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Study on Environment Friendly Concrete

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ABSTRACT:
Environmentally Friendly or Green concrete required for sustainable development requires the utilisation of wastes of industrial processes to lower usage of natural resources and energy. It also promotes lesser pollution caused by the concrete production process.
Natural sand in many parts of the country is not graded properly and has excessive silt on other hand quarry rock dust does not contain silt or organic impurities and can be produced to meet desired gradation and fineness as per requirement. Consequently, this contributes to improve the strength of concrete. Through reaction with the concrete admixture, Marble sludge powder and quarry rock dust improved pozzolanic reaction, micro-aggregate filling, and concrete durability. This paper presents the feasibility of the usage of quarry rock dust and marble sludge powder as hundred percent substitutes for natural sand in concrete. An attempt has been made to durability studies on green concrete compared with the natural sand concrete. It is found that the compressive, split tensile strength and durability studies of concrete made of quarry rock dust are nearly 14 % more than the conventional concrete. The concrete resistance to sulphate attack was enhanced greatly. Application of green concrete is an effective way to reduce environment pollution and improve durability of concrete under severe conditions.
Recently there has been a 3-year project initiated by the Danish cement and concrete industry. This project has succeeded in promoting the image of concrete as a sustainable building material in the Danish public. It is the result of several scientific investigations for instance determining the effect of concrete emissions on the indoor air quality and the solution to hydrocarbon pollution in concrete slurry at the concrete plant. Finally the article contains examples of how to improve the sustainability of concrete production and how to produce green concrete. Green concrete is the term used in Denmark for environmentally friendly concrete production and structures.

INTRODUCTION

The concrete is made with concrete wastes which are eco-friendly so called as Green concrete. The other name for green concrete is resource saving structures with reduced environmental impact for e.g. Energy saving, co2 emissions, waste water.

Green concrete is a revolutionary topic in the history of concrete industry. This was first invented in Denmark in the year 1998 by Dr. WG. With the increasing interest of the public, industry and government in sustainable development, environmental assessment in construction is becoming more important. Society and the social changes that have occurred in the world have placed insatiable demands on the construction industry in terms of the world's material and energy resources. The construction
Industry must address certain consequential issues in the process of achieving sustainable development as it consumes considerable resources and has a significant impact on the environment.
The purpose of the project is based on a holistic approach, integrating material characteristics and structural performance with the following tasks:

1. To develop green cement and green concrete types; e.g. concrete with less cement, i.e. high amounts of cement replacement materials, such as fly ash, silica fume and other natural pozzolans and concrete with waste materials such as stone dust, crushed concrete, concrete slurry, cement stabilised foundations with waste incineration and other inorganic residuals products.
2. To develop green design strategies which require less maintenance and repair activities using for example stainless steel instead of black reinforcement. This is of particular interest since it is very well known that in concrete structures located in aggressive environment the highest environmental loads result from maintenance and repair activities during the service life of the structure.
3. To develop green structural designs and structural solutions for green concrete e.g.: optimised structural detailing by minimising the structural dimensions using for example:

	Traditional concrete	Green concrete
Traditional structure	Concrete with restricted amount of fly ash and micro silica.	High amount of fly ash and micro silica Green types of cement Use of stone dust, slurry, waste incineration
Green structure	Cladding with stainless steel Stainless steel reinforcement	Green concrete (see above) plus stainless steel cladding or stainless steel reinforcement.

Table: Combination of traditional and green concrete/concrete structures

The technical activities include transverse activities, combining research and development with focus on the environmental aspects, and the mechanical, fire, durability, performance, and physical/ thermodynamic related concrete properties.

GREEN LIGHTWEIGHT AGGREGATES:

1. Synthetic lightweight aggregate produced from environmental waste is a viable new source of structural aggregate material.
2. The uses of structural grade lightweight concrete reduce considerably the self-load of a structure and permit larger precast units to be handled.
3. Water absorption of the green aggregate is large but the crushing strength of the resulting concrete can be high.
4. The 28-day cube compressive strength of the resulting lightweight aggregate concrete with density of 1590 kg/m3 and respective strength of 34 MPa.Most of normal weight aggregate of normal weight concrete is natural stone such as limestone and granite.

GREEN CEMENT WITH REDUCED ENV. IMPACT:

1. The cement is based on an intermediate product, clinker, which is produced with minor additions of mineralizes (CaSO4 and CaF2) to the kiln resulting in 5% reduction in energy consumption and 5-10% increase in 28-day strength of the cement.
2. Cement with reduced environmental impact. (Mineralized cement, limestone addition, waste-derived fuels).
3. By replacing cement with fly ash, micro silica in larger amounts.

PRODUCTION OF GREEN CONCRETE:

Concrete with inorganic residual products (stone dust, crushed concrete as aggregate.)
Ceramic wastes used as green aggregates.
By replacing cement with fly ash, micro silica in larger amounts.
To develop new green cements and binding materials (i.e. by increasing the use of alternative raw materials and alternative fuels, and by developing/improving cement with low energy consumption).
To use residual products from the concrete industry, i.e. stone dust (from crushing of aggregate) and concrete slurry (from washing of mixers and other equipment).
To use new types of cement with reduced environmental impact. (Mineralized cement, limestone addition, waste-derived fuels).
Production of green concrete is not just a matter of choosing a plausible mix design with reduced Portland clinker content. It is also strongly associated with awareness towards the primary resources and a responsible consumption of energy. In many situations these principles are in good correspondence with a manufacturer's wishes to produce concrete with minimum production costs. However, it is also recognised that these principles are depending on local conditions which may vary significantly from plant to plant. For instance they may lead to increased investments in the plant equipment such as storage facilities and water treatment system.

Concrete plant energy: Production of concrete requires energy like all other building materials. At the concrete plant electricity and fuel are needed to mixers, conveyors, pumps, trucks and so forth. Each concrete constituent also requires energy for quarrying and processing and since concrete is a heavy material the transportation also is an important energy consumer. In the various energy contributions are calculated into CO emissions. It is obvious why cement clinker are considered to be the most important indicator to describe the environmental footprint of concrete.

Mass balance: A concrete manufacturer should also have concerns about the mass flow through the plant. Production of concrete involves different residual products such as water with slurry and concrete remains from washing of mixer, equipment and trucks. Also hardened concrete waste from surplus production, rejected concrete and trial batches is being accumulated at ready-mix concrete plants as well as precast factories. The amount of hardened concrete waste is typically 1-3 % of the total production. For precast element factories there are also waste materials such as steel, insulation, plastic, timber and so forth. It is needles to say that these other residuals should be sorted and properly recycled.

SUITABILITY OF GREEN CONCRETE IN STRUCTURES:

1. Reduce the dead weight of a facade from 5 tons to about 3.5 tons.
2. Reduce crane age load, allow handling, lifting flexibility with lighter weight.
3. Good thermal and fire resistance, sound insulation than the traditional granite rock.
4. Improve damping resistance of building.
5. speed of construction, shorten overall construction period.

ADVANTAGES:

1. Reduction of the concrete industry's CO2-emmision by 30 %.
2. Increased concrete industry's use of waste products by 20%.
3. NO environmental pollution and sustainable development.
4. Green concrete requires less maintenance and repairs.
5. Green concrete having better workability than conventional concrete. Good thermal resistant and fire resistant.
6. Compressive strength behaviour of concrete with water cement ratio is similar to conventional concrete
7. Flexural strength of green concrete is almost equal to that of conventional concrete.

LIMITATIONS:

1. By using stainless steel, cost of reinforcement increases.
2. Structures constructed with green concrete have comparatively less life than structures with conventional concrete.
3. Split tension of green concrete is less than that of conventional concrete.

SCOPE IN INDIA:

1. Green concrete is a revolutionary topic in the history of concrete industry.
2. As green concrete is made with concrete wastes it does take more time to come in India because industries having problem to dispose wastes.
3. Also having reduced environmental impact with reduction in CO2 emission.

CONCLUSION:

1. Green concrete having reduced environmental impact with reduction of the concrete industries co2 â€œemissions by 30%.
2. Green concrete is having good thermal and fire resistant.
3. In this concrete recycling use of waste material such as ceramic wastes, aggregates, so increased concrete industrial„¢s use of waste products by 20%. Hence green concrete consumes less energy and becomes economical.
4. So definitely use of concrete product like green concrete in future will not only reduce the emission of co2 in environment and environmental impact but also economical to produce.

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