Review on Use of Waste Material in Concrete

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Abstract: **Concrete is a mixing of different raw material like binding material (cement+ fly ash), fine aggregate, coarse aggregate and water. Concrete is normally used in all the types of structure. Use of concrete is huge and all the structure are made with this material so availability of this raw material is reduced day by day so cost and requirement of this material is increased. Due to this limitation of availability of natural material we are trying to partially replaced cement by different waste material for this we conducted survey of different paper which gives the idea about effect of different waste material on properties of concrete. The primary objective of this study is to select the waste material which gives proper properties with concrete. This study includes review of different paper published in national and international journals or in conferences.**

Keywords: **Waste materials, Binding aterial, Replacement, Natural materials.**

I. INTRODUCTION

Cement is a binder material used in construction industries. Use of concrete is increased as rate of construction increased. Concrete is used in construction of different engineering and non engineering structures (temporary structures).concrete is nothing but mixture of different raw material like fine aggregate, coarse aggregate, water and binder. Use of this all raw material is increased day by day due to increasing in the rate of construction at same time avaibility of raw material is reduced and some material among natural raw material omits CO2 in to the atmosphere. Use of concrete spoils atmosphere. However, these construction and engineering materials must meet new and higher demands. When facing issues of productivity, economy, quality and environment, they have to compete with other construction materials such as wood, plastic, ceramic, clay, aluminum etc... We can solve this problem by two methods (a) Concrete is replaced by other material, which is very difficult or impossible right now in terms of workability, durability and strength (b) partial or full replace different raw materials. Second option is possible. Now a day‟s lots of invention in the field of concrete technology are carried out by different researcher. We are trying to solve this problem with the help of partial replacement of different waste material for this we have go through different published paper which gives the suggestion of different material which can be used as partial replacement of raw material like cement, fine aggregate and coarse aggregate.

II. LITERATURE REVIEW

A.V.S.Sai. Kumar and Krishna Rao[1] has studied on Strength of Concrete with Partial Replacement of Cement with Quarry Dust and Metakaolin Concrete a composite material made from cement, water, and fine aggregate and coarse aggregate. The present paper deals with partial replacement of cement with quarry dust and metakaolin which are having silica used as admixture for making concrete. They have stated that use of quarry dust as partial replacement of cement up to 25% of partial replacement is beneficial to concrete without loss of strength of cement. They have also done research on effect of quarry and metakaolin on concrete and they have made experiment on 25% quarry dust and 2.5%, 5.0%, 7.5%, 10.0%, 12.5% metakaolin as an partial replacement of cement. Results were found that quarry dust and metakaolin usage in partial replacement to cement can be made. Venkata Sairam Kumar et al. [2] have studied on Partial Replacement Of Cement With Quarry Dust. Quarry dust is a waste from the stone crushing unit accounts 25% of the final product from stone crushing unit. They have concluded that this quarry dust which is released directly into environment can cause environmental pollution. To reduce the impact of the quarry dust on environment and human, this waste can be used to produce new products or can be used as admixture in concrete so that the natural resources are used efficiently and hence environmental waste can be reduced. In this research paper quarry dust is used for partial replacement of cement in concrete to study the strength property of concrete. The aim of the experiment was to find the maximum content of quarry dust used as partial replacement of cement in concrete. The percentages of quarry dust as partially replacement of cement in concrete ware 0, 10%, 15%, 20%, 25%, 30%, 35%, and 40%.From the experimental studied 25% of partial replacement of cement with quarry dust improves hardened concrete properties H. S. Sureshchandra et al.[3] have studied on the Effect of Replacement of Sand by Quarry Dust in Hollow Concrete Block for Different Mix Proportions. In this paper an attempt has been made to determine the properties of hollow concrete blocks produced by replacement of sand by quarry dust. Both partial (i.e.50%) and complete replacement has been tried with and without admixtures.

Baboo Rai et al.[4] has studied on effect of Fly Ash on Mortar Mixes. This paper presented the results of an experimental investigation carried out to

evaluate the compressive strength and transverse strength of 1: 3mortar mixes in which natural sand was replaced with 20%, 50%, and 100% quarry dust by weight which was further modified by partially replacement of cement with different proportion (15%, 20%, 25%, and 30%) of low calcium fly ash. Test results revealed that the combined use of quarry rock dust and fly ash exhibited excellent performance due to efficient micro filling ability and pozzolanic activity. Tasnia Hoque et al.[5] have studied Influence of Stone Dust as Partially Replaced material of Cement and Sand on some Mechanical Properties of Mortar. Mortar is one of the most important components in reinforced concrete structural member. In this paper they have investigated on the mechanical properties of mortar modified by stone dust as replacing material of both fine aggregate and cement. Properties of mortar were investigated with the replacement of 25% and 50% of fine aggregate and also 5% of cement by stone dust. This work has indicated that 25% replacement level exhibit higher strength than the controlled sample. A.Krishnamoorthi, and G. Mohan Kumar.[6] have studied on Properties of Green Concrete Mix by simultaneous use of Fly Ash and Quarry Dust. The raw materials of concrete consist of cement, sand and crushed aggregates. Partially replacement of these raw materials by waste products may reduce the energy consumption and also reduce the environment pollution. Fly ash can be used as packing materials and helps to reduce the total voids content in concrete. However, the used of fly ash lead to a reduced in early strength of concrete .The decrease in workability by the addition of quarry dust was reduced by the addition fly ash. This paper investigated the workability and strength characteristics of Quarry Dust Concrete (QDC) containing 0% to 30% of fly ash. Chandana Sukesh et al.[7] have stated about Partial Replacement of Sand with Quarry Dust in Concrete. Quarry dust, a by-product from the crushing process during quarrying activities is one of such materials. Granite fines or rock dust is a by-product obtained during crushing of granite rocks and is also called quarry dust. In recent days there were also been many attempts to use Fly Ash, an industrial by product as partial replacement for cement to have higher workability. This paper was an attempt to use Quarry Dust as partial replacement for Sand in concrete.

T. Subbulakshmi and B. Vidivelli.[8] have been studied Mechanical Properties of High Performance Concrete A High performance concrete is something which demands much higher performance from concrete as compared to performance expected from routing concrete. Use of chemical admixtures reduced the water content, thereby reduced the porosity within the hydrated cement paste. The demand for natural sand in the construction industry has successively increased which has resulted in the reduction of sources and an increase in price. In such a situation the quarry dust can be an economical alternative to the river sand. Therefore the quarry dust should be used in construction works, then the cost of construction would be saved significantly and the natural resources would be used efficiently. In this study, they have obtained the quarry dust material sample from the source of Thiruvakkarai and perumukkal source from Villupuram district. The scope of the present study is to investigate the effect of quarry dust towards the performance of High performance concrete. The mechanical properties of High performance concrete with quarry dust at the replacement levels of 0%, 50%, and 100% were studied from the studies contained, it was observed that quarry dust plays a very important role in improving the strength of concrete.

Ms. Monica C. Dhoka.[9] has studied about Green Concrete: Using Industrial Waste of Marble Powder, and Paper Pulp Green Concrete is capable for sustainable development is characterized by application of industrial waste such as marble powder, quarry dust, wood ash, paper pulp, etc… to reduce consumption of natural resource and energy and pollution of the environment. Used of such waste material saved 14%-20% amount of cement. M.V.Rama Raju et al.[10] have been Studied of Properties of SCC using „Quarry Dust" and „Fly Ash The reduction in the sources of natural sand and the requirement for reduction in the cost of concrete production has resulted in the increased need to identify substitute material to sand as fine aggregates in the production of concretes especially in Self Compacting Concrete. Quarry dust, a by-product from the crushing process during quarrying activities is used. Granite fines or rock dust is a by-product obtained during crushing of granite rocks also used. This paper was an attempted to used Quarry Dust and Fly Ash as partial replacement for Sand and Cement respectively in SCC. Attempts have been made to study the properties of such SCC and to investigate some properties of Quarry Dust & Fly Ash and the suitability of those properties to enable them to be used as partial replacement materials for sand and cement in concrete. Dr. A.D. Pofale and Syed Raziuddin Quadri.[11] have studied on Effective Utilization of Crusher Dust in Concrete Using Portland Pozzolana Cement. The present investigation was taken up with a view to verify the suitability, feasibility and potential use of crusher dust. In view of above discussion, an attempt was made to replaced the natural sand in concrete control mixes of M25 and M30 grades designed for 100 to 120mm slump at replacement levels of 30%, 40%, 50% and 60% using Portland Pozzolana Cement. It was found that amongst all the mixes, the highest compressive strength was obtained for 40% replacement of sand by crusher dust. Hence it could be concluded and recommended that crusher

dust could be effectively used in concrete for replacement levels of sand by 30-60% economically leading to sustainable development.

D. A. Opeyemi and O. O. Makinde.[12] have studied on effect of replacement of cement by rise husk and they stated that mixture of Rice Husk Ash and Bone Powder were used as partial replacement for cement in concrete structures. In this paper, the replacement of rise husk varied from 5% to 20% in a mix of 1:2:4. Cubes casted. and the results showed that workability were consistent within the described values for lightweight concrete.Substitution of the mixture should not be more than 10% for the best result in the concrete production for concrete structures. There is reduction in density of the concrete from 0 - 10% replacement of material, and an increase in 10% - 20% which shows that the unit weight of concrete first reduced, which in turn leads to reduction in total self-weight of the structure. Amitkumar D. Raval et al.[13] have studied about effect of partially replaced ceramic waste concrete and they stated in this research they studied the (OPC) cement has been replaced by ceramic waste powder accordingly in the range of 0%, 10%, 20%, 30% 40%, & 50% by weight of M-20 grade concrete. Concrete mixtures were produced, tested and compared in terms of compressive strength to the conventional concrete. Thes tests were carried out to evaluate the mechanical properties for 7, 14 and 28 days. As a result, the compressive strength achieved up to 30% replacing cement with ceramic waste. This research work was concerned with the experimental investigation on strength of concrete and optimum percentage of the partial replacement by replacing cement via 0%, 10%, 20%, 30%, 40% and 50% of ceramic waste. Sonali K. Gadpalliwar et al.[14] have studied about the effect of partially replaced cement by GGBS. They have stated that partial replacement of natural sand (NS) with Quarry sand and partial replacement of cement with GGBS and RHA can be an economic alternative. This research was carried out in three phase, in first phase mix of M40 grade concrete with replacement of 0%,15%,30%,45%,60%,75%,90% and 100% of quarry sand with natural sand is carried out to determine the optimum percentage of replacement at which maximum compressive strength was achieved. It was observed that when natural sand was partially replaced with 60% quarry sand maximum strength was achieved. In second phase, cement is partially replaced with GGBS by 10%, 20% and 30%. In phase three, combination of GGBS and RHA is partially replaced with cement. The composition of 22.5% GGBS + 7.5% RHA with 60% of quarry sand gives good strength results. Eknath P.Salokhe and D.B.Desai[15] have studied on partial replacement of cement with foundry waste and they have stated that foundries successfully recycle and reuse the sand many times in casting process. Foundry sand can be used in concrete to improve its strength and other durability factors. Foundry Sand can be used as a partial replacement of cement or as a partial replacement of fine aggregates or total replacement of fine aggregate and as supplementary addition to achieve different properties of concrete. In this research paper experimental investigations were performed to evaluate the comparative study of the properties of fresh & hardened concrete containing ferrous & non-ferrous foundry waste sand as fine aggregate replacement. Fine aggregates were replaced with four percentages of foundry sand. The percentages of replacements were 0, 10, 20, & 30% by weight of fine aggregate & tests were performed for all replacement levels of foundry sand for M20 grade concrete at different curing periods (7 & 28 days).and they have concluded that foundry waste can be used as a partial replacement of cement and fine aggregate.

A. A. Raheem and O. K. Sulaiman[16] have studied about the partial replacement of cement with saw dust and they have stated that the use of Saw Dust Ash (SDA) as partial replacement for ordinary Portland cement (OPC) in sandcrete blocks. They have made hollow blocks by partially replacing the cement content with 5% to 25% by weight of SDA, using vibrating block moulding machine. The blocks produced were tested to determine their density, compressive strength and water absorption rate. The results indicated that compressive strength of sandcrete hollow blocks at 28 days are 2.16N/mm2, 1.94N/mm2, 1.64N/mm2, 1.59N/mm2,1.39N/mm2, and 1.25N/mm2 for Control, 5%, 10%, 15%, 20% and 25% SDA contents respectively. At 56 days, the compressive strength of blocks with 5% and 10% SDA replacement are 2.33N/mm2 and 2.04N/mm2 respectively, both of which surpassed the required standard of 2.00N/mm2 specified by the National Building Code (2006). K. Muthusamy and Z. Nur Azzimah[17] have studied on partial replacement of cement by Palm Oil Fuel Ash and they have stated that issue of environmental pollution resulting from disposal of Palm Oil Fuel Ash (POFA) which is a by-product from palm oil mill. In this paper they have investigated the effect of palm oil fuel ash content as partial cement replacement towards compressive strength OPS lightweight aggregate concrete. Several OPS lightweight aggregate concrete mixes were produced by replacing various percentage of POFA ranging from 10, 20, 30, 40 and 50%, respectively by weight of cement. All the mixes were cast in form of cubes. The compressive strength test is conducted in accordance to BSEN 12390 (2009) at 7 and 28 days. From the results, it was observed that the combination of appropriate POFA content would enhance the compressive strength of OPS lightweight aggregate concrete. Specimen produced using 20% POFA as partial cement replacement. exhibit higher value of compressive strength than

that of control OPS lightweight aggregate concrete. However, mixes consisting POFA up to 50% is also suitable for structural application.

III. CONCLUSION FROM LITERATURE REVIEW

Ceramic waste	Silica Fume	Alkofile
Marble Dust	Born Powder	Pond Ash
Granite Dust	GGBS	Glass Powder
Fly Ash	Foundry Waste	Palm Oil Fuel Ash
Rise Husk	Quarry Dust	Saw Dust

From Literature review we have studied that above materials can be used as a partial replacemenent of cement .

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