to the harmful elements in the environment because of these fissures. On a microscopic level, cracks and other types of damage have been found to modify the thermal, electrical, and acoustical properties of materials, and crack propagation can lead to material failure.

Cracks are difficult to detect early on, and periodic inspections and repairs Necessitate personal involvement. Self healing materials, on the other hand, prevent degradation by triggering a self-healing process. Self-healing materials, on the other hand, prevent degradation by triggering a repair mechanism in response to micro-damage. Smart structures are self-healing materials that, thanks to their sensing and actuation properties, can adapt to a variety of environmental situations. Self-healing concrete has the potential to tackle the problem of concrete constructions decaying long before they reach the end of their useful lives. Tiny fractures in concrete do not often compromise structural integrity in the short term, but they do allow water and other chemicals to seep into the building, potentially causing difficulties in the long run. Clay particles imbedded in self-healing concrete provide a food source for hibernating bacteria.

1.1 Approaches of Self-Healing :-

The make-up of concrete is responsible for autogenously self-healing, and it is unaffected by the hydration reaction of cementation materials within the concrete matrix. Within the majority of typical concrete matrixes, 15-25 percent of the cement remains unhydrated. Unhydrated cement cereals may be exposed to fluids infiltrating the fracture in the event that the concrete cracks. If this is the case, the hydration process may begin again, and advertisement hydrating solutions may run, curing the crack. Although this natural self-healing mechanism has since been extended and recognised as autogenously recovery. It's most useful for extremely thin splits.

1.2 Mechanism of Self-Healing :-

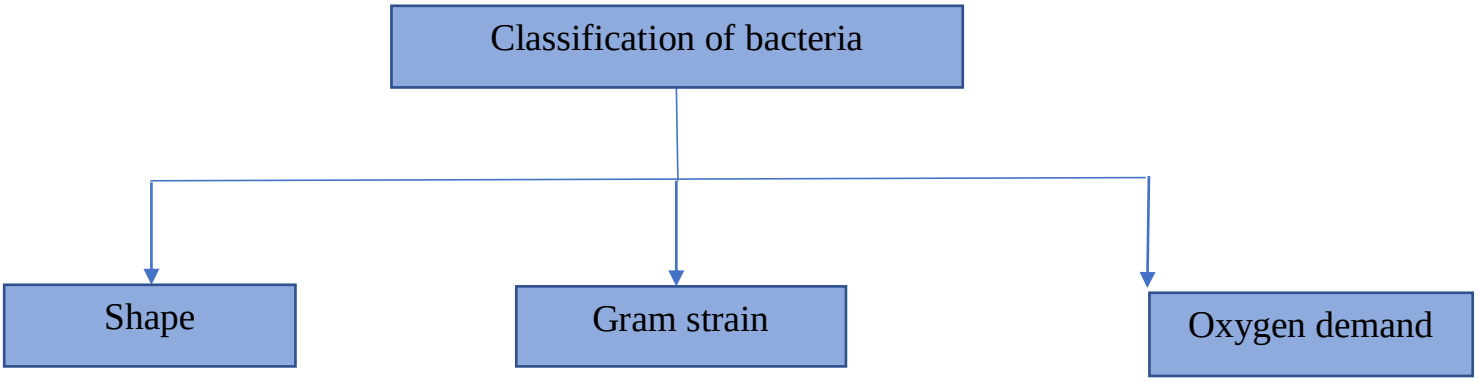
Microbial Induced Calcium Carbonate Precipitation (MICCP) or Bio mineralization is the term used to describe the process of using microbes in deep bio concrete. Followin g activation, bacteria undergo a number of metabolic processes, including sulphate red uction, photosynthesis, and urea hydrolysis, which results in calcium carbonate as a by product. Bacillus Pasteurii, Bacillus Pseudofirmus, Bacillus Cohnii, Bacillus Sphaeric us, Bacillus Subtilis, Bacillus Halodurans, and other bacteria can precipitate calcium c arbonate in different ways depending on the laboratory and the situation.The bacteria must be able to convert organic and natural nutrients into insoluble inorganic calcite crystal that fills the cracks in order for selfhealing to occur. Each laboratory has its own set of issues. Precipitation is primarily influenced by ph value, calcium concentration, and DIC (Dissolved Inorganic Carbon) concentration. It's critical for the bacteria to be able to convert organic and natural nutrients into insoluble inorganic calcite crystal that plugs the splits in order for self-healing to occur. The self-healing representative contains bacteria that function as catalysts, as well as calcium calcite that converts to calcium carbona.

1.3 Suitability of self-healing in India:-

India's weather varies from region to region due to the country's terrain, as well as a wide spectrum of heat variations originating from mountains, flatlands, woods, and shorelines. Many major centres, including as New Delhi, Lucknow, Patna, and Jalandhar, are experiencing climate shifts from pleasant weather in April to mid-June to bitterly cold weather in February and November. Serious weather can cause concrete framework to fracture, reducing the building's life duration. Bio concrete may be the best alternative for combating these extreme weather conditions. infrastructure development is so important, bio concrete is frequently used in construction projects. Bacterial induced concrete is a carbonate precipitation self-healing approach that is both ecologically safe and appealing for use in offshore structures and underground where minor cracks can be devastating. Aside from that, bio concrete is frequently used in the construction of sprinkler systems.

1.4 Classification of bacteria:-

Bacteria are generally classification in three category Basis on shape, Basis on gram stain and Basis on oxygen demand which is shown in below chart:-



1.5 Escherichia coli :-

E. coli is an obligate aerobe bacteria that is used to kill mosquito larvae as a larvicide. End spores are spherical. Bacillus spherical is a gram-positive bacteria with rod-shaped cells that form chains in the form of medium-sized, smooth colonies with an entire edge. Rod-shaped cells can also be found. spore-forming rods having a diameter of 0.9 m, gram-variable. Positive for Catalos Lecithin's-negative. Sugars aren't affected. Temperatures for growing things: 37°C 35-37 degrees Celsius is the ideal temperature.

1.6 Limitations

The followings are the limitations

- Cost of Fly ash
- Cost of bacteria

Conclusion :-

It's a lot more useful because of the self-healing capacity of its compared to the traditional concrete with break fixing. Bio self healing is a novel as well as earth friendly approach. it can concluded that easily cultured E.coli can be safely used in improving the performance and characteristics of concrete. Hence we can use the bacterial concrete in the structures, to get more strength and durability.

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