Utilization Performance of Bagasse Ash in Fly Ash Brick

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Abstract- **In this study is to reduce the utilization of natural material. There is a greater shortage of natural materials in many parts of the world. In our study sugar-cane, bagasse ash can be utilized by partial replacing fly ash in fly ash brick. Fly ash brick is pozzolanic in nature. The sugar-cane bagasse is a fibrous waste product of the sugar refining industry. Use of bagasse ash in brick can solve the disposal problem, reduce cost and produce a 'greener' Eco-friendly bricks for construction. Environmental effects of wastes can be reduced through this study. A better measure by an innovative construction material is formed through this study. The huge quantity of bagasse ash available at affordable rate. The bricks are casting with different proportions 10%, 15% and 20% of fly ash with a replacement of bagasse ash. Were bricks are analyzed compression strength and water absorption test as per IS:3495-part 1-1992 & IS:3495-part 2-1992. It provides uses of class F fly ash which contains less than 20% lime. It's used in making a structure of brick as per size. We chosen Modular size brick mould is 230mm X 110mm X 75mm. The aim of our study is to make an economical brick with green material. It was also expected light weight, meet compressive strength, less water absorption and durability.**

Keywords: **bagasse ash, pozzolonic, Fly ash brick, cost feasibility, quarry dust..**

I. INTRODUCTION

Population scenario comes towards India by means of increasing industries. The efforts of industries lead to develop a India. As the end of survey result coming that the amount of the approximately 250 to 300 million tons of industrial wastes are being produced every year by chemical and agricultural process in India. It is very essential to dispose these wastes safely without affecting health of human being, environment, fertile land, sources of water bodies, etc. Sugar cane baggase, the fibrous residue after crushing and juice extraction of sugar cane is a major industrial waste product from the sugar industry.

Depending on the incinerating conditions, the resulting sugarcane bagasse ash (SCBA) may contain high levels of SiO_2 and Al_2O_3, enabling its use as a supplementary cementious material (SCM) in blended cement systems. Uses of sugarcane bagasse ash waste in brick can save the sugarcane industry disposal costs and produce a 'greener' bricks for construction. There is a strong demand for environmentally safe reuse and effective disposal method for bagasse ash due to the increasing amount of sludge generated by the various industries or plant in India, rapid urbanization has made it increasingly difficult to find suitable landfill sites. Therefore, incineration has become one of the few alternatives available for disposal of sludge.

The disposal of incinerated bagasse ash can be accomplished by using it as an engineering construction materials. One possible solution for the management of this sludge is to re-use it is a building material, namely to incorporate this bagasse ash into bricks. Agro wastes such as rice husk ash, wheat straw ash, hazel nutshell and sugarcane bagasse ash can be used as pozzolanic materials for the development of construction materials. Sugarcane is major crop grown in over 110 countries and its total production is over 1500 million tons. Sugarcane production in India is over 300 million tons per year. The sugar-mill generates about 10 million tons of waste material. One ton of sugarcane can generate approximately 26% of bagasse and 0.62% of residual ash. Bagasse is often used as a primary fuel source for sugar mills; when burned in quantity, it produces sufficient heat energy to supply all the needs of a typical sugar mill. The dumping of these industrial wastes in open land poses a serious threat to the society by polluting the air and waste bodies. This also adds the no availability of land for public use. After the extraction of all economical sugar from sugarcane, about 40-45% fibrous residue was obtained, which is reused in the same industry as fuel in boilers for heat generation leaving behind 8-10% ash as waste, known as sugarcane bagasse ash (SCBA). The SCBA contains high amounts of un-burnt matter, silicon, aluminum and calcium oxides.

II. MATERIALS

Bagasse Ash

The burning of bagasse, a waste of sugarcane produces bagasse ash. Presently in sugar factories, bagasse were burnt as a fuel to run their boilers. This bagasse ash is generally spread over farms and dump in ash pond which causes environmental problems also research states that workplace exposure to dust from the processing of bagasse can cause the

chronic lung condition pulmonary fibrosis, more specifically referred to as bagassosis. So there is grest need for its reuse, also it is found that bagasse ash is high in silica and is found to have pozzolanic property so it can be used as a substitute for construction material. The residue after combustion presents a chemical composition dominates by silicon dioxide (Sio_2). In spite of being a material of hard degradation and that presents few nutrients, the ash is used on the farms as a fertilizer in the sugarcane harvests.

Fig 1 Bagasse Ash

Fly Ash

Fly ash is finely dividedly residue from the combustion of powdered coal. It referred as either pozzolonic or cementanious. A cementanious material is one that hardens when mixed with water. It also improves workability and reduces internal temperature. It is a fine-grained, Powderly particulate material in nature and it contains less than 20% lime (CaO). Coal-based thermal power plants all over the world face serious problems of handling and disposal of the ash produced. Safe disposal of the ash without adversely affecting the environment and the large storage area required major concerns. The burning of harder and bituminous coal typically produces class F fly ash. It contains an agent such as Portland cement, quicklime or hydrated lime, with the presence of water in order to react and produce cementanious compounds.

Fig 2 Fly Ash

Lime

Pure calcium oxide is fused with coke in order to render the highest yield in the manufacture of acetylene. The quality of the resultant carbide lime is a direct result of the excellent quality raw materials. Carbide lime is finer in particle size and physically, having a very finely divided particle size makes carbide lime better. A finer particle size means faster and more reactive

Fig 3 Lime

Quarry Dust

Quarry dust is a residue produced during the crushing process which is used to extract stone. It is rock and mineral particles. When huge rocks break in too small parts for the construction in quarries. It has sharp edges. It is just like sand but mostly grey in color.

Fig 4 Quarry dust

Water

Water is an important ingredient of brick as it actually used for the manufacturing of brick. Since it helps to bind all the raw materials for giving a proper mix. Water used for making brick should be free from impurities. It plays a role in the formation of concrete as it participates in a chemical reaction with cement. Due to the presence of water, the gel is formed which helps in increase of strength of concrete. Almost any natural water that is drinkable and has no pronounced taste or odor can be used as mixing water.

III. MIX PROPORTION

Table 1- Raw Material Mix Proportion

Material	Proportion 1 (P1) (Kg)	Proportion 2 (P2) (Kg)	Proportion 3 (P3) (Kg)
Fly Ash	1.770	1.610	1.450
Bagasse Ash	0.320	0.480	0.645
Lime	0.480	0.480	0.480
Quarry Dust	0.645	0.645	0.645

IV. EXPERIMENTAL METHODOLOGY

Molding is one of the important processes of the shaping of bagasse ash brick. It's used to make a structure of brick as per size. Modular size of fly ash brick is 230mmX110mmX75mm. Drying is an important process in manufacturing fly ash brick. After molding process, the molded brick is dried in open atmosphere or normal room temperature. Curing is used hardened a mortar due to the heat of hydration. Normally membrance curing is adopted for fly ash brick manufacturing process taking the preliminary test and the results it is used in the mix design calculation, then the ratio is used in the fly ash brick. After the curing period, the compressive strength test is to handling, the results to included and the compressive strength, structure test, water absorption test, hardness test at various intervals to testing and the results are noted in this study.

Fig 5 Molding

Fig 6 Hand Mixing

Fig 7 Compaction Process

Fig 8 Bagasse Ash Bricks after De-moulding

V. TEST RESULTS

Table 2 - Test Results Comparison between Clay, Fly Ash and Bagasse Ash Bricks

S.No	Types of brick	Water absorption in %	Compressive strength in Mpa
1.	Clay Brick	10.16	9.20
2.	Fly Ash Brick	8.91	11.40
3.	Gaggasse Ash Brick (P1)	9.15	14.20
4.	Gaggasse Ash Brick (P2)	9.61	12.60
5.	Gaggasse Ash Brick (P3)	9.88	10.15

VI. CONCLUSION

The outcome of this study; it can solve the disposal problem of waste, reduce the manufacturing cost and produce a 'greener' Eco-friendly bricks. The maximum compressive strength was obtained by replacing 10% of Bagasse ash with fly ash. The usage of Bagasse ash will reduce the cost of raw material by 15 to 20%.

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