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Partial Replacement of Cement and Fine Aggregate by using Sugarcane Ash and Waste Glass Aggregate for Rigid Pavement- A Review

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Abstract - *This paper attempts the investigations on the use of sugarcane bagasse ash and waste glass aggregate with the partial replacement of cement and fine aggregate for rigid pavement in road construction. In developed countries use of mineral admixtures such as fly ash, silica fume, plastic waste and rise husk ash etc is already adopting to prepare concrete. This includes commercial application on large scale either for addition or for replacement of cement. In our country too much replacement has been already planned and adopted with the introduction of ready mix concrete and the process has been accelerated in recent time in order to effects the economy in construction industry. An investigation is undertaken to study the effect of sugarcane bagasse ash and waste glass aggregate with partial replacement of cement and fine aggregate in concrete. In this study the mechanical properties at different % of replacement is to be proposed. Locally available bagasse ash and waste glass aggregate from Khargone (M.P.) region is proposed for the study. Cement is partially replace with bagasse ash by 5%,10%,15%&20% and Natural Sand is partially replace with 10%,15%,20%,&25%. Ordinary Portland Cement 53 grade cement is used in the study. The effect of replacement of cement by bagasse ash on properties like workability for fresh concrete are tested and for hardened concrete compressive strength at the age of 7 days and 28 days are determined.*

Keywords- *Bagasse Ash, waste glass, aggregate, Cement, Workability, Flexural & Compressive Strength.*

I. INTRODUCTION

As we know that the roads are the link of every nation. A country's road network should be capable in order to make best use of economic and social reimbursement. Roads are a fundamental part of the convey system. They play an important role in achieving national growth and causal to the overall performance and social functioning of the community. It is recognized that roads improve mobility, taking people out of isolation and therefore poverty. Roads play a very important role in the socio-economic progress of the country. The road transport industry is the backbone of strong economies and dynamic societies. It plays a crucial role in the daily economic and social life of industrialized and developing countries alike. An important part of the road transport industry is sustainable progress. Due to the above mentioned advantages, the road transport has become very popular and its share is constantly increasing. It is therefore legitimate and indispensable to safeguard an industry that is vital to economic growth, community development and ultimately peace and which plays a crucial role in everyone's life in industrialized and developing countries alike by meeting the demand for the sustainable mobility of both people and goods. As we know that due to limited availability of natural resources and rapid urbanization, there is a shortfall of conventional building construction materials. Thus the funds required for the construction of roads also increase. These financial constraints hamper the development of a developing nation like India. Also energy consumed for the production of conventional building construction materials pollutes the air, water and land. The growth of transport not only leads to pressure on limited availability of nonrenewable energy resources but also gives rise to environmental issues. Moreover, the various processes for the production and processing of cement, bitumen, fine and coarse aggregate require a lot of energy and production of harmful gaseous and chemical wastes into the environment. As the demand for transport services rise, it leads to increased use of scarce land resources and contributes to the atmospheric pollution in a big way. But on the other hand, there is a large production of agricultural wastes such as rice husk ash, wheat straw ash, hazel nutshell, fly ash, cork and sugarcane bagasse ash. Agriculture industry is the largest industry in India as more than 70% of Indian population is dependent on it. It is observed that in India more than 600 MT wastes have been generated from agricultural wastes-(2010). Sugarcane is largely produced in the states of Punjab, Haryana, Uttar Pradesh and Tamil Nadu. The state of Uttar Pradesh is called the "Sugar Bowl" of India. A large number of sugarcane processing industries are located in these areas. But a large quantity of wastes called as bagasse is produced from these sugarcane processing industries.

Glass is a transparent material produced by melting a mixture of materials such as silica, soda ash, and CaCO3 at high temperature followed by cooling where solidification occurs without crystallization. Glass is widely used in our lives through manufactured products such as sheet glass, bottles, glassware, and vacuum tubing. One of its significant contributions is the construction field where the waste glass was reused for concrete production. The application of glass in architectural concrete still needs improvement. Several study have shown that waste glass that is crushed and screened is a strong, safe and economical alternative to sand used in concrete. During the last decade, it has been recognized that sheet glass waste is of large

volume and is increasing year by year in the shops, construction areas and factories. Using waste glass in the concrete construction sector is advantageous, as the production cost of concrete will go down. The amount of waste glass is gradually increased over the years due to an ever-growing use of glass products. Most of the waste glasses have been dumped into landfill sites. The land filling of waste glasses is undesirable because they are not biodegradable, which makes them environmentally less friendly. There is huge potential for using waste glass in the concrete construction sector. When waste glasses are reused in making concrete products, the production cost of concrete will go down (Topcu and Canbuz, 2004). Crushed glass or cullet, if properly sized and processed, can exhibit characteristics similar to that of gravel or sand.

II. LITERATURE REVIEW -Various studies have been carried out in the current earlier period on the use of sugarcane bagasse & waste glass in the development of modified concrete. These studies reinforce the view of using this vast bulky waste in the construction of pavements. The various findings in this field are as tabulated below:-

1) **Akash G, Madhukar K, Chetan, Aishwarya T, Dinesh S Magnur, Dr. Shivakumara B** in construction industry and due to less availability of sand the cost is also high. So this research were conducted for potential use of sugar factory waste such as sugarcane bagasse ash was partially replaced by sand in the ratio of ,10%,20%,30%,40% by conducting freshened and hardened stage tests prove that the SCBA can be replaced with sand up to 10% will give the better result as normal concrete and it found economical.
2) **G. Nithin Kumar Reddy , G. Harsha Vardhan , S. Vijaya Bhaskar Reddy** SCBA concrete performed better when compared to ordinary concrete up to 10% replacement of sugar cane bagasse ash due to presence of high amount of silica in SCBA • Compressive strength was decreased when cured in 5% MgSo4 comparatively when cured in normal water. • It is observed that the usage of sugarcane bagasse ash in concrete helps in increasing the resistivity towards sulphate attack. • The percentage reduction in compressive strength was decreasing with increase in percentage replacement of sugarcane bagasse ash when cured in 5% MgSo4 which concludes that SCBA helps in resisting the concrete towards sulphate attack.
3) **R.Prakash**, The experimental result shows that the increase in the strength of concrete can be achieved by replacing 10 % of bagasse ash by the weight of cement. The increase in strength maybe due to the pozzzolonic properties of bagasse ash. Though the increase in strength is very minimum, the cost reduction of concrete can be achieved due to the 10 % less consumption of cement in the concrete. Using bagasse as replacement of in concrete, the emission of greenhouse gases can be reduced due to less production of cement. The spilit tensile strength of control concrete and bagasse concrete are around 10 % of the corresponding compressive strength of concrete, which resembles it is similar to conventional concrete. The results indicate that bagasse ash can be used as a pozzolanic material in concrete with an acceptable strength, lower heat evolution, and reduced water permeability with respect to the control concrete. Also the environment can be kept clean as land filling of bagasse is avoided.
4) **Kamal Ranout* and Er. Prachi Vasistha** Waste glass is the better idea to use in concrete as fine aggregate as India produce 22 million metric ton of waste glass per year and recycles only 45% of it. Fine aggregates replaced by glass with 3%, 6%, 9%, 12%, 15% in M40 mix. In this research also alccofine 1203 used to provide additional strength to concrete. Tests performed on these examples were: compressive strength, split tensile strength, flexural strength test, SEM and XRD test. Findings: Strength increases with the addition of glass particles to the concrete by partially replacing fine aggregates. Alccofine addition to glass as additive helps to improve the strength properties of glass concrete due to its micro size. Strength increases as replacement of 5%, 7% to 9 % due to angular shape of glass molecules. Improvement: Size of the waste glass can be finer and more Alccofine may be added.
5) **K.Lineesh, D.Sivakumar, S.Janaki Sundaram** International The recycled materials can be used effectively in architectural and civil engineering fields. They can stand close to the concept of green concrete which is in compatible with the environment. Foundry sand from casting industries is a waste material which is dumped extensively and in shops, damaged glass sheets & sheet glass cuttings are go to waste, which are not recycled at present and usually delivered to landfills for disposal. Using Glass powder and waste foundry sand in concrete is an interesting possibility for economy on waste disposal sites and conservation of environment. The constant depletion of sand beds at all major sources of availability is a major concern and thus efforts are taken in order to replace sand in construction activities. In this study, effect of foundry sand and glass powder as fine aggregate replacement on the compressive strength, flexural strength and split tensile strength of concrete with a mix proportion of 1: 1.28: 2.56: 0.45 was compared and investigated at different limited curing periods (7 days and 28 days).The percentage of foundry sand and glass powder used for replacement were (10%, 20%, and 30%) by weight of fine aggregate. Test showed impressive results, showing capability of glass powder for being a component in concrete is very much appreciable than the foundry sand because GP giving higher strength results. Making concrete from waste materials saves energy and conserves resources which lead to a safe sustainable environment.

III. SCOPE OF WORK

Laboratory tests on cement, fine aggregate, coarse aggregate, bagasse ash& Waste Glass agregate, water. Whatever may be the type of concrete being used, it is important to mix design of the concrete? The same is the case with the industrial waste based concrete or bagasse ash& Waste Glass aggregate replacement. The major work involved is getting the appropriate mix proportions. In the present work, the concrete mixes with partial replacement of cement & fine aggregate with bagasse ash & Waste Glass aggregate will develop using OPC 53 grade cement. A simple mix design procedure is adopted to arrive at the mix proportions. After getting some trail mix, cubes of dimensions 150mm x 150mm x 150 mm will caste and cure in the curing tank for 14&28 days. Compressive strength, Split tensile strength and Flexural strength of concrete will conducted to know the strength properties of the mixes. Initially, a sample mix design will follow and modifications will made accordingly while arriving at the trail mixes to get optimized mix which satisfies both fresh, hardened properties and the economy. Finally, a simple mix design will propose.

IV. Objectives of Study

The main objectives of the proposed experimental study is as below-
1) To study the physical properties of SCBA modified concrete.
2) To study the workability of a fresh sample of this concrete.
3) To study the different strengths of hardened concrete such as compressive strength of concrete samples at 7 and 14 days.
4) To compare the workability and various strengths for different percentage substitutions of cement and sand with sugarcane bagasse ash.

Conclusion

From the study of work presented in the various papers, it was observed that baggase ash & waste Glass particals with Cement & aggregates can be successfully utilized in the partial replacements of cement &fine aggregates in the concrete. Out of the replacement in the ingredients of the concrete, baggas ash &waste glass Particals is found to be most suitable for the structural applications. The results demonstrated that utilization of baggas ash & glass powder might increase the compressive strength, flexural strength, workability and tensile strength of the concrete. Moreover the concrete containing baggase Ash & waste glass particals will also prove to be economical and environment friendly as compared to conventional concrete. So a detailed study will be undertaken in the nominal concrete with the baggas ash &glass particas as partial replacement of cement & fine Aggregate.

References

1)Experimental Study On Partial Replacement Of Sand With Sugarcane Bagasse Ash In Concrete Akash G, Madhukar K, Chetan, Aishwarya T,Dinesh S Magnur, Dr. Shivakumara B, International Research Journal Of Engineering And Technology
2) Partial Replacement of Cement in Concrete with Sugarcane Bagasse Ash and its Behaviour in Aggressive Environments G. Nithin Kumar Reddy , G. Harsha Vardhan , S. Vijaya Bhaskar Reddy IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN : 2320–334X PP 29-35
3) Mechanical Properties of Concrete with Partial Replacement of Bagasse Ash) ,R.Prakash, International Journal of Advance Engineering and Research Development Volume 4, Issue 7, July -2017
4) Partial Replacement of Fine Aggregates with WasteGlass in Concrete With Respect To ConventionalConcrete with Alccofine Kamal Ranout* and Er. Prachi VasisthaIndian Journal of Science and Technology, *Vol 11(31), DOI: 10.17485/ijst/2018/v11i31/130501,* August 2018
5) Comparative Study on Partial Replacement of Fine Aggregate by Glass Powder and Foundry SandK.Lineesh1, D.Sivakumar,S.Janaki Sundaram International Journal of Advanced Information ScienceandTechnology(IJAIST)ISSN:2319:2682Vol.3,No.12,december2014.