

Reviewing the Advancement of Concrete Technology using M-sand

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Abstract: A review is presented in this paper about the application of crushed sand as a smart material in concrete. After a brief outline of the theoretical as well practical studies few measures are reviewed to replace natural sand with manufactured crushed sand. This helps in reducing the likely damage to the ecological balance due excessive sand lifting from river beds, affecting the ground water level. Crushed sand as replaced materials to natural sand has become beneficial and is common in the world. Different researchers have carried out research to study the effect of use of crushed sand on properties of concrete.

Keywords: M-Sand, concrete, aggregate, etc.

I. INTRODUCTION

Currently India has taken a major initiative on developing the infrastructures such as express highways, power projects and industrial structures etc. To meet the requirements of globalization, in the construction of buildings and other structures concrete plays the rightful role and a large quantum of concrete is being utilized. River sand, which is one of the constituents used in the production of conventional concrete, has become highly expensive and also scarce. In the backdrop of such a bleak atmosphere, there is large demand for alternative material. Natural sand is excavated from river bed impacts on environment in many ways. There is erosion of nearby land due to excess sand lifting as well as it destroys the flora & fauna in surrounding areas. Due to limited supply of natural sand, cost is very high and its consistent supply cannot be guaranteed. Under these circumstances use of artificial sand becomes unavoidable. As the supplies of suitable natural sand near the point of consumption are becoming exhausted, the cost of this sand is increasing. In addition to this, the turbulence created by dredging sand

near the estuaries could damage the fragile ecosystem along the coast [1].

Concrete is an artificial material formed by coalition of particles into one solid mass. Concrete is composite of sand, rock, pulverized shake, or other aggregate held together by a solidified glue of pressure driven cement and water. It is made by blending coarse and fine aggregates, water, cement, and added substances in a specific recommended extent. Aggregate is one of the primary fixings in concrete. It covers more than 60-75% of the aggregate volume of any concrete blend. In certain circumstance, blend will be added to satisfy the normal for concrete to be accomplished.

In the ever increasing construction industry, concrete forms the basic building block. Concrete consists mainly of three raw materials apart from water. These are cement, coarse aggregate and fine aggregate. Out of these raw materials, cement and coarse aggregate can be easily manipulated to match the needs of how concrete should be made. While as sand, which amounts to about 35% by volume of concrete, is mainly obtained from natural sources like river beds and the quality and texture of sand cannot be controlled. Sand is mainly obtained by mining it from river beds by sand dragging which causes various environmental issues as it disrupts the natural habitat of these rivers. Sand mining is causing depletion of sand from the river beds at an alarming rate. Thus various laws have been imposed on mining of sand from river beds, due to which it is required to look for a replacement of the natural sand which can be found in the form of manufactured-sand or M-sand, fly ash, quarry dust, crushed glass etc. M-sand has been chosen for replacing

natural river sand [2]. Msand is obtained from granite stone quarries and it acts as a good replacement for the river sand. Plain concrete is a brittle material. Concrete without fibers develops cracks due to plastic shrinkage, drying shrinkage and changes in volume of concrete. Development of these micro cracks leads to elastic deformation of concrete. In order to meet the required values of flexural strength, fibers are used in normal concrete. The addition of fibers in concrete should control the cracking due shrinkage and also reduce the bleeding of water. Fiber reinforced concrete is the concrete which consists of fibers of steel, plastic, glass, natural fibers [vegetable fibers, leaves, twinges, coir, etc.] as the reinforcing material which generally increases its strength. It contains short discrete fibers that are randomly oriented and uniformly distributed [3]. The properties of this concrete changes with the change in cement, fiber materials, geometries, distribution, densities and orientation. Fiber reinforcement is provided to avoid cracking due to shrinkage. The amount of fibers recommended ranges from 0.1 to 3% of the total volume of the composite. The use of natural fibers is economical as compared to synthetic fibers. Natural reinforcing materials are obtained at low costs and at low levels of energy using local manpower and technologies. Utilization of natural fibers as a form of concrete enhancement is of particular interest to lesser developed regions where conventional construction materials are not readily available or are far too expensive. Bamboo and sisal-fiber reinforced concrete have been used for making roof tiles, corrugated sheets, pipes, silos and tanks. Bamboo fibers are strong, light in weight. The addition of Bamboo fiber can reduce the thermal conductivity of the composite specimens. Bamboo fiber is economical, readily available and reasonably increases the strength of concrete. There have been some studies on use of Bamboo fibers in concrete but in this study, a particular ratio of Msand and river sand in the concrete mix has been used which increases the strength of the concrete. The various samples which were made for the above study were tested for three different strength characteristics which are compression, tension and flexural strength for 7 days and 28 days curing.

II. LITERATURE REVIEW

Suresh Sankaranarayanan et al. [4] This article presents manufacturers who have used river sand as a fine aggregate in concrete production. In due course,

construction activity has increased significantly. This leads to a serious lack of good quality sand available and also affects concrete production. Because the excessive extraction of sand from rivers leads to deterioration of river beds and pollution. Furthermore, the extraction of river sand deepens the rivers and interrupts the aquatic way of life. In short, agricultural activities are completely affected. The degradation of rivers is therefore limited. As a result, an alternative solution has become necessary. This means that we can choose sand that has the same properties as river sand. Because the greater practical density of the sand produced would increase the durability of the concrete. In this thesis, the properties of pozzolan sand based on Portland cement were examined.

Vishal Gadgihalli et al. [5] In this work, the analysis of the properties of the concrete that uses the sand produced as a leveling aggregate is examined and the resistance of the concrete and the temperature emitted due to the chemical reaction on normal Portland cement are checked. When using production sand as a leveling aggregate, the temperature emitted by the exothermic reaction of the concrete is decreased. Although the compressive strength of concrete has decreased compared to normal concrete, in which no additives have been used to improve the properties of the concrete.

Nimitha Vijayaraghavan et al. [6] The construction industry uses a large amount of concrete. About 35% of the volume of concrete is made up of sand. Good quality concrete is produced by carefully mixing cement, fine and coarse aggregates, water and additives necessary to obtain optimal quality and economy. Generally, cement and raw aggregates are factory-made products whose quality and standards can be easily controlled and maintained. The water for mixing concrete is generally tap water. The fine aggregates or sand used are normally obtained from natural sources, in particular from beds or banks. Due to the constant sand extraction, natural sand is running out at an alarming rate these days. The sand extracted from the river beds has created several environmental problems. Due to various environmental problems, the government has banned sand from rivers. This resulted in a shortage and a significant increase in the cost of natural sand. It is imperative to find an alternative to river sand. The only long-term replacement of sand is sand.

Zarafath Zimar et al. [7] River sand demand is increasing considerably due to the scarcity of the market. The sand produced (MS) from crushed stone is considered an

appropriate alternative to replace river sand in concrete. However, further studies on MS are needed to reveal the technical properties before use. The main objective of this study is to examine the possibility of using MS in concrete structures of grade 20. In this work, experimental studies on the development of the compressive strength of concrete with sand produced (CMS) have been completed. Conventional river sand was replaced by MS in 0%, 30%, 50%, 70% and 100% concrete mixes and test cylinders were poured for each percentage. CMS cylinders were tested after 7 and 28 days of hardening. The results showed that river sand can be completely replaced by MS. If necessary, add additives to reduce the water. Furthermore, the compressive strength of concrete with MS has been exceeded compared to that of concrete with natural sand with the same W / C ratio. On the other hand, the values of the wells gradually decrease with the increase of the MS in the concrete due to the greater angularity of the sand particles produced.

Bhishma K. Vaidya et al. [8] The huge amount of concrete is used by the construction industry worldwide. This forced the government to impose restrictions on the sand extraction process, which resulted in a shortage and a significant increase in costs. The replacement and replacement of natural sand is that sand is easily produced by grinding natural stone. In this report we have examined residential buildings where different types of concrete have been used, from which the analysis of compressive strength and cost analysis of class M30 are examined.

III. CONCLUSION

A review of different experimental studies performed by various researchers have been carried out to examine various operational parameters viz. workability, durability and compressive strength of concrete with crushed sand as replacement to the natural sand. The data assembled during the course of investigation lead to the following conclusions;

- The concrete with crushed sand performed better than concrete with natural sand as the grade of concrete mix increased.
- The flexural strength of concrete with crushed sand was marginally increased on the strength of concrete with natural sand.
- The workability of concrete manufactured with crushed sand was lesser than that manufactured with natural sand.
- The round shape and smooth surface texture of natural sand reduce the interparticle friction in the fine aggregate component so that the workability is higher in natural sand. Manufactured sand particles are angular in shape and their rough surface texture improves the internal friction in the mix. Because of that the workability is reduced.
- Manufactured sand is free from chemical impurities such as sulfates and chlorides which improves the properties of concrete like strength and durability.

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