GREEN CONCRETE – THE FUTURE OF CONCRETE

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ABSTRACT

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. It is a concept of thinking environment into concrete considering every aspect from raw materials manufacture over mixture design to structural design, construction, and service life. Green concrete is very often also cheap to produce, because, for example, waste products are used as a partial substitute for cement, charges for the disposal of waste are avoided, energy consumption in production is lower, and durability is greater. Green concrete is a type of concrete which resembles the conventional concrete but the production or usage of such concrete requires minimum amount of energy and causes least harm to the environment. The CO2 emission related to concrete production, inclusive of cement production, is between 0.1 and 0.2 t per tonne of produced concrete.

Keyword : - *Green Concrete, Cheap Concrete, Environment friendly Concrete*

1. INTRODUCTION

The potential environmental benefit to society of being able to build with green concrete is huge. It is realistic to assume that technology can be developed, which can halve the CO2 emission related to concrete production. With the large consumption of concrete this will potentially reduce the world‘s total CO2 emission by 1.5-2%. Concrete can also be the solution to environmental problems other than those related to CO2 emission. It may be possible to use residual products from other industries in the concrete production while still maintaining a high concrete quality. During the last few decades society has become aware of the deposit problems connected with residual products, and demands, restrictions and taxes have been imposed.

And as it is known that several residual products have properties suited for concrete production, there is a large potential in investigating the possible use of these for concrete production. Well-known residual products such as silica fume and fly ash may be mentioned. The concrete industry realised at an early stage that it is a good idea to be in front with regard to documenting the actual environmental aspects and working on improving the environment, rather than being forced to deal with environmental aspects due to demands from authorities, customers and economic effects such as imposed taxes. Furthermore, some companies in concrete industry have recognised that reductions in production costs often go hand in hand with reductions in environmental impacts. Thus, environmental aspects are not only interesting from an ideological point of view, but also from an economic aspect.

2. THE GREEN CONCRETE

Green Concrete is expected to fulfil the following environmental obligations:

- Reduction of CO2 emissions by 21 %. This is in accordance with the Kyoto Protocol of 1997.
- Increase the use of inorganic residual products from industries other than the concrete industry by approx. 20%.
- Reduce the use of fossil fuels by increasing the use of waste derived fuels in the cement industry.
- The recycling capacity of the green concrete must not be less compared to existing concrete types.
- The production and the use of green concrete must not deteriorate the working environment.
- The structures do not impose much harm to the environment during their service life.

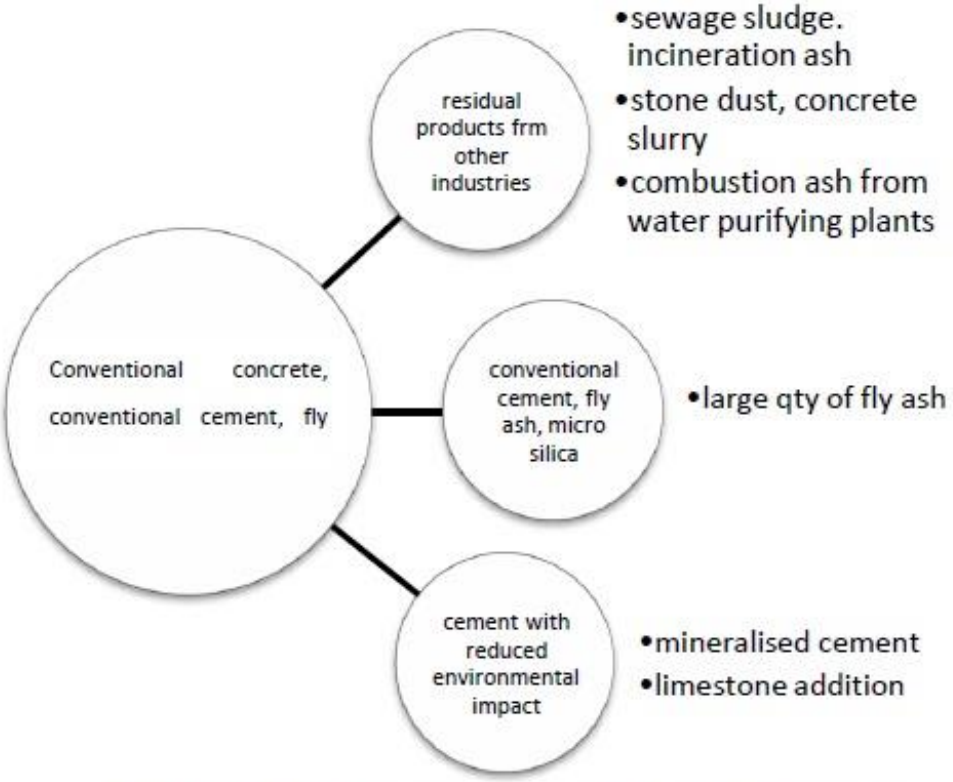

Fig. 1 A chart depicting the methods to develop green concrete

2.1 Properties of Green Concrete

a) Reduced CO2 emissions.

b) Low production costs as wastes directly substitute the cement.

c) Saves energy, emissions and waste water.

d) Helps in recycling industry wastes.

e) Reduces the consumption of cement overall.

f) Better workability.

g) Sustainable development.

h) Greater strength and durability than normal concrete.

i) Compressive strength and Flexural behaviour is fairly equal to that of the conventional concrete.

j) Green concrete might solve some of the societies‘ problems with the use of inorganic, residual products which should otherwise be deposited

2.2 Advantages

Green concrete has manifold advantages over the conventional concrete. Since it uses the recycled aggregates and materials, it reduces the extra load in landfills and mitigates the wastage of aggregates. Thus, the net CO2 emissions are reduced. The reuse of materials also contributes intensively to economy. Since the waste materials like aggregates from a nearby area and fly ash from a nearby power plant are not much expensive and also transport costs are minimal. Green concrete can be considered elemental to sustainable development since it is eco-friendly itself. Green concrete is being widely used in green building practices.

Use of fly ash in the concrete also increases its workability and many other properties like durability to an appreciable extent. One of the practices to manufacture green concrete involves reduction of amount cement in the mix, this practice helps in reducing the consumption of cement overall. The use waste materials also solve the problem of disposing the excessive amount industrial wastes.

3. REPLACEMENT MATERIALS 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

3.1 Use Of Recycled Aggregates

Construction and Demolition disposal has emerged as a major problem in all over the world. In USA, approximately 135 million tons of Construction and Demolition waste is generated annually. Wastes' arising from construction and demolition constitutes one of the largest streams within the European Union and many other countries. It is now widely accepted that there is significant potential for reclaiming and recycling demolished debris for use in value added applications to maximize economic and environmental benefits. As a result recycling industries grew up. Many governments throughout the world have now introduced various measures aimed at reducing the use of primary aggregates and encouraging reuse and recycling, where it is technically, economically, or environmentally acceptable.

3.2 Use Of Quarry Dust

Common river sand is expensive due to excessive cost of transportation from natural sources. Also large-scale depletion of these sources creates environmental problems. As environmental transportation and other constraints make the availability and use of river sand less attractive, a substitute or replacement product for concrete industry needs to be found. River sand is most commonly used fine aggregate in the production of concrete poses the problem of acute shortage in many areas. Whose continued use has started posing serious problems with respect to its availability, cost and environmental impact.

4. 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.

5. REFERENCES

[1]. "A Review on Green Concrete"- by Abhijeet Baikerikar

[2]. B.L.Rajput and Indrasen Singh, "Green Concrete- An Overview", Indian Highways Journal, February 2012.

[3].M. Shahul Hammed and A.S.S Sekar. "Properties of Green Concrete Containing Quarry Dust and Marble Sludge Powder as Fine Aggregate", APRN Journal of Engineering and Applied Sciences, June 2009.