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A Case Study on Compressive Strength of Bagasse Ash in Concrete when Partially Replaced with Cement

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ABSTRACT: The focus is on the use of industrial and agricultural waste generated from industrial processes on waste reduction for economic, environmental and technical reasons. Sugarcane Bagasse ash, along with ethanol vapor, is a fibrous waste from the sugar industry. These bagasse wastes It causes serious environmental pollution and requires immediate waste disposal. Bagasse ash is mainly contained Ions of silica and alumina. In this paper, bagasse ash is chemically and physically partially characterized. The weight of cement in concrete has been replaced by the ratios 0%, 5%, 15% and 25%. Fresh concrete compaction test We have performed factor tests, slump tests, compressive strength tests and hardened concrete tests such as cracks. Flexural strength, Tensile strength and modulus of elasticity were obtained after 7 and 28-days result. It is shown that the concretes strength increases with an increase in the sugarcane bagasse ash replacement ratio.

KEYWORDS: concrete, Fibrous waste product, bagasse.

I. INTRODUCTION

Ordinary Portland cement is generally considered to be the main ingredient building materials worldwide. Portland cement is a traditional building material. In fact, it occupies about 5-8% of the world carbon dioxide emissions. This is an environmental problem may be increased due to highdemand Portland cement. Today's researchers around the world focus on how to use industry or industry agricultural waste. Utilisation of this waste is not only Economical but can also happen in forex-Revenueearning but also in pollution control. Scientists and even Portland cement producers Explore alternative ways to green building ingredients. Industrial waste such as blast fly ash, furnace slag and microsilicaare alternative material in auxiliary cement. , Large amounts of baggage ash, residues from thebagasse biomass fuel and sugar industry are utilised in energy industries. This is a also occurs during controlled incineration contains amorphous silica containing pozzolanReal estate. Some research is being doneon the ash obtained directly from industry for researchpozzolan activity and suitability as a binder, some part of the cement.

Sugarcane ash has many uses like for productionWood, paper, fodder, compost, heatInsulation, according to statistics, about 1 million tons addedCake ashes remain in this country. Sugarcane about 30% bagasse, extractable sugar about 10%, sugarcane ash leaving about 8% sugarcane ash Like waste.

When sugar production increases the amount of bagasse ash produced will also increase in this way disposal is a problem. Sweet cane Bagasse has recently been tested in several parts of the world to use as an alternative to cement ingredients. Bagasse ash has been found to improve several Characteristics of mortar,paste and concrete. Higher silica content of bagasse ash is the main reason for this replacement improvement. Concrete is mostly used because it is simple and it is used in large quantities, not only basic materials, but excellent building materials, not only road construction, but more interesting project. Concrete production is responsible for this Portland cement production Requires a large amount of energy to achieve Not only reaction temperature up to 1500°C Because the reaction that matters is collapse from calcium carbonate to calcium oxide and CO₂ from About 530 kg of the 800 kg CO₂ emitted Limestone decomposition reaction itself.

Mostly people use concrete as a building material in the world. Due to the increase in demand and consumption ofcement, Scientists and researchers around the world Always trying to develop alternative binderswhich are good and

helps sustainable management. In addition to this industrial and agricultural Waste from industrial processes Waste reduction research focuses on sustainability. Sugar cane mill leaves 8 to 10 ash Non-flammable substances which contains alumina and silica. But by high crystallization of minerals at high temperature, the ash does not react. Sugar Bagasse was imported from Sudan for this study.

After setting parameters such as chemical composition, carbon Content, presence of crystals Pozzolanic reactivity (SCBA) Evaluation is done by Conduction Strength SCBA-OPC mixed development test on concrete to control the hydration reaction of the specimen. is one of the main crop grown for over 120 years in country and total production is over 1.5 billion tons. After extraction, all sugar is economical about 40-47% of the fibrous residues are sugar cane. In addition to non-flammable substances, silicon, alumina, calcium oxide. Some research is being done directly on industrial ash to study the activity and suitability of pozzolana A binder that partially replaces cement.

Crystallization of minerals 800°C and above burning temperature up to 800°C with crystalline silica and silica Amorphous grows over time combustion. The relevant combustion conditions at 800°C was found after 3 hours. In this state brownish white indicates complete combustion and the amorphousness of the ash was determined by X-ray diffraction analysis. Sugarcane bagasse ash was not formed continuously It is sufficient to mix with cement, so Ash obtained of particle size comparable to OPC After combustion, grind with a ball mill and then it was sieved through a 63 µm sieve.

This study was conducted at the SCBA obtained from Mumbai, India. Sugarcane production in India exceeds 350 million tons where 10 million tons remains as waste material. This paper Analysis of the effect of sugarcane bagasse on partial concrete Cement change at 0%, 10%, 15%, 20%, 25%, 30% by weight. Main components were Portland cement, sugarcane bagasse, crushed and Coarse aggregate. After mixing materials Pour a sample and check everything the samples were dried in water at 7, 28, 56, and 90 days.

II. SCOPE OF WORK

Lab testing of cement, both fine as well as coarse aggregates bagasse ash, water. Everything is possible type of concrete used, it is important to use mix design. The same can be said replacing concrete or heathen ash based on industrial waste. Appropriate mixing ratio. In this job Concrete mix with partial replacement of cement using bagasse ash formulated using OPC grade 53 cement. We used simple mixed design procedure here.

Achieve mixing ratio. After receiving the track mix, 150 mm * 150 mm * 150 mm size cube, cylinder dimensions Beam 150 mm * 300 mm and dimensions of 100 mm * 100 mm * 150 mm was prepared then cured in Storage tank. Compressive strength of concrete was tested. We followed the design mix for satisfying its properties.

III. MATERIALS AND METHODS

{a} Cement:

Commonly used cement is ordinary Portland cement. normal general production Portland cement is 80 to 90 percent. Many experiments have been carried out to improve its properties. There are consistency tests, configuration tests, and so on.

{b} Fine aggregate:

Sand is also known as fine aggregate. sand particles must also package to minimize the gap factor. More gap content between aggregated requires more water mixture. Specific Sand density 2.68. This ratio is 4.75 mm Up to 150 microns is called fine aggregate. The specific gravity (in loose state) of fine aggregate is at 1393.16 kg/m³ the condition of the trunk is 1606.84 kg/m³.

{c} Coarse Aggregate:

The crushed aggregate used is nominally 20 mm size. Specific gravity of coarse aggregate is 2.83. Bulk density is 1692.31 kg per m³

{d} Water:

Needed amount of water required for concrete and curing: From IS: 456-2000.

{e} Sugar cane ash:

Bagasse is about 50% Cellulose, 25% hemicellulose, 25% lignin. The output per ton of sugar cane is about 26% bagasse (water content 50%) and 0.62% Ash. Residue after incineration Silicon predominates in its chemical composition. (SiO₂). Even though it's hard stuff Degradation and malnutrition – ashes It is used in agriculture as a fertilizer for sugar cane grab.

IV. MIXING AND CASTING

Fresh concrete mixed with pan or hand mixer withstands loads up to 150 kg uniform Reached before mixing. Material Lay in approximately layers on the bottom of the mould first aggregate, then cement, finally small filler. mixed ingredients Stir until completely dry for 1 minute to homogenize after Portion mix, then with water Stir for 3 more minutes. This concrete was prepared in 3 layers and 36 tamping applied to each layer with a 16mm diameter rod for the removal of entrapped air. Required for all mixes the number of cubes is poured (total 150 cubes). Then we should keep moulds at room temperature for at least 24 hours. The sample will be removed from the curing tank after at least 24 hours.

Before casting workability and compaction factor test is conducted because a concrete lies in two state plastic and hardened state, as a hardened concrete is not so workable so it becomes necessary to conduct workability test. Differences in prices for materials clearly visible in Cement is several times more expensive. In general, the goal is to produce something very lean concrete.

V. EXPERIMENTAL WORK

There are 180 numbers in this experimental work. Pour the concrete sample. This paper consists of 36 number of Side cube 150mm, diameter 150mm 108 number of cylinder length 300mm, 36 number of 750mm x 150mm x 150mm prism. mixed design Concrete according to Indian standards Instruction for the grade M20. Ratio of aggregate to cement water is 0.48. based Depending on the amount of ingredients to be mixed Number of 0, 5 and 10 15, 20, 25% by weight will be replaced.

The concrete components are completely mixed. Mixer for uniform and full consistency Achieved. Moulds are polished with oil before filling Cast iron on the inside. Pour concrete into the formwork and compact it. Use a table vibrator carefully. Top surface Finished by small shovel. After 24 hours, it was removed from the mould and hardened and poured for 7 days and 28 days in water. Samples are retrieved from the water tank before test. Compression and split test the force is carried out at a pressure of 2000 kN Testing Machine, Modulus Test Carried out with compression testing machine for modules Breakout runs at the Universal 1000kN Test machine [9]. This test is carried out in accordance with Related Indian Standard Specifications. There are 56 numbers in total in this experimental work. Pour the concrete sample. Standard size Cube We use 150mm x 150mm x 150mm. mixed design Concrete according to Indian standards Procedures for classes M20, M30 and M40 [6]. Based Depending on the amount of sugarcane bagasse to be 0, 10, 15, 20, 25 and 30% Weight change and the concrete components are completely mixed. Mixer for uniform and full consistency Achieved. Pour concrete into the formwork and compact it. Use a table vibrator carefully. Top surface Finished by small shovel. After 24 hours, it was removed from the mould and hardened. 7, 28, 56, 90 days in water. Samples are retrieved from the storage tank only Before the test. Compression test is done on 2000 kN compression testing machine. This test is carried out by an appropriate person in Indian Standard Features.

VI. TEST RESULTS

All values in each case, an average of 3 tracks per year Test program for this study. Result This will be discussed as follows.

Workability (approx. 6.5 cm High) Fully Grown Fresh Power. Generally, the higher the measured height Degeneration improves performance. Maximum concrete strength It is related to workability and can only be acquired If the concrete has sufficient workability. This is due to increased surface area of bagasse in the specimen. Water to wet the cement

particles. Power Concrete cubes, cylinders and an SCBA partial permutation prism pattern. The result is SCBA concrete significantly higher compressive strength than Concrete which is without SCBA it is found that Cement can be replaced with bagasse Up to 15%. Perfect, SCBA content reaches 15% replacement. Partial replacement of cement with sugarcane bagasse ash improves the workability of fresh concrete. So, use of high-performance water reduction agents is irrelevant. Based We can draw the following conclusions. Compressive strength of the specimen after 7 days, its physical strength gradually decreased as Compared to regular mix. This was observed that 5% and 10% sugarcane bagasse's compressive strength has reached at its mean strength and the compressive strength was increased by 2.04% and 6.55% for 5 and 10% respectively. Further it is observed that the compressive strength for 15, 20 and 25% sugarcane bagasse has decreased its compressive strength by 60.15, 16.92 and 34.13% respectively on comparing with nominal mix.

VII. DEVELOPMENT OF COMPRESSIVE STRENGTH

This is so due to the relative interaction With Pozzolana SCBA activity and also Crystalline silica is present. Judging by the strengthening capability of enriching mineral mixtures not only the reactivity of pozzolana, the relative size of the aggregate. 90 days Compressive strength of phase S4 when replacing 10% There was a clear development potential of around 0.96% OPC, other samples (S2 and S3) are displayed Strength development of OPC by 85%. Interrupt The value of compressive strength with increasing the replacement ratio has a filler effect Ash replacement dominates up to 10%. The increase in the value of compressive strength S4 occurs as follows. Physical and Chemical process. Caused by physical activity High specific surface area and SCBA chemistry Pozzolanic reaction between calcium Hydroxide and silicon dioxide. Also, Hydration of silica itself in an alkaline environment may be responsible for improved Compressive strength. However, the hydration reaction S2 An example of a slow S3. maybe it's because it has low reactivity of SiO₂ and reduction of CaO Content could be the reason for the final reduction of strength.

VIII. CONCLUSION

Test results show improvement Strength of concrete using bagasse Ash. Therefore, bagasse is used for ash Partial replacement of concrete with cement, we can Increase the strength of concrete by reducing the consumption of cement. It is also good to use sugar Bagasse ash as an alternative to warehousing and production clean environment. This is due to the combination Relative smoothness effect and pozzolanic activity SCBA and possibly again Crystalline silica. By reinforcements Buis Ability of mineral mixtures the reactivity of the pozzolana depends on as well as the relative subtlety of filler material. At 90th day Compressive strength S4 is an alternative to 10% A clear development potential of about 0.96% OPC is shown. Other samples (S2 and S3) showed 85% Develop strength like an OPC. Interrupt The value of compressive strength with increasing the replacement ratio has a filler effect Ash replacement dominates up to 10%. The increase in the value of compressive strength S4 occurs as follows. Physical and Chemical process Caused by physical activity High specific surface area of SCBA (6) and chemicals The effect is a pozzolanic reaction between calcium Hydroxide (CH) and silicon dioxide (SiO₂). And also moisturizing Silica itself can be present in an alkaline environment. Responsible for increasing compressive strength. However, the hydration reaction of samples S2 and S3 Slowly; probably due to the low reactivity of SiO₂, it can also be caused by lower CaO levels. Decreased development of extreme strength.

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