Experimental Studies on Strength of RC Concrete by Partially Replacing Cement with Sugar Cane Bagasse Ash

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Abstract The utilization of waste material as mineral admixture in cement provides a satisfactory solution to some of the environmental concerns and problems associated with waste management. Agro waste such as Sugarcane Bagasse Ash (SCBA) is one among such a potential material. Utilization of industrial and agricultural waste products in the industry has been the focus of research for economical, environmental, and technical reasons. Sugar-cane bagasse is a fibrous waste-product of the sugar refining industry, along with ethanol vapor. This wasteproduct is already causing serious environmental pollution which calls for urgent ways of handling the waste. In this paper, Bagasse ash has been chemically and physically characterized, in order to evaluate the possibility of their use in the industry. The investigation program

included the partial replacement of cement by bagasse ash by 10%, 15% and 20%. And also influence of CO2 while cement production and the reasons of replacements of cement by bagasse ash. The various types of test which can be preformed are also discussed. The strengths of normal cement mix and bagasse added samples are been compared graphically. The above studies indicates that an increase in compressive strength and flexural strength of RC concrete for 15 % replacement of cement with Bagasse ash.

I. INTRODUCTION

Currently, many countries are using pozzolanic materials in concrete structures for improving compressive strength and reducing the cost of concrete. Many pozzolanic materials such as fly ash, silica fume, rice husk ash, sugar cane bagasse ash, palm oil fuel ash, etc., have been improved and used to replace cement in concrete.
Concrete consists of cement, aggregates, water, and eventually, mineral and chemical admixtures. When all these materials are mixed, cement particles in contact with water undergo a hard-ening reaction that bonds the aggregates together. It is the most common construction material in the world because it combines very good mechanical and durability properties, workability, versatility, and relative low cost. However, cement production emits greenhouse gases, mainly CO2, being responsible for about 5% of global anthropogenic CO2 emissions in the world. Since 1.00kg of cement produces approximately 1 kg of CO2 [1], the use of low emission pozzolans as cement replacement is one of the possibilities to reduce greenhouse gases emissions.

Aim of the Project: To study the effect of utilization of bagasse ash as pozzolonic admixture in concrete by partially replacing cements with bagasse ash. Objective of the Project: The main object investigation is to conduct an experiment study on strength of concrete using sugarcane bagasse ash as partial replacement of Cement. To study the behavior of (fresh and hardened) concrete with varying the percentage content of bagasse ash under compression. Scope of the Project:
To study the feasibility of using bagasse ash (SCBA) in concrete as partial replacement of cement in different ratios (10%, 15%, 20%).
To determine the workability of concrete for various ratios of bagasse ash by conducting compacting factor test and slump test. To determine the cube and cylinder compressive strength of concrete by replacing cement.
To determine the beam flexural strength of concrete by replacing cement. *To determine the optimum percentage of bagasse ash (SCBA) to be added with cement in concrete.

II. PROPERTIES OF SUGAR CANE BAGASSE ASH

PHYSICAL PROPERTIES:

The color of the ash obtained normally is black in color.
The size of the grinded fine particles of bagasse ash should be less than 75 micron sieve.
The carbon content in the bagasse ash must be nil this is done so by heating it to a high temperature of about 800°c in a incinerator and should maintaining it for one hour. *And further the ash must be free from dust, clay, silt, mica, and organic matter, soft and flaky particles

Chemical Properties:

1) SiO2	2) Silicon dioxide	3) 70.9 7%
4) Al2 O3	5) Aluminiu m trioxide	6) 8.55 %
7) Fe2 O3	8) Iron (III) oxide	9) 3.61 %
10) Ca O	11) Calcium oxide	12) 6.5 0%
13) Mg O	14) Magnesi um oxide	15) 2.8 3% K2O Potassium oxide 1.77%
16) Na 2O	17) Sodium oxide	18) 0.9 2% 19) Ti O2
20) Titanium dioxide	21) 0.5 3%	22) Mn O
23) Mangan ese oxide	24) 0.1 8%	25) P2 O5
26) Phospho rus pentoxide	27) 0.7 8%	28) SO 3
29) Sulfur trioxide	30) 0.8 0%	

III. ADVANTAGES OF USING SUGAR CANE BAGASSE ASH

Air pollution control: The emission of CO2 during Portland cement manufacturing process is minimized. This results in the decrease of global warming.
Land pollution control: The disposal of bagasse is usually done by spreading it in the open ground and reduces the availability of land for human inhabitance.
Ash disposal process: Primarily the ash disposal problem from sugar industry is reduced since it is been used in the replacement of cement.
Economy: The use of such type of replacement reduces the overall cost of cement. And the non-renewable resources are also saved from non availability
Demand in future: This sort of partial replacement helps in solving the future demand of cement.

IV. MATERIALS AND METHODS

1.SUGAR CANE BAGASSE ASH

Fineness by dry sieving
Consistency
Initial and Final setting time
Soundness
Specific gravity of SCBA

2. CEMENT
Fineness by dry sieving
Consistency
Initial and Final setting time
Soundness
Specific gravity of Cement

3. FINE AGGREGATE
Specific gravity of Fine Aggregate
Sieve Analysis of Fine Aggregate

4. COARSE AGGREGATE
Specific gravity of Coarse Aggregate

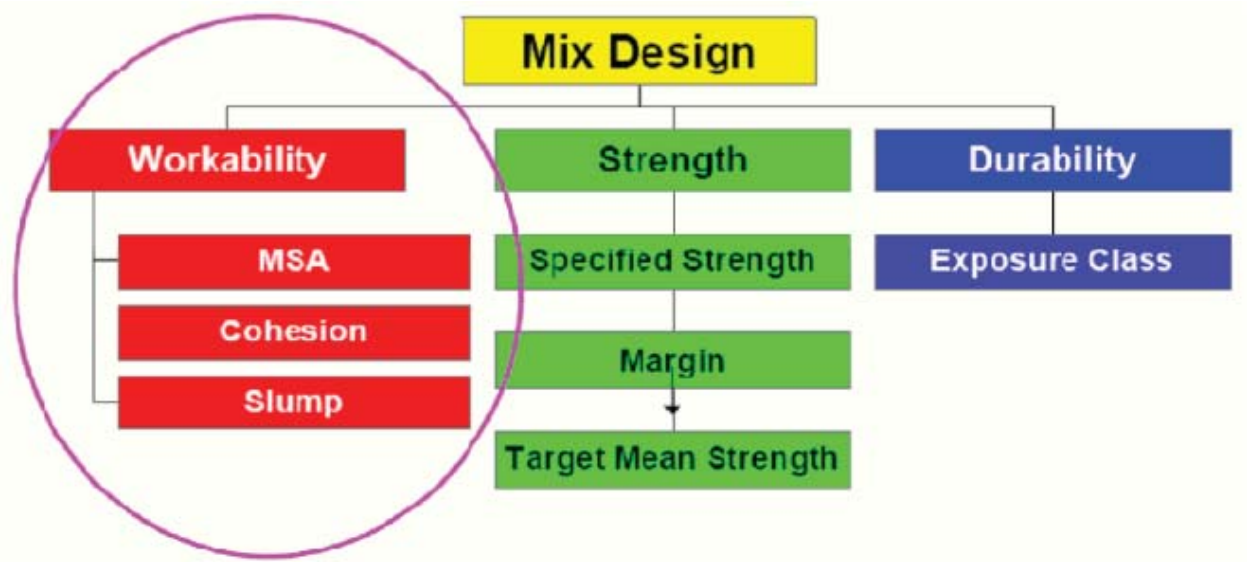
Sieve Analysis of Coarse Aggregate

V. CONCRETE MIX DESIGN AS PER IS 10262-2009

Concrete is an extremely versatile building material because, it can be designed for strength ranging from M10 (10Mpa) to M100 (100 Mpa) and workability ranging from 0 mm slump to 150 mm slump. In all these cases the basic ingredients of concrete are the same, but it is their relative proportioning that makes the difference.

Basic ingredients of Concrete: -

1. Cement - It is the basic binding material in concrete.
2. Water - It hydrates cement and also makes concrete workable.
3. Fine Aggregate - Along with cement paste it forms mortar grout and fills the voids in the coarse aggregates.
4. Coarse Aggregate - It is the basic building component of concrete.
5. Admixtures - They enhance certain properties of concrete e.g. gain of strength, workability, setting properties, imperviousness, etc. Concrete needs to be designed for certain properties in the plastic stage as well as in the hardened stage.



MIX PROPOTIONING OF CONCRETE S.No	**Materials**	**Mass of Materials**
kg/m3		
1.	Cement	**361.524**
2.	SCBA	**63.798**
3.	Fine Aggregate	**621.750**
4.	Coarse Aggregate	**1130.097**
5.	Water	**191.58**
6.	Admixture	**2.98**
7.	Water Cement Ratio = 0.450	

VI. RESULT AND DISCUSSION

COMPRESSIVE STRENGTH FOR CUBE AND CYLINDER

COMPRESSIVE STRENGTH FOR CUBE

Days	N/mm2
7	40
14	50
21	60

COMPRESSIVE STRENGTH FOR CYLINDER

Days	N/mm2
14	45
21	55

Flexural Strength of Beam Mould at 28 days

DISCUSSION

The test results show that there is an increase in compressive strength of concrete for 15 % replacement of cement with Bagasse ash.
The test results show that there is an increase in flexural strength of concrete for 15 % replacement of cement with Bagasse ash.
Preliminary investigations with SCBA demonstrate that it presents appropriate chemical composition for application as a pozzolan.

VII. CONCLUSION

Utilization of industrial and agricultural waste products in the industry has been the focus of research for economical, environmental, and technical reasons. Sugar-cane bagasse is a fibrous waste-product of the sugar refining industry, along with ethanol vapour. In this paper, Bagasse ash has been physically characterized, in order to evaluate the possibility of their use in the industry. Bagasse ash has good potential for cement replacement. Common sugar is one of the most effective retarding agents used as an admixture for delaying the setting time of concrete without detrimental effect on the ultimate strength.
Thus Bagasse ash contributes to reduce both environmental and economical problems that would be associated with their disposal.

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[3] IS: 456-2000 ―CODE OF PRACTICE FOR PLAIN AND REINFORCED CONCRETE‖.
[4] IS: 10262-2009 ―CONCRETE MIX PROPORTIONING – GUIDELINES‖ (FIRST REVISION).