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A Review Study on Effect of Bagasse Ash on Fibrous Concrete

Harish kumar[1], Aditya Kumar Tiwary[2]

[1]*M. E. Transportation Engineering, Chandigarh University, Mohali 140413, Punjab, India*
[2]*Assistant Professor, Department of Civil Engineering, Chandigarh University, Mohali 140413, Punjab, India*

Abstract - *Ordinary Portland cement is recognized as a major construction material throughout the world. Researchers all over the world today are focusing on ways of utilizing either industrial or agricultural waste, as a source of raw materials for industry. The current examination centres around the usage of Sugarcane Bagasse Ash as a replacement material for cement in concrete production. Demand and utilization of cement are expanding step by step which has led specialists and researchers to look for locally accessible substitute fasteners that can replace cement partially and are eco-accommodating and contribute towards waste management. Toward this path, mechanical and agricultural waste assume the essential job. Sugarcane Bagasse ash contains high amorphous silica content and aluminium. The agriculture waste product like Sugar Cane Bagasse Ash (SBCA) is utilized as a substitute for restricting material in the current examination. The utilization of reused total to use in development exercises have been practice by created European nations and of some Asian nations. We realize that concrete is the main construction material over the world and the generally utilized in a wide range of structural designing works. As total speaks to around 70-80% of solid parts, so it will be gainful to reuse the aggregate for construction works and to tackle the natural issues. In this paper, an investigation has been made on the past explores did by the various researchers and their outcomes have been examined.*

Key Words: Recycle coarse aggregate; Bagasse ash; fibre; mechanical properties;

1. INTRODUCTION

Concrete is one of the most extensively used construction material in the world. Every year the manufacture of Portland cement increases with the demand for construction. Therefore, the rate of production of carbon dioxide released into the atmosphere during the manufacture of Portland cement is also increasing. Each ton of Portland cement production releases a ton of carbon dioxide into the atmosphere Ordinary Portland cement (OPC) is conventionally used as the key binder to produce concrete. Initiatives are developing worldwide to control and regulate the supervision of sub-products, residuals, and industrial wastes to preserve the environment from contamination. A good solution to the problem of recycling agro-industrial excess would be by burning them in a controlled environment and use the ashes (waste) for more polite means. Utilization of such wastes as cement and fine aggregate replacement materials may reduce the cost of concrete production and also minimize the harmful environmental effects with the disposal of these wastes. Sugarcane is one of the foremost crops grown all over nations and its whole production is more than 1500 million tons. After the extraction of all effective sugar from sugarcane, large fibrous excess is obtained. When bagasse is burnt in the boiler of the Cogeneration plant under controlled conditions, sensitive amorphous silica is formed due to the combustion process and is present in the remaining ashes known as Sugarcane Bagasse ash. This amorphous silica content makes bagasse ash a useful Cement substitution material in concrete. Every huge load of sugarcane produces around 25.65% of bagasse (at a dampness substance of half) and 0.61% of leftover ash the overabundance after burning presents a compound organization controls by silicon dioxide (Sio2). From the past explores it is discovered that the bagasse ash involves the properties of natural sand.

1.1 Recycled Aggregate Concrete

The need and importance of concrete in the construction industry are ever-increasing. Recycled Aggregate Concrete (RAC) is concrete that using Recycled Aggregate (RA) as partially or fully replacement in coarse and fine aggregate. Recycling is the act of processing the used material for use in creating a new product. The usage of natural aggregate is getting more and more intense with the advanced development in the infrastructure area. Recycled aggregate is comprised of crushed, graded inorganic particles processed from the materials that have been used in the constructions and demolition debris. Recycled aggregates are produced from the re-processing of mineral waste materials, with the largest source being construction and demolition waste. These wastes are normally composed of concrete rubble usually, constitute the largest proportion of C&D waste.

1.2 Scope of the work

Laboratory tests on cement, fine aggregate, coarse aggregate, bagasse ash, water. Whatever may be the type of concrete being used, it is important to mix the design of the concrete. The same is the case with the industrial waste-based concrete or bagasse ash replacement. The major work involved in getting the appropriate mix proportions. 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 were cast and cured in the curing tank. Compressive strength split tensile strength and Flexural strength of concrete were conducted

to know the strength properties of the mixes. Initially, a sample mix design was followed and modifications were made accordingly while arriving at the trail mixes to get an optimized mix that satisfies both fresh, hardened properties and the economy.

1.3 Material Used

The materials used in the investigations are

Cement

The cement is used as a binding material. In this study, the cement used as OPC 43 grade cement available from ACC Cement Company, and it conforming as per IS 12269-1987.

Fine Aggregate

Aggregates for the concrete were obtained from approved suppliers conforming to the specifications of IS 383 - 1970 and were chemically inactive(inert), spotless and robust. The fine aggregate was tested as per the limits which are specified in IS: 2386 (Part-3):1963. In this study, fine aggregate having a fineness modulus of 2.46 which is carried out by using sieve analysis and it confirming zone 2.

Coarse Aggregate

Coarse aggregates will be machine-crushed one of black trap or equivalent black tough stone and shall be stiff, robust, dense, durable, spotless, or procured from quarries approved by the consultant. In this study, the crushed aggregate of size 20 mm in angular shape is used and it conforming to IS 383.

Rice Husk Ash

RHA is in form of ash and collected from the rice production process and it is in the base of agriculture waste materials origin and used in soil stabilization techniques. It's in form industrial waste materials origin and produced during loading and unloading of grain in storages and it appears as a fine powder and used in clay soil improvement.

Polypropylene fiber

Reduce the early plastic shrinkage cracking by enhancing the tensile capacity of concrete. This fiber is thermoplastic, lightweight, resistant, and many different chemicals.

Sugarcane Bagasse Ash

It comprises a high volume of Sio2. Therefore, it is classified as a good pozzolanic material. SCBA can be used as an add-on for cementitious material due to its pozzolanic property. Sugarcane bagasse ash was collected from Kanpur. SCBA contains approximately 25% hemicellulose, 25% lignin, and 50% cellulose. Each ton of sugarcane generates approximately 26% of bagasse (at 50% moisture content) and 0.62% of residual ash. The residue after combustion gives a chemical composition dominated by silicon dioxide. The Specific gravity of SCBA was found to be 2.17. The chemical properties of SCBA are shown in Table-1.

Table 1 Chemical properties of bagasse ash

S No	Component	Percentage
1	Silica	71%
2	Alumina	1.9%
3	Ferric oxide	7.8%
4	Calcium oxide	3.4%
5	Magnesium oxide	0.3%
6	Potassium oxide	8.2%
7	Sodium oxide	3.4%
8	Phosphorus pentoxide	0.2%
9	Manganese oxide	0.2%

2. Literature review

Okorie Austine Uche (2008) studies the influence of recycled aggregate concrete (RCA) as a substitute for virgin coarse aggregate in the compressive strength of `plain concrete and concluded the use of recycled concrete aggregates (RCA) as an alternative to natural or virgin aggregate in structural concrete reduces the strength development of the concrete [1].

Ismail Abdul Rahman et al (2009) presented the effects of the size of Recycled Aggregate on compressive strength and found that the compressive strength has been improved [2].

Mirjana Malešev et al (2010) performed a comparative analysis of the experimental results of the properties of fresh and hardened concrete with different replacement ratios of natural with recycled coarse aggregate and the author found the results on the basic properties of concrete with three different percentages of coarse recycled aggregate content (0%, 50%, and 100%). He found that the workability of concrete with natural and recycled aggregate is almost the same if ―water-saturated―surface dry recycled aggregate is used. Bulk density of fresh concrete is slightly decreased with an increasing quantity of recycled aggregate concrete compressive strength mainly depends on the quality of recycled aggregate [3].

Parekh D. N. et al (2011) studied the basic properties of recycled fine aggregate and recycled coarse aggregate. He also compares these properties with natural aggregates and resulted that recycled aggregate concrete has better resistance to carbonation than natural aggregate concrete [4].

Katrina Mc Nei et al (2013) studied the properties of the RCA, the effects of RCA use on concrete material properties, and the largescale impact of RCA on structural members and found that aggregate properties are most affected by the

residual adhered mortar on RCA due to less density and more porosity of the RCA. They also investigated that the RCA particles are more round in shape and have more fines broken off in L.A. abrasion and crushing testes [5].

Jitender Sharma et al (2014) studied the introduction and production of recycled concrete aggregates and its various applications in the construction industry and they found that when the water-cement ratio used in the recycled aggregate mix is reduced, tensile strength and modulus of elasticity are improved [6].

Jitendra Kumar Tanaji Mohite et al (2015) studied the different tests on the natural aggregate, recycle aggregate and blended aggregate and compare results and found that the strength of the recycled aggregate concrete is slightly less for the same condition as that of the natural aggregate. The amount of the reduction depends on the parameters such as the amount of blending of the recycled aggregate, w/c ratio, quality of the processed recycled aggregates [7].

Srinivasan et al. studied chemical and physical characterization of SCBA and partially replaced in the ratio of 0%, 5%, 15%, and 25% by weight of cement in concrete. Compressive strength split tensile strength, flexural strength, and modulus of elasticity at the age of 7 and 28 days was obtained as per Indian Standards. It was found that the cement could be advantageously replaced with SCBA up to a maximum limit of 10%. Therefore, it is possible to use sugarcane bagasse ash (SCBA) as cement replacement material to improve quality and reduce the cost of construction materials such as concrete [8].

Somna et al. studied the utilization of a pozzolanic material to improve the mechanical properties and the durability of recycled aggregate concrete. Ground bagasse ash (GBA) was used to replace Portland cement at the percentages of 20, 35, and 50 by weight of the binder. SCBA is used to replace natural coarse aggregate not more than 25% by weight. 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. Compressive strength, modulus of elasticity, water permeability, and chloride penetration depth of the concretes were determined as per American Standards. Recycled aggregate concrete by incorporating SCBA has the modulus of elasticity, lower than that of the conventional concrete by approximately 25–26% [9].

Otuoze et al. concluded that SCBA was a good pozzolana for concrete cementation and partial blends of it with OPC could give good strength development and other engineering properties in concrete. An optimum of 10% SCBA with OPC could be used for reinforced concrete with dense aggregate. The replacement of cement by SCBA was 0-30% and under American and Brazilian Standards all tests were carried out [10].

Lavanya et al.. Examined the partial replacement for cement in conventional concrete. The tests were conducted as per Bureau of Indian Standards (BIS), IS 516-1959 codes to evaluate the suitability of SCBA for partial replacements up to 30% of cement with varying water-cement (w/c) ratio. The physical properties of SCBA were studied. Compressive strengths (7, 14, and 28 days) were determined following Indian Standards. The results showed that the addition of sugarcane bagasse ash improves the strengths in all cases. The maximum strength increase happens at 15% with a 0.35 w/c ratio [11].

3. CONCLUSIONS

To reduce the consumption of energy and available natural resources. Minimizing the environmental impact, energy and CO2 intensity of concrete used for construction is increasingly important as resources are declining. The following conclusions are drawn based on a thorough review of future research work:

- Recycled aggregate can be used with natural aggregates.
- The higher ratio of Recycle aggregate can worsen the properties and strength of the mix.
- The use of recycled aggregate in the construction industry can slow the impact of waste on the environment.
- Furthermore, improvement is needed in the recycled aggregated cement.
- The effect of PPC cement on the use of RA has not been studied.
- The experimental result shows that the strength of concrete increases with the help of Sugar Cane Bagasse
- Ash (SCBA). Therefore, with the use of Sugarcane Baggage Ash (SCBA) in partial replacement of cement in concrete, we can increase the strength of concrete reducing the consumption of cement.
- It has been observed that the experimental result for the 10% replacement of bagasse ash to OPC has an increase in strength in comparison with 0% and 5% replacement.

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BIOGRAPHIES

Currently pursuing Masters in Transportation engineering (M.E) from Chandigarh University, Punjab, India and completed Bachelors in civil engineering from Vaishno college of engineering, H.P.