

A REVIEW REPORT ON SUSTAINABLE CONCRETE**N. Sinda* & S. Dinesh****

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Abstract:

This is review report on Sustainable Concrete and is done by studying various journal papers on Sustainable concrete and this paper mainly concentrated on how to improve the Sustainability of concrete by using various materials.

1. Introduction:

Construction is an unavoidable process in all over the world. But continuous concreting process will negatively affect our environment. Avoiding the concreting process for the protection of our nature is not possible. Then the only method to protect our environment is, construct a structure in a sustainable manner. For this we have to develop sustainable concrete. Sustainable concrete is also known as “Concrete for the environment”.

2. Types of Sustainable Concrete:

Replacement of Cement by C.K.D (Cement Kiln Dust): Cement is a second large producer of green house gases, so, we have to use environment friendly cement replacement material (C.R.M) while producing cement, cement kiln dust is a waste material. But we can use it as cement replacement material by certain treatment. 5% by weight of cement replacement is not affect the compressive strength of cement and it can also be used as an activator to speed up the hydration process. But if the replacement exceeds 5%, that may corrode the reinforcement by increasing the permeability of chloride. But before the cement kiln dust use as a cement replacement material, we have to eliminate the alkali content from the cement kiln dust. For this a pre heater by-pass system is provided. Then we can use it as environment friendly sustainable concrete [1].

Cellular Light Weight Concrete: Cellular light weight concrete is produced by mixing cement, fly ash, foam, water. Cellular structure is produced by pumping the foam for the production of fixed volume of air voids. This will reduce the amount of carbon dioxide production. The usage of waste products such as fly ash will improve the environmental quality and no emission of pollutant will occur the during the manufacturing of cellular light weight concrete. But one of the disadvantages of cellular light weight concrete is the reduced ability to dissipate energy. But the fibre reinforced concrete have larger energy absorption capacity. Then the combination of cellular light weight concrete and fiber reinforced concrete will give improved sustainable concrete. Fiber reinforced concrete can be produced by reinforcing the concrete by fibers of glass, aramid, carbon. The cellular light weight concrete can be classified according to their method of production.

- ✓ Air Entrain Method
- ✓ Foaming Method
- ✓ Combined Pore Foaming Method

Flexural strength of cellular light weight concrete = 1/3 to 1/5 of compressive strength. So it I indicated that cellular light weight concrete is one of the important sustainable concrete. [2]

Sustainable Green Concrete: From the name itself we get the idea about the concrete. Green-friendly to nature. Self compacting concrete is on of the major type of sustainable green concrete. The row material of self compacting concrete include cementitious material, river sand, recycled lime stone sand, ordinary Portland cement, blast furnace slag and metakaolir. The variation of the mineral admixture is influences the greenness of the concrete. By varying the proportion of mineral admixture, the optimum quantity is found out. Optimum quantity means the quantity at which emission of carbon dioxide is less and the amount of strength is adequate. Thus we get sustainable concrete. [3]

Recycled Polymer Concrete: Recycled polymer is an excellent thermal insulator, therefore the inclusion of plastic inside the concrete will improve considerably the thermal resistance and it also decreases the concrete stiffness that leads to increase the insulation against sound impact. The sustainability of the final material is definitely higher compared to that of traditional concrete. By using this large amount of plastic waste can be disposed. But it have less bond between the plastic and cement matrix. Even though the strength is reduced, the structural capability will be increased. So it can be used in the floating floors. In that view recycled polymer concrete is sustainable. [4]

Fiber Reinforced Concrete: We all know that concrete is weak in tension and cracks are developed very easily and that may propagate and finally leads to the breaking of structure. To avoid this we can use glass, carbon, aramid fibers for the reinforcement of the concrete. That have enough capability to withstand in tension and we can avoid cracking of concrete. Many structural element such as roads, sewers, electric grid etc. can be constructed by using fiber reinforced concrete. [5]

Concrete with Optimum Aggregate: Generally concrete containing 60 to 75 % of aggregate. But aggregate will reduce the engineering property. Therefore optimization of aggregate will improve the engineering property and strength. Reduction in the amount of aggregate reduces the amount of binding material and we can save cost. Usage of largest particle along with the densest packing is one of the major method which help to reduce the amount of aggregate. Compacted condition and selection of best graded aggregate will also help to reduce the amount of aggregate to certain extent. [6]

Concrete with Oil Palm Kernel Shell: The aggregate extraction is an environment hazardous procedure and it destroys the eco system. To prevent this we have to reuse and recycle the waste material. Successful example of using waste material in concrete production is replacement of aggregate by oil palm kernel shell. Oil palm kernel shell is a waste product obtained during the extraction of oil from oil palm. Many researches done on this revealed that it is a light weight aggregate with high compressive strength. Due to its light weight, it is very easy to handle. [7]

Recycled Aggregate Concrete: Huge amount of construction and demolishing waste is the source of recycled aggregate. But it have ordinary mechanical property and its fundament behavior is adequate. The weak mechanical properties can be overcome by using this recycled aggregate along with the fly ash which gives increased mechanical and durability performance. [8]

Sulfur Based Concrete: The main drawback of manufacturing of concrete is the emission of carbon dioxide. This can be reduced by using sulfur based concrete. Sulfur based concrete is a thermo plastic composite of mineral aggregate and sulfur. The durability problem due to the freezing and thawing can also overcome by using sulfur. Sulfur and aggregate are hot mixed and cooled to get sulfur concrete product, the liquid sulfur binder initially crystallizes to monoclinic sulfur. As it continues to cool, the material goes through a solid phase transition to orthorhombic sulfur which causes the material to shrink in volume. This reduction in volume creates internal stress and causes durability problem, especially when exposed to freezing and thawing. Therefore chemical modifiers that polymerize sulfur to reduce or eliminate the solid phase transmission and thus enhance the durability of sulfur based concrete. [9]

Green Building Rating: Green building rating is a consolidation of number of methods which help to reduce environmental impact by the concrete. For this agricultural waste such as ground nut shell, oyster shell, saw dust and giant reed ash are used as aggregate replacement material and the fibrous residue of sugarcane after crushing and extraction of juice is known as “ bagasse “. The bagasses are reused as fuel for heat generation which leaves 8 to 10% of ash known as sugarcane bagasse ash (SCBA). SCBA is also used as aggregate replacement material whose emission of carbon dioxide is very less. [10]

3. Conclusion:

Sustainable concrete is nothing but whose environmental hazards are very less and durability is very high. It can improve the qualities of traditional concrete by various methods as mentioned above to get sustainable concrete.

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