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A Review on the Study of Green Concrete

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ABSTRACT: Green concrete is nothing but concrete made with eco friendly wastes. In concrete industries green concrete is a revolutionary topic. Green Concrete is a environmental friendly material. Normal concrete is responsible for release of carbon dioxide to some extent. To reduce such emissions, various types of concrete were developed by various researchers by using some waste products from industries and agriculture. It depicts the convenience of the usage of various by products such as dust, marble, fly ash, plastic waste, marble granules, silica fumes, blast furnace, slag, etc. which requires less amount of energy and it is also less harmful to environment. Green Concrete is capable for sustainable development by the application of industrial waste to reduce the consumption of natural resources and energy etc. Use of such materials saves approximately 20% of cements. Thus, green concrete is an excellent substitute of cement as it is cheaper, due to which it is made up of waste products, saving energy. Green Concrete has greater strength & durability compared to normal concrete.

KEYWORDS: Concrete, aggregates, sustainability, durability, fly ash, supplementary cementitious materials, industrial wastes, agricultural waste, construction industries, carbon dioxide emissions.

I. INTRODUCTION

Green concrete is nothing but using greener materials concrete to make a infrastructure more sustainable. Green Concrete is cheap to produce because it is prepared by waste materials which lowers the energy consumption, increases its strength and durability. Green Concrete was first developed by Dr.WG in 1998.He made green concrete by including various aspects such as mechanical properties, fire resistance, durability, strength, thermodynamic properties, environmental properties, etc. to prepare green concrete. At recent century India has taken a major initiative in developing the infrastructure such as express highway, bridges, power projects, airports, industries, etc. to cope up with the requirements of globalization. In the construction of any infrastructure, concrete plays an important role. Concrete is a affordable material which is used for the infrastructure of any thing such as industries, bridges, highways, roads, residences, etc.

In the present century, India produces more than 170 million cubic meters of concrete annually. In all over the world more than 7% emission of carbon dioxide takes place due to concrete industries. There is alternative technique to produce green concrete. Green Concrete has no relation with its colour(i.e it doesn't have green colour). At recent time according to various researchers the production of one ton cement produces approximately one ton of carbon dioxide in atmosphere. Some researchers take an initiative to reduce the emissions of Carbon dioxide from concrete by replacing the some amount of cement by various supplementary cementitious materials. The use of such materials improves the property of concrete.

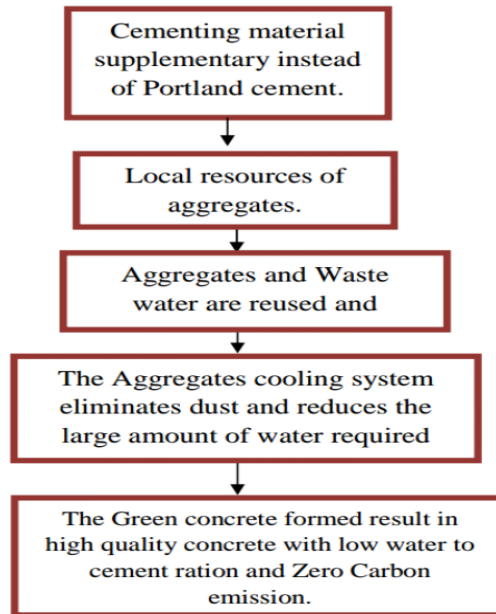


Fig: Concept of green concrete

II. LITERATURE REVIEW

Mr.VardhanNagarkar, et al publishes a paper on green concrete in 2016. In which they conclude that green concrete is a very low energy and resources consuming material. And it is also reduces environmental pollution. This method is useful for saving natural resources for future generations. He also studied about the silica fume and conclude that cement is a scarce resources all over the world because the demand of cement increases day by day. At recent time the use of silica fume increases because when it mixes with cement its enhance the hardness and freshness of cement.

Mr.VardhanNagarkar, et al also studied about the emission of of carbon dioxide from conventional cement and conclude that concrete is most common material used in construction field and it emits a large amount of environmental wastes. And carbon dioxide produced from concrete affects the global warming, etc.

Mr.AbhijeetBaikerikar studied about the factor affect on environment due to concrete from which he conclude that at recent time approximately one ton of carbon dioxide are emitted from one ton of cement. Carbon dioxide is one responsible gas for global warming. Without aggregates concrete cannot be produced.

Table: Material replaced Concrete Green Concrete

Sr No.	Components of Concrete	Replaced material for Green Concrete
1.	Cement	Sludge ash, fly ash, etc.
2.	Coarse Aggregates	Silica fume, waste glass, etc.
3.	Fine Aggregates	Demolished bricks, quarry dust, micro silica, marble, sludge powder, etc.

III. PROPERTIES OF GREEN CONCRETE

- A. It improves Mechanical properties like strength, shrinkage, static behaviour, etc.
- B. Fire resistance (I.e. heat transfer), etc.

- C. It improves the workability.
- D. It improves strength development.
- E. It improves the curing properties.
- F. It improves durability.
- G. It improves corrosion protection.
- H. It improves frost.
- I. It improves new deterioration mechanism.
- J. It improves environmental impact.

IV. MATERIAL/PRODUCT SELECTION

A. Efficiency of Resources:

It mainly includes properties like natural recycled content/renewable recycled content, efficient resource manufacturing process, refurbished or reusable and durability.

B. Energy Efficiency:

The energy required to make this concrete is known as energy efficiency. The materials which require the amount of energy during the construction period of the concrete are mostly preferred.

C. Conservation of Water:

Water is mainly conserved by using materials that help us and conserve water in landscape areas or even help to reduce the consumption of water in building materials.

V. TOOLS AND STRATEGIES

A. Using Geopolymer Concrete:

Nowadays innovation has been made in concrete by using a variety of geopolymers. The use of Portland cement can be eliminated by combining these materials with materials such as slag, fly ash, etc. Geopolymer has high resistance to acid attack according to the recent sources and also it is found to be strong and durable. The most important advantage of geopolymer concretes is that it has greatly improved fire resistance compared to Portland cement concretes. Further, geopolymer concrete also exhibits zero alkali-aggregates expansion.

B. Fly Ash:

Fly ash is nothing but a very fine powder. Fly ash improves the most core property of concrete which is nothing but strength. It is well suited for mass concrete application as it generates very less hydration heat. A plus point of fly ash is that it is widely available anywhere also, fly ash is still less expensive than Portland cement. The performance of concrete is improved by the use of fly ash in the concrete in optimum proportion. We can theoretically replace 100% of portland cement by fly ash, but we need a chemical activator in replacement levels above 80%.



Fig: Comparison between cement and fly ash

C. Ground Granulated Blast Furnace Slag:

It is an excellent cementitious material. Slag is obtained by crushing molten iron slag which is nothing but a byproduct of iron and steel making from a blast furnace in water or steam, to make a granular glassy product that is then dried and



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grounded into a fine powder. Similar to fly ash, even GGBFS generates less heat of hydration. GGBFS is also responsible for improving durability as well as mechanical properties of concrete.

VI. ADVANTAGES OF GREEN CONCRETE

- A. It has good thermal resistance.
- B. It has good acid resistance.
- C. It increases compressive strength.
- D. It increases split tensile strength.
- E. Reduce consumption of the cement.
- F. Reduce the environmental pollution.
- G. It is cheaper.

VII. DISADVANTAGES OF GREEN CONCRETE

- It has less structure construction.
- It has less flexural strength.
- Water absorption is high.
- Shrinkage is high.
- Creep is high.

VIII. CONCLUSION

In this article, we have studied about the green concrete like properties, preparation, advantages, disadvantages, etc. With the help of Green Concrete we can save the natural materials for future generations. Green Concrete Technology is one major steps in construction industry to achieve sustainable construction. It is cost effective. This paper deals with the use of Portland cement. With the waste materials we can help to reduce the environmental problems.

In this article, we conclude that one ton of conventional cement approximately produce a one ton of carbon dioxide. To over come from this factor Green Concrete is best material. In future, green concrete will not reduce environmental problems but it also reduces the cost of concrete. Water absorption is slightly greater that the conventional concrete. Permeability of green concrete is less than conventional concrete.

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