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USE OF SUGARCANE BAGASSE ASH AS A PARTIAL REPLACEMENT IN CONCRETE MATERIALS: A REVIEW

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ABSTRACT

Recycled waste is produced by various industries like thermal power plant, steel plants, brick & stone industry, coal industry & sugar industry etc. These three products can be reused as a partial replacement of dry concrete ingredients in the construction industry. Sugarcane Bagasse ash (SCBA) is one of the main sources of recycled waste for civil engineering construction backgrounds. Sugarcane bagasse is an agricultural waste that can be transformed by incineration into a cement replacement material for various cementing purposes.

The article summarized the literature review of the investigation of finely ground bagasse ash (GBA) in the production of engineered cementitious compounds (ECCs). The different research paper based on the use of sugar bagasse in concrete can get the optimized concrete strength with economic cost. The use of biomass waste as a supplementary cementitious material (SCM) in concrete has drawn the attention of researchers to the efficient use of waste and a reduction in cement demand. One such example of biomass waste is Sugarcane bagasse ash (SCBA). The review shows that cement is used in a large area when it is used in the form of ash.

Keywords: Sugarcane Bagasse Ash (SCBA), Recycled Waste, Concrete, Cement, Cementitious Compounds.

I. INTRODUCTION

The construction industry relies a lot on cement for its operations in the development of shelter and other infrastructural facilities. It then becomes extremely difficult for majority of the people to own their own houses. In recent years, remarkable efforts have been taken in the domain of concrete engineering and technology to research and study the utilization of by-products and waste materials in the production of concrete. The successful utilization of these raw materials will result in the reduction of global warming and environmental loading, waste management cost and concrete production cost, besides enhancing the properties of concrete in both fresh and hardened state. Efforts in this direction have been focused in identifying and optimizing the benefits of different types of cement replacement materials as well as identifying alternative materials as aggregates in concrete and by better perceptive of constituent's chemistry of the concrete mix.

Ordinary Portland cement is recognized as the major construction material throughout the world. Industrial wastes, such as blast furnace slag, fly ash and silica fume are being used as supplementary cement replacement materials. In addition to these, agricultural wastes such as rice husk ash, wheat straw ash, and sugarcane bagasse ash are also being used as pozzolanic materials and hazel nutshell used as cement replacement material. When pozzolanic materials are added to cement, the silica (SiO2) which is present in these materials reacts with free lime released during the hydration of cement and forms additional calcium silicate hydrate (CSH) as new hydration products, which improve the mechanical properties of concrete formulation. The ash produced by controlled burning of agro waste materials below 700^{0}C incinerating temperature for one hour transforms the silica content of the ash into amorphous phase and the reactivity of amorphous silica is directly proportional to the specific surface area of ash. The ash so produced is pulverized or ground to required fineness and mixed with cement to produce concrete and Mortar. Thus the SCBA (Sugarcane Bagasse ash) ash properties depend on burning time, temperature, cooling time and grinding conditions. India being one of the largest producers of sugarcane in the world produces 300 million tons per year and large quantity of sugarcane bagasse is available from sugar mills. Sugarcane bagasse is partly used as fuel at the sugar mill. Only a few studies have been reported on the use of SCBA as pozzolanic material in respect of cement paste. The objective of the present investigation is to evaluate SCBA as supplementary cementations material with reference to mechanical properties of hardened concretes and Mortar and identify the optimal level of replacement.

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SUGARCANE BAGASSE ASH (SCBA)

For this Research Work Sugarcane bagasse ash used was obtained from purti power plant, bela ,Nagpur. Sugarcane baggase ash is a byproduct of sugar factories and it is produced by burning sugarcane baggase where it is formed by extracting all sugar from sugarcane, for the use of SCBA as a partial replacement of cement in concrete and mortar, it is tested in various part of the world. SCBA was found that it improves the properties of concrete such as compressive strength and water tightness in some percentage of replacement and fineness. The main parameter responsible for this improvement was higher silica content. The silica content may vary from ash to ash and this content is depending on the burning condition of sugarcane baggase. SCBA is a valueless agricultural waste product but it has a pozzolanic property which can be used to replace cement in concrete and mortar, first reaction is the hydration reaction which takes place after addition of water in cement to form calcium hydroxide (CH) and calcium silicate hydrate (C-S-H). The second reaction is pozzolanic reaction which takes place between CH from hydration reaction and SiO_2 a pozzolona from SCBA and produced second phase of CSH which increase the compressive strength. Initiatives are taken worldwide to control and to manage the agricultural waste to prevent environment pollution. The solution is found out to burn these waste materials. Variation in burning temperature and duration of burning, size of particle, chemical composition has been studied rigorously. Aim of this study was to evaluate the potential use of SCBA as partial replacement of cement in mortar and concrete.

Fig.1: Raw Sugarcane Bagasse

Fig.2: Sugarcane Bagasse Ash

II. LITERATURE REVIEW

The following research paper is studied to get knowledge about the use of sugar can baggas in concrete which are as follows:

D. Neeraja, S. Jagan, Satheesh Kumar and P. G. Mohan (2014) Researchers investigated the use of Sugarcane Bagasse Ash (SBA), a finely ground waste product from the sugarcane industry, as a partial replacement for cement in conventional concrete. The disposal of this material causes environmental problems in sugar factories. On the other hand, the intensification of construction activities in the country has led to shortages of most concrete production materials, especially cement, which has led to an increase in prices. The percentages selected for this study are 0%, 5%, 10% and 15% of cement mass in concrete. Based on the experimental tests, it can be concluded that SBA, an agricultural waste product, can be effectively used for the partial replacement of cement, thereby reducing CO2 emissions and disposal problems to a certain extent.

Nithin Kumar Reddy, G. Harsha Vardhan, S. Vijaya Bhaskar Reddy (2016) The article deals with the replacement of cement with bagasse ash in fixed proportions and the analysis of the effect of magnesium sulfate on SCBA mixed concrete. The concrete mix is designed by changing the proportions of Bagasse ash 0%, 5%, 10%, 15%, 20%, 25% cubes are cast and hardened in normal water and 5% magnesium sulfate solution at 7 years of age. At 28 and 60 days, properties such as slump cone test and compaction factor test for fresh concrete and compressive strength for hardened concrete are checked and the results are analyzed.

Chandru.G, Vignesh.V, Dr. Saravanan. R (2019) The study was carried out by replacing cement with bagasse ash in fixed proportions. Four different experiments were carried out to determine the ultimate compressive strength and tensile strength in comparison with that of normal concrete using a grade partially replaced with bagasse ash at 0%, 5%, 10%, 15% and 20% by weight of cement. M-20 on the 7th and 28th. Test results show that the strength of concrete increases by up to 20% Substitution of sugarcane ash with cement.

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Prashant O Modania, M R Vyawahare (2013) Cane sugar is one such fibrous waste product of the sugar refining industry, along with ethanol vapor. Bagasse ash mainly contains aluminum ions and silica. In this work, raw sugarcane ash was partially replaced with 0%, 10%, 20%, 30% and 40% by volume of fine aggregates in concrete. Fresh concrete tests such as compaction factor test and slump cone test were performed along with hardened concrete tests such as compressive strength, splitting tensile strength and sorption. The result shows that bagasse ash can be a suitable substitute for fine aggregate.

K Meeravali1, K V G D Balaji2, T. Santhosh Kumar (2014) The researcher used the concept of replacing cement with sugarcane bagasse up to 25% at regular intervals of 5%. To analyze the behavior of SCBA concrete in HCl, cast samples are cured in 5% HCl solution for 7, 28 and 60 days. The water binder ratio adopted is 0.4. The use of mixed materials in concrete reduces the heat of hydration and increases the life of the structure. When calcium hydroxide reacts with hydrochloric acid it releases ettringite (and CaCl2) which possesses a crystal-like structure that makes concrete porous and allows external chloride ions to penetrate the concrete, leading to loss of concrete weight and strength. In this paper an attempt is made to demonstrate that SCBA helps to limit this attack of HCl on concrete.

Pallavi S. Kumbhare, Shifa Tanwar, Yogesh Thosar, Yash Dudhe, Gaurav Rudrakar, Krushna Teware (2019) Concrete is a mixture of cement, fine aggregate, coarse aggregate and water, concrete plays a vital role in infrastructure development in this experimental study that SCBA (sugarcane ash) which is a by-product of sugarcane and it can be used as a partial replacement material for ordinary Portland cement in concrete. The higher amount of silica present on it reacts with the cement component, therefore, it increases the properties of the cement. This experimental study focuses on analyzing the strength characteristics of M20 grade concrete with cement replacement with SCBA 10%, 20%, 30% and compares with plain mix cement concrete in terms of cube compressive strength for 7 days, 14 days and 28 days respectively. .

Lathamaheswari, R., Kalaiyarasan, V and Mohankumar, G (2017) Sugar-cane bagasse is one such fibrous waste product of the sugar mills and sugar refining industry. The bagasse ash with alumina and silica, creates disposaland environmental problems around the factories.The use of such ash in concrete by partial replacement of cement, not only reduces the cost of making concrete, but also improves the properties of concrete and reduces environmental pollution. This paper presents the attempt made in making concrete with partially replacing cement by 2.5, 5.0, 7.5,10 and 12.5 % of bagasse ash. Mix design is made for conventional M20 grade, conventional and ash based concrete prepared, the workability, strength and durability characteristics are determined through proper testing and the results are compared. The optimum level of cement replacement with bagasse ash is observed to be 7.5 percent.

Memon, S.A. Javed, U. Shah, M.I. Hanif, A. (2022). In this study, the effect of SCBA processed as SCM in concrete was investigated. SCBA processing involves the removal of fibrous and carbon-containing particles by sieving followed by grinding. SCBA was ground for 45 minutes until the surface area was comparable to cement and then used for further characterization and incorporation into concrete. A grinding time of 45 minutes resulted in 2.92 times higher pozzolanic SCBA reactivity. SCBA was incorporated by replacing cement in different weight fractions (10%, 20%, 30%, 40%) in concrete. The test results show that the workability of concrete increases with the incorporation of SCBA, while the density of the resulting concrete decreases. The results of mechanical properties, including compressive strength and hardened density, were improve d after cement replacement by SCBA. Concrete containing 30% SCBA can be used for structural applications because its 28-day compressive strength is 21 MPa, which complies with ACI 318-16 specifications. The resistance of concrete to scaling and leaching due to the adverse effects of sulfuric and hydrochloric acids increases significantly with the addition of SCBA and is due to the microstructure density by the formation of secondary hydrates due to the lower content of portlandite detected by thermogravimetric analysis. Thus, SCBA processing increases its reactivity, as reflected by better mechanical properties and better durability of SCBA-incorporated concrete.

P V Rambabu, G V Rama Rao (2017) Sugarcane bagasse is one such cement replacing pozzolanic material. The positive effect of using sugarcane bagasse in concrete includes Producing concrete of better rheology, higher strength and enhanced durability. Preservation of lime stone and coal reserves Minimizing greenhouse gas emissions associated with manufacturing of OPC. Considering the above beneficial effects of using

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sugarcane bagasse in concrete, this should be considered as resource material rather than an industrial waste. The present experimental investigation was carried on bagasse ash and has been chemically and physically characterized, and partially replaced in the ratio of 0%, 5%, 10%, 15% and 20% by weight of cement in concrete. The variable factors considered in this study were concrete of grade M60 for a curing period of 28 days, 60 days and 90 days of the concrete specimens in 1%, 3%, 5% H_2SO_4 and HCl solution. Test for compressive strength at the age of 28days, 60days and 90days were conducted and results are presented.

Sagar Dhengare, Sourabh Amrodiya, Mohanish Shelote, Ankush Asati Nikhil Bandwal, Anand Khangan, Rahul Jichkar M(2015)

In developing countries, accumulation of unmanaged agricultural waste has resulted in an increased environmental concern. Recycling of such agricultural wastes is the viable solution not only to pollution problem, but also the problem of land filling. In view of utilization of agricultural waste in concrete and mortar, the present paper reviews, utilization of sugarcane bagasse ash (SCBA) in different compositions that were added to the raw material at different levels to develop sustainable concrete and mortar. Various physico-mechanical properties of the concrete and mortar incorporating sugarcane bagasse ash are reviewed and recommendations are suggested as the outcome of the study. The study in turn is useful for various resource persons involved in using SCBA material to develop sustainable construction material

Vikas Kumar, Pankaj Kumar (2022)

This study presents the findings on the strengths, permeability, and structural behaviour of concrete beams containing sugarcane bagasse ash and laterite soil. The goal of the research was to combine traditional concrete with sugarcane bagasse ash to produce sugarcane bagasse ash laterised concrete, which could be used for the construction of low-cost housing. Ash from sugarcane bagasse and lateritic soil were used as blenders and blended with regular concrete materials. Cement was largely replaced with sugarcane bagasse ash in the following proportions by mass: 0%, 5%, 10%, and 15%. The impact of different degrees of material substitution on the workability and compressive strength of concrete was investigated using a concrete mixture with the proportions 1:2:4 and a water-to-cement ratio of 0.55. The same mixture was utilised, but this time with a continuous slump of 30mm+3mm. This was done in order to assess the influence of different degrees of combination material replacement on the characteristics of concrete and the behaviour of structural beams.

Srinivasan, R. and Sathiya, K. (2010)

This waste product (Sugar-cane Bagasse ash) is already causing serious environmental pollution, which calls for urgent ways of handling the waste. Bagasse ash mainly contains aluminium ion and silicachemical and physical characterization, and partially replaced the SCBA in the ratio of 0%, 5%, 15% and 25% by weight of cement in concrete. Fresh concrete tests like compaction factor test and slump cone test were undertaken as well as Hardened concrete tests such as Compressive strength, split tensile strength, flexural strength and modulus of elasticity at the age of 28 days was obtained. The results show that the SCBA in concrete had significantly higher compressive strength, tensile strength, and flexural strength compare to that of the concrete without SCBA. It is found that the cement could be advantageously replaced with SCBA up to maximum limit of 10% as well as the workability was found to have increased. The results produced demonstrated that there was decrease in the density of concrete with SCBA. Therefore it became possible to use sugarcane bagasse ash (SCBA) as cement replacement material to improve the quality and reduce cost of concrete. All the tests were carried according to Indian standards.

Nuntachai C, Chai J., (2009)

Portland cement type the research carried out with the replaced (0-30%) by ground or un-ground bagasse ash. The physical properties of concrete containing ground bagasse ash (BA) including compressive strength, water permeability, and heat evolution were investigated & all tests were done in accordance with American standard. When bagasse ash is ground up into small particles, the compressive strength of concrete containing this ground bagasse ash improves significantly. It was found that concrete with bagasse ash in grounded state had 113% more compressive strength than that of conventional concrete. The low water permeability values of concretes containing ground bagasse ash at 90 days were mostly caused by the pozzolanic reaction, which filled up the voids and increased the concrete density. The higher the replacement fraction of Portland cement by

ground bagasse ash, the longer the delay time to obtain the highest temperature rise. This may be due to the super plasticizer, which can delay the hydration reaction of concrete. Concrete containing up to 30% ground bagasse ash had a higher compressive strength and a lower water permeability than the control concrete, both at ages of 28 and 90 days.

Kawade U, Rathi V. (2013) studied the effect of use of SCBA on strength of concrete by partial replacement of cement at the ratio of 0%, 10%, 15%, 20%, 25% and 30% by weight for compressive strength. If some of raw material having similar composition can be replaced by weight of cement in concrete then cost could be reduced without affecting its quality. It is found that the cement could be effectively replaced with SCBA up to maximum limit of 15%. Partial replacement of cement by SCBA increases workability of fresh concrete; therefore use of super plasticizer is not essential. All tests were done in accordance with Indian standard. the SCBA concrete had significantly higher compressive strength compare to that of the concrete without SCBA. It is found that the cement could be advantageously replaced with SCBA up to maximum limit of 15%. Although, the optimal level of SCBA content was achieved with 15.0% replacement. Partial replacement of cement by SCBA increases workability of fresh concrete; therefore use of super plasticizer is not essential.

Modani P, Vyawahare M. (2013)

optimized the workability and flow ability. Bagasse ash was partially replaced in the ratio of 0%, 10%, 20%, 30% and 40% by volume of fine aggregate in concrete. Fresh concrete tests like compaction factor test and slump cone test were undertaken along with hardened concrete tests like compressive strength, split tensile strength & Sorpitivity test. the Sorptivity coefficient increases with increase in percentage of SCBA and decreases with increase in compressive strength of concrete. The raw SCBA contains coarser, un burnt and half burnt particles which are porous hence absorb more water. It is reflected in the increase in the Sorptivity with increase in the percentage of baggase ash. On the basis of experimental investigation carried out The fraction of fine aggregates is replaced by 10% to 20% can be effectively replaced with a bagasse ash (untreated) without a considerable loss of workability and strength properties. In its purest form the bagasse ash can prove to be a potential ingredient of concrete since it can be an effective replacement to cement and fine aggregate.The result shows that bagasse ash can be a suitable replacement to fine aggregate. In accordance with Indian standard all tests were carried out.

Ganesan K, Rajagopal K, Thangavel K., (2007) The articles studied the effects of SCBA content as partial replacement of cement (0-30%) on physical and mechanical properties of hardened concrete. Raw bagasse ash has a large particle size and a high porosity, so it needs more water content in the concrete mixture and thus results in a lower compressive strength of concrete. However, when bagasse ash is ground up into small particles, the compressive strength of concrete containing this ground bagasse ash improves significantlyThe properties of concrete were investigated include compressive strength, splitting tensile strength, water absorption, permeability characteristics, chloride diffusion and resistance to chloride ion penetration. All test carried out in accordance with Indian standard. The test results indicated that SCBA is an effective mineral admixture up to 20% replacement was advantageous. the result shows The mean values observed in the mechanical compressive strength tests of the prisms, with and without SBA, were very close to each other; although the reference values were slightly higher, they cannot be considered statistically different.The increase in strength may be due partially to the pozzolanic reaction researchers.Ground bagasse ash is a suitable pozzolanic material for use in concrete.

Somna R, Jaturapitakkul C, Rattanachu P, Chalee W. (2012) studied the utilization of a pozzolanic material to improve the mechanical properties and durability of recycled aggregate concrete. Ground bagasse ash was used to replace Portland cement at the percentages of 20, 35, and 50 by weight of binder.Limestone in the mix proportion of conventional concrete was replaced by recycled aggregate. When GBA was used to partially replace cement in recycled aggregate concrete, the chloride penetration decreased and was lower than those of control concrete at the same immersed time. This result was similar to the result of concrete using natural aggregate. Compressive strength, modulus of elasticity, water permeability, and chloride penetration depth of the concretes were determined. The results revealed that the modulus of elasticity of recycled aggregate concrete with and without GBA was lower than that of conventional concrete by approximately 19%. The elastic modulus of recycled aggregate concrete with and without GBA was lower than that of CON concrete by

approximately 19% where as the compressive strengths of both concretes were the same. Some researchers reported that the recycled aggregate concrete has the modulus of elasticity lower than that of the conventional concrete by approximately 25–26%.All test were done in accordance with American standard.

Sivakumar M, Mahendran N. (2013) The aim of this paper is to describe the chemical nature of some of these resources and to emphasize the fundamental properties of this class of material so that it can be best utilized in an appropriate manner.Ground bagasse ash can be used as a supplementary cementing material up to 20% by weight of binder in concrete and still yield satisfactory compressive strength as well as reduced heat evolution. Besides the increase in the ultimate compressive strength of concrete. In this the paper major advantages of the bagasse ash is that it is cheaper to produce, needs much lower or even negligible capital inputs to get started, and requires far fewer imported technological equipment because it is produced by already existing facilities. They can also be produced on a small scale to supply a local market resulting in greatly reduced transportation costs and a much greater degree of local accountability in the supply of building materials and For economic benefits, the cost of pozzolanic material is usually lower than that of ordinary Portland cement. Because bagasse ash is a byproduct from sugar mills, therefore the cost of bagasse ash is very low or zero. The major cost of bagasse ash depends on the process of grinding bagasse ash. However, the authors believe that the grinding cost of bagasse ash is still cheaper than that of the grinding cost of cement clinker.

Abdolkarim A, Amin Z (2013) The rheological tests were carried out with a stress controlled rheometer equipped with a ball measuring system. In addition, mini-slump cone and the flow/spread table tests were carried out to determine the feasibility of evaluating the rheological properties of pastes and mortars from empirical tests. The results indicate that for the binary pastes and mortars, there is an inverse relationship between the yield stress and Fly ash concentration. On the other hand, the shape and size of the particles of the used sugarcane bagasse ash produced more viscous and plastic binary pastes and mortars than mixes without the sugar cane bagasse ash. When the sugarcane bagasse ash concentration was increased, the yield stress linearly increased as well. In the ternary systems, the use of 20% of Fly ash combined with 10% and 20% of SCBA was beneficial producing lower yield stresses than those presented in the binary system. A mini-cone was used for evaluating the flow spread of pastes.This apparatus was developed by Kantro and consists of a mould in the form of a frustum of a cone, 60 mm high with diameters of 70 mm at the top and 100 mm at the base The results obtained with the mini-slump cone and the flow/spread table tests showed a certain relationship with the rheological measurements, but this could not be completely identified.

Montakarntiwong K, Chusilp N, Tangchirapat W. (2013) the study of strength parameter and heat evolutiontake a Two different sources of bagasse ash with low and high loss on ignition were used in this experiment. Ordinary Portland cement was replaced by bagasse ash at the levels of 20%, 30%, and 40% by weight of binder. The effects of Loss of ignition, fineness, and cement replacement of bagasse ash on the compressive strength of concrete were investigated. Additionally, the heat evolution of concrete mixed with ground bagasse ash with low loss on ignition was also measured. The results revealed that the compressive strength of concrete containing unground bagasse ash was much lower than that of control concrete. Concrete mixed with lowloss on ignition ground bagasse ash had a slightly higher compressive strength than the mixture with high loss on ignition ground bagasse ash. Fresh concrete tests like compaction factor test and slump cone test were undertaken along with hardened concrete tests like compressive strength, split tensile strength and sorptivity. The result shows that bagasse ash can be a suitable replacement to fine aggregate. IS 383-1970 was referred. The replacement of cement by ground bagasse ash with low and high loss on ignition at 30% and 20% by weight of binder and the most important factor is Ground bagasse ash can be used as a supplementary cementing material up to 20% by weight of binder in concrete and still yield satisfactory compressive strength as well as reduced heat evolution. Besides the increase in the ultimate compressive strength of concrete, the amount of disposal waste in landfill and the cement usage are also reduced, resulting in a better environment.

G. C. Cordeiro, R. D. Toledo Filho (2008) This work investigates the pozzolanic and filler effects of bagasse ash residue in mortar. Initially, the effect of SCBA particle size on packing density, pozzolanic activity of bagasse ash and compressive strength of mortar was analyzed. In addition, the behavior of bagasse ash was compared to insoluble materials with the same packing density. The results show that bagasse ash can be classified as a pozzolanic material, but its activity is highly dependent on the particle size and fineness. The effect of adding

bagasse ash was SCBA pozzolanic activity was determined from the comparison with insoluble materials at the same packing density. In this regard, different behavior has been verified with respect to the compressive strength of mortar produced with mineral, SCBA and quartz admixtures. After 28 days curing, the compressive strength of SCBA mortar was 31% higher than that of concrete and mortar. This difference was also observed in pozzolanic activity, mechanical response, and the results of the modified Chapelle method. Thus, the results indicate that SCBA displays suitable physicochemical properties for use as a mineral admixture and its reactivity mainly depends on particle size and fineness. Some benefits will be gained regarding the greenhouse gas emissions resulting from the use of mineral admixtures as a substitute for cement, as their use allows for a reduction in cement production.

Fairbairn E, Americano B, Cordeiro C G (2010)

Concrete is the most widely consumed construction material in the world because it combines good mechanical properties and durability, tensile strength, workability and is relatively inexpensive. However, cement production involves significant emissions of CO2, which is known as the most important greenhouse gas for global warming. Every ton of cement produces about one ton of CO2. Sugarcane bagasse ash (SCBA) is a pozzolanic material that can partially replace clinker in cement production and reduce CO2 emissions into the atmosphere. Bagasse ash is a mineral resource, it is highly recommended to apply bagasse ash applications to avoid potential replacement of one of the environmental problems. Bagasse ash is a pozzolanic material suitable for use in concrete. The literature shows the beneficial applications of this by-product material. The compressive strength of mortar containing SCBA is inversely proportional to the size of the SCBA particles. It was concluded that SCBA is a good pozzolan for concrete cementation and its partial admixture with OPC can provide good strength development and other engineering properties in concrete. The cost of pozzolanic materials is usually lower than that of ordinary Portland cement.

III. CONCLUSION

On the basis of literature review, the following conclusions can be drawn.

- SCBA can be a good replacement for cement in concrete as well as mortar.
- The SCBA concrete gives higher compressive strength than that of control concrete.
- To improve the compressive strength, of concrete, the suitable replacement of Portland cement by SCBA was 15% by weight. The different research replaced between 0 to 50%. (in the range of 5% internal with M-20 Grade of Concrete)
- Partial replacement of cement by SCBA increases workability of fresh concrete; therefore use of super plasticizer is not essential.
- Some researchers used SCBA along with adding of other chemicals in the mixtures H2SO4 and HCl solution.
- In its purest form the bagasse ash can prove to be a potential ingredient of concrete since it can be an effective replacement to cement.
- Some other replacements materials also used by different other recycled materials such fly ash, glass powder, brick dust powder, steel industry waste etc.
- This material is also used for the mortar.

IV. FUTURE SCOPE

- The Flexural strength, split tensile strength of the concrete without SCBA can be compared with compressive strength.
- The Concrete and Mortars can be made more workable with using SCBA as the admixture.
- The properties of concrete with SCBA can be studied by using various fibers in it to increase the tensile strength.
- The evolution of heat by the concrete with SCBA can be studied.
- Determining the strength of mortar by using various types of fiber.
- Cement is a costly material so replacing cement by bagasse ash, rice husk ash and fly ash and find the compressive strength, flexural strength and split tensile strength of concrete.
- Analyzing the effect on concrete with Sugarcane Bagasse Ash due to shearing.
- To determine the Effect on the permeability of concrete with Sugarcane Bagasse ash.

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