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Green Concrete: A Sustainable Solution

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ABSTRACT
All over the world, the real estate is growing very fast and the civil constructions need a very high demand of various construction materials in which concrete is the core material and to make it tones of natural resources are being consumed, leaving a question mark on environmental issues. Recycle and reuse of waste materials from industries is becoming very popular to overcome these environmental issues. So there is an urgent need to develop an efficient and eco-friendly concrete which can sustain economically longer without any pollution. The paper reviews some articles and researchers findings along with some innovative ideas of advantages and disadvantages of the green concrete.

Keywords: Construction, eco-friendly, issues, materials, natural resources, overcome, real estate.

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I. INTRODUCTION

The color green has no meaning with the green concrete here. It is basically a thought given to save environment against various levels of pollution that occur during manufacturing of concrete ingredients. The green concrete concept derives from saving of various natural resources without compromising with the future generation needs, durability, low cost, recycle and reuse of waste materials without wasting space, time and money on their disposal. It aims to the sustainable construction which is only the solution to prevent various levels of pollution in developing countries like India where real estate is growing very fast. Green concrete playing a vital role in sustainable construction and development is not only becoming popular but also it is an urgent need of today's era. Civil engineers and architects are very much interested more than ever in sustainable construction materials. As we think of conventional concrete we find cement is the main ingredient material and worldwide cement production adds approximately 6% Carbon Dioxide (CO_2), a green house gas to the worlds global warming.
India being largest consumer of cement per capita and the world's third largest country for cement production. Researchers report that during manufacturing of cement one ton of cement releases one ton of CO_2 which can be minimized by replacing some other cementitious material or reusing concrete and then the concrete so developed can be termed as the green concrete (Mr. Nagarkar, V. et al (2017). Some inorganic residual products so called green aggregates like stone dust, crushed concrete, marble wastes, can be mixed with binding materials such as green cement, the conventional cement replaced by fly ash, micro fillers, micro silica in larger amount, making the green concrete not only cost effective but durable also.

II. ENVIRONMENTAL ISSUES

About 0.9 ton of cement manufactured releases 1 ton of Carbon dioxide being green house gas is mainly responsible for global warming. Various ingredients of concrete are rock mined which cause the reduction in natural resources.Construction and demolition wastes disposal has been a very big problem these days. This disposal consumes land reducing the soil fertility and agricultural lands threatening next generation Baikerikar, A. (2014.

During cement manufacturing lot of cement dust causes air pollution and when it settles down on to the leaves of plants and trees their growth restricts and the problem does not stop here, it continues to the lungs of living beings getting stiff loosing their flexibility which may be the root cause of many diseases.
Various industrial and dismantling wastes being heaped, turning into hills and occupying lands of various uses is also becoming an environmental issue today.

Concrete industry uses trillion gallons of water every year globally which is also a big problem in the regions where fresh water is short (Wangchuk, K.(2013).

III. SOLUTION: SUSTAINABLE CONSTRUCTION

The green concrete is only the solution to get rid of the above mentioned environmental issues and hence the use of green concrete in construction which minimizes the environmental impact and makes it economically environmental friendly may be termed as sustainable construction.
The concrete waste originated by dismantling concrete structure can be reused to make environmental friendly Green Concrete that can reduce impact on our surrounding. The following details regarding green concrete will make everything clear about the material and composition to be used like the effective use of plastic waste, waste (recycled) concrete, fly-ash, Dust (query, marble) etc. Fly-ash reduce the emission of greenhouse gasses and bad effects too.
Tafheem, Z et al (2011) provided an overview of the status of green concrete which reduced the environmental impact and emphasized that the use of green concrete embodied low energy costs, lower green house gas emission, and low maintenance cost leading to sustainable construction materials. Furthermore, as far as resource conservation is concerned, the reuse of post consumer wastes and industrial byproducts usedas a partial replacement for Portland cement clinker, makes concrete more durable and eco-friendly as well.

Green concrete is the major alternative to reduce this CO_2 emission. Green concrete is the best alternative because it saves energy , make use of waste and also cheap. The mechanical properties like strength, and durability of green concrete found quite more than that of normal concrete (Garg, C. & Jain, A. 2014).
Sustainable use of natural resources has become a greatest need of the present era.Therefore it becomes a necessity to take such steps that are innovative and efficient for construction. So, for sustainable development material to be used must comprise of waste products from industry, recycled products.Therefore Green Concrete is the material which can fulfill these necessities by considering all above factors , as its formation includes the application of marble powder , quarry dust, wood ash etc, which contribute for the eco-friendly environment reducing the percentage composition of cement by 14-20%.The processes of concrete get enhanced and improved.Therefore,to reduce emissions, pollution and to improve the mechanical properties of concrete, green concrete is the best and effective way.The technology and modernisation in green concrete proves very efficacious in the field of construction.Therefore the great diversity or variety of green concrete will contribute a lot in balancing environment Ms.Dhoka, M. C. (2013) .

Formation of modular conventional concrete is harmful at some extent due to emission of harmful gases majorly carbon dioxide emitted during the formation of cement. Though becomes necessary to reduce that emissions by any means.Therefore, Various types of concrete are being developed to reduce these emission using waste product from various sector and recyclable material like fly ash, moorum, Blast furnace ,slag etc
As these waste materials are cheap, energy saving, easily available and has less-impact over Environment.To cope up with the production of pollution by cement, Green concrete proves to be a technological way that can counter the use of cement to some extent.Therefore by using green concrete, emissions like greenhouse gases, CO2 can be reduced that subsequently reduce the negative impact of concrete over environment (Nagarkar, V. et al 2017).
There exists a enormous and limitless number of material to be used in the field of construction. But the engineers and architectures are continuously working to opt material that is sustainable as well as ecofriendly.Therefore green concrete is targeting Industrial waste and recycled products in construction to meet the future demands and limits the use of natural resources. So, there is a great need to use green concrete over conventional concrete (Jain, N. et al 2015).

The widely used construction material in the world is none other than concrete. The ingredients used in formation of concrete include cement that emits highly poisonous gases like CO2 and greenhouse emission. so, the Author described Green concrete as the concrete formed by making use of waste material(recycle) and other resource so to reduce the impact over Environment and natural resources. But the thing that struck in mind is that by using waste recycled products (cement& aggregate), how will the properties of concrete will differ from traditional concrete. Another issue is whether all the benefits and barriers of producing green concrete have been adequately understood and or addressed (Jin, R. and Chen, Q. 2013).
Jain, N., et al (2015) developed M30 grade green concrete using waste aggregates for sustainable solutions. The researchers removed old weak mortar stucked to the surface for improving the physical and mechanical properties.The influence of natural coarse aggregates replacement (50 and 100%) with recycled coarse aggregate on various mechanical and durability properties of hardened concrete were discussed and compared with

controls at different w/c ratio. Improvements in all the engineering properties of hardened concrete were observed using washed recycled coarse aggregates. The compressive strength of 28-day hardened concrete containing 100% washed recycled aggregate was slightly lower (7%) than concrete prepared with natural aggregates. Water absorption, carbonation, and rapid chloride penetration test were conducted to assess the durability of the concrete. Concrete was found moderately permeable for chloride ions penetration and no carbonation was observed in all the concrete mixes studied.

The Author here first describe the benefit of using waste materials to produce green concrete , that follows the papers that have previously been published. The current Status of producing green concrete in the field of producing green concrete in the field of consruction in US has been stated in this paper. The Data presented provide knowledge about green concrete (Jin, R., Chen, Q. 2013).

In the present era the use of recycled and waste products are increasing day by day and it has become a very challenging task to use waste productsof the manufacturing of new material. As, natural resources are depletion day by day so it becomes very necessary to use waste production for the generation of another material.While taking an example of construction industry, the wastes obtained from dismantled structures and buildings can be recycled and reuse. From last few years, efforts and studies are made to use the recycled aggregate further.Being a strengthening material of mix, the researchers described the use of recycled coarse aggregate in the construction of new structures and building.Reviewing literature it was studied that, crushed concrete ,rubble and dismanted concrete (aggregates) obtained could be reused in the contruction.Recycled Waste Aggregates including crushed graded particles obtained from dismantlled structure from debris.Therefore,the main objective of the researcher was to determine the characteristic strength of concrete by using different types of aggregates obtained from waste in M45 grade. Though, it is known that for green concrete, the composition of recycled waste aggregate varies up to 40% (Prof. Chetna, M. Vyas et al 2013).

Manufacturing of cement emits 8-10% of global CO2.At high temperature when limestone and Clays are heated and crushed,green house gas Carbon dioxide (CO_2) is released. Green concrete is a kind of environment friendly concrete that makes use of waste recycled product so as to sustain life.Many researchers gave many solution to cope up with high energy consumption and impacts on environment that happened during formation of cement and also maintaining ecological balance in nature That also includes the use of nano particles in the formation of cement as well as concrete mix, the use of fly ash (100%), natural pozolanas, Waste material(recycled),& Nanoparticles by integration CNT's will raise the properties of concrete and give rise to a cleaner technology. The concrete formed showed high strength, durability, performance etc.The author also discussed the implementation of green concrete in Indonesia using Nanosilica in addition with obstruction in implementation , political scenarios adopted by many countries as well (Suhendro, B. 2014).

Conventional concrete contributes enormous amount of carbon dioxide to the environment to counteract which, green concrete is developed using waste products from industries and agricultural use like blast furnace,slag ,silica fumes, fly ash. These waste matereials used pollute less as compared to conventional concrete. Cement manufacturing emits excessive amount of carbon dioxide which harms the environment terrifically, so by limiting the use of cement we not only reduce the emission of Co_2 but also save the cost of disposal of industrial and agricultural wastes and this way we save the environment from pollution (Mr. Nagarkar, V. 2017).

Jain, N.et al 2015 studied evolution of green concrete (M30 grade) using recycled coarse aggregates for sustainable development and found coarse aggregates with physical and mechanical properties are of inferior quality and progress in properties was noticed after washing, due to removal of old mortar on its surface. The compressive strength of 28-day hardened concrete containing 100% washed recycled aggregate was slightly lower (7%) than concrete prepared with natural aggregates. Water absorption, carbonation, and rapid chloride penetration test were also conducted to assess the durability of concrete. Concrete was found permeable for chloride ions.

Aiyewalehinmi E.O and Adeoye T.E (2016) estimated that about 15% to 20% of construction waste materials join land fills and dumping pits. They performed testing of four different mixes 0.5, 0.55, 0.60 and 0.65 water cement ratios on total of 96 concrete cubes casted, cured and crushed and found that at lower percentage water/cement ratios, the compressive strength of used aggregates after 28 days were much lower than virgin aggregates i.e. 16.89 N/mm^2 against 19.93 N/mm^2 while at higher percentage water/cement ratios it was very near to that of virgin aggregates i.e. 18.07 N/mm^2 and 18.37 N/mm^2. The researchers investigated that the used aggregates could attain the same compressive strength as that of virgin at higher water/cement ratios.

IV. SUITABILITY & SUTAINABLITY

Lesser dead load of structure, increased handle ability, damp proof, heat and fire resistant, sound proof, speedy construction, reduced CO_2 emission, eco-friendly, lesser maintenance and high workability makes it most

suitable with a very revolutionary scope in India but costuction may have lesser life, may absorb water and flexural strength low if proper care is not done.

V. CONCLUSION

The review study concludes that though there are plenty of waste materials that may be used as the part ingredients of conventional cement without affecting its strength much yet it needs a detailed study of life cycle analysis with all its affecting parameters taken in to account so as not to compromise with its quality during optimization with respect to environmental factors. Thus the use of waste materials in construction purposes and getting rid of disposal problems is a kind of Sustainable Environmental Management keeping the various needs of future generations to come in mind through saving our natural resources.

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