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STUDY OF GREEN CONCRETE OBTAINED USING SMART MATERIALS

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ABSTRACT

Construction industry is growing rapidly and new technologies have evolved very fast to cater different difficulties inthe construction industry. Among all materials used in the construction industry concrete is main material for construction puposes. Billions of tons of naturally occurring materials are mined for the production of concrete which will leave a substantial mark on the environment. Nowadays recycling of waste and industrial by products gaining popularity to make concrete environment friendly material and the concrete can be called as Green Concrete. This review paper will give us a brief idea about as well as advantages and disadvantages about green concrete

Key Words **—1.Concrete, 2.Green Concrete, 3.Recycled Aggregates, 4.Quarry Dust, 5.Recycled Aggregate Concrete, 6.Cement, 7.FineAggregate, 8.Coarse Aggregate**

I. INTRODUCTION

Green concrete is a revolutionary topic in the history of concrete industry. This was first invented in Denmark in the year 1998 .

Green concrete has nothing to do with colour but it is a concept of using eco-friendly material in the concrete, to make the system more sustainable and service life.The size of construction industry all over the world is growing at faster rate. The huge construction growth boosts demand for construction materials. Aggregates are the main constituent of concrete. Due to continuously mining the availability of aggregates has emerged problems in recent times. To overcome this problem, there is need to find replacement to some extent. Nowadays, there is a solution to some extent and the solution is known as “Green Concrete”.It is a concept of thinking environment into concrete considering every aspect from raw materials manufacture over mix design to structural design, construction, and service life. Green concrete is also cheap to produce because, waste products are used as partial substitute for cement, charges for the disposal are avoided, energy consumption in production is lower, and durability is greater.

II. WHY USE GREEN CONCRETE

During the formation of traditional concrete there is several activity which impacts on the environment

- The aim of using green concrete is to reduce the environment impact.
- Major ingredient in the production of concrete is aggregates without aggregates it is impossible to produce concrete. Aggregates are mined from the rock mines and the rate with which concrete is produced there will be significant reduction in naturally occurring materials.
- Disposal of construction and demolition waste has become a major problem these days, according to the report of Technology, Information, Forecasting, Assessment Council the total amount of waste from construction industry is estimated to be 12 to 14.7 million tons per annum. Out of which 7.8 million tons are concrete and brick waste. Because of increasing problems of these wastes many countries have started researches to use these materials as source.
- About 0.9 tons of carbon dioxide is produced for every 1 ton of cement produced. Carbon dioxide is one of the green house gas which is responsible for global warming

III. MATERIAL FOR GREEN CONCRETE

Sl. No	TRADITIONAL INGREDIENTS	REPLACEMENT MATERIALS FOR GREEN CONCRETE
1.	CEMENT	ECO-CEMENT, SLUDGE ASH, MUNCIPAL SOLID WASTE FLY ASH
2.	COARSE AGGREGATES	RECYCLED AGGREGATES, WASTE READY MIX CONCRETE, WASTE GLASS, RECYCLED AGGREGATES WITH CRUSHED GLASS, RECYCLED AGGREGATES WITH SILICA FUME.
3.	FINE AGGREGATES	FINE RECYCLED AGGREGATE, DEMOLISHED BRICK WASTE, QUARRY DUST, WASTE GLASS POWDER, MARBLE SLUDGE POWDER, ROCK DUST AND PEBBLES, ARTIFICIAL SAND, WASTE GLASS, FLY ASH AND MICRO SILICA, BOTTOM ASH OF MUNCIPAL SOLID WASTE

USE OF QUARRY DUST

Quarry rock dust can be an economic alternative to the river sand. Quarry Rock Dust can be defined as residue, tailing or other non-voluble waste material after the extraction and processing of rocks to form fine particles less than 4.75mm. Usually, Quarry Rock Dust is used in large scale in the highways as a surface finishing material and also used for manufacturing of hollow blocks and lightweight concrete prefabricated Elements. Use of Quarry rock dust as a fine aggregate in concrete draws serious attention of researchers and investigators.

In the recent past good attempts have been made for the successful utilization of various industrial by products (such as fly ash, silica fume, rice husk ash, foundry waste) to save environmental pollution. In addition to this, an alternative source for the potential replacement of natural aggregates in concrete has gained good attention. As a result reasonable studies have been conducted to find the suitability of granite quarry dust in conventional concrete. The utilization of Quarry rock dust which can be called as manufactured sand has been accepted as a building material in the industrially advanced countries of the west for the past three decades. As a result of sustained research and developmental works undertaken with respect to increasing application of this industrial waste, the level of utilization of Quarry Rock Dust in the industrialized nations like Australia, France, Germany

V.APPLICATION OF GREEN CONCRETE

Fig1. Green concrete dam

Fig 2. Green concrete bridge

Fig 3. Green concrete columns

VI. BENEFITS TO USE GREEN CONCRETE

Lasts Longer: Greenconcretegainsstrength faster and has a lower rate of shrinkage than concrete made onlyfrom Portland Cement. Structures built using green concrete have a better chance of surviving a fire, as it can withstand temperatures of up to 2400°F . It also has a greater resistance to corrosion, which is important with the effect pollution has had on the environment. Acid rain greatly reduces the longevity of traditional building materials.

All of those factors add up to a building that will last much longer than one made with ordinary concrete. Similar concrete mixtures have been found in ancient Roman structures. This material was also used in the

Ukraine in the 1950s and 1960s. Over 40 years later, those Ukrainian buildings are still standing. If buildings aren't constantly having to be rebuilt, fewer construction mterials are needed. The impact on the environment is reduced.

Reduces Energy Consumption: If you use less Portland cement and more fly ash when mixing concrete, thenyou will use less energy. The materials that are used in Portland cement require huge amounts of coal or natural gas to heat. Fly ash already exists as a byproduct of another industrial process, so you are not expending much more energy to use it to create green concrete. Another way that green concrete reduces energy consumption is that a building constructed from it is more resistant to temperature changes, thus saving heating and cooling costs.

Reduces Carbon Dioxide Emissions: Among the main ingredients in ordinary cement are pulverizedlimestone, clay, and sand which are heated to a high temperature. This process is responsible for between 5 and 8% of all Carbon Dioxide emissions worldwide. The manufacturing of green concrete releases up to 80% fewer Carbon Dioxide emissions. As a part of a global effort to reduce emissions, switching completely to green concrete for construction will help considerably.

VII. ADVANTAGES OF GREEN CONCRETEa

1. Reduce carbon dioxide emission.
2. Reduces environmental pollution.
3. Have good thermal and acid resistance.
4. Compressive and split tensile strength is better with some materials compared to conventional concrete.
5. Reduces the consumption of cement overall.
6. Green concrete is economical compared to conventional concrete.
7. Green concrete having better workability than conventional concrete.
8. Low production costs as waste directly substitute the cement.
9. Saves energy, emission and waste water.

VIII. DISADVANTAGES OF GREEN CONCRETE

1. Structures constructed with green concrete have comparatively less
2. Life than structures with conventional concrete.
3. Compressive strength and other characteristics are less compared to conventional concrete.
4. Water absorption is high.
5. Shrinkage and creep are high compared to conventional concrete.
6. Flexural strength is less in green concrete.
7. Structure constructed with green concrete have comparatively less life than structure with conventional concrete.
8. Split tension of the green concrete is less than that of conventional concrete.

X. SCOPE IN INDIA

Green concrete is a revolutionary topic in the history of concrete industry. Concrete is an indispensible entity for a developing country like India which desperately needs a continuously expanding infrastructure. India is the second largest producer of cement in the world. Further India would be facing an expontial growth in the concrete demand by 2011.

Project cement demand in India

Cement Demand(MT/Annum)

Year	GDP Total	GDP Industry	GDP Construction	GDP Average
2001	103	107.6	106.2	105.6
2006	139.5	148.7	150.8	146.3
2011	186.9	204.2	210.4	200.5

Source : Shumacher(1999)

Being produce in voluminous quantity in India, the concrete industry has a considerable part in the net carbon dioxide emission from the country. The net carbon dioxide emission from the construction agency are greater than any other industry.

XI. CONCLUSIONS

- There is significant potential in waste materials to produce green concrete.
- The replacement of traditional ingredients of concrete by waste materials and by products gives an opportunity to manufacture economical and environment friendly concrete.
- Partial replacement of ingredients by using waste materials and admixtures shows better compressive and tensile strength, improved sulphate resistance, decreased permeability and improved workability.
- The cost per unit volume of concrete with waste materials like quarry dust is lower than the corresponding control concrete mixes.
- A detail life cycle analysis of green concrete by considering various parameters is very much necessary to understand the resultant concrete properties

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