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Sustainable Utilization Of Textile Waste In Fly Ash Brick

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ABSTRACT: *In the development of civil field we aim to use textile waste as a replacement material of fly ash bricks to reduce landfills. Many textile waste materials such as polyester and other fabric etc.. are used in manufacturing brick as replaceable alternatives for fly ash and reinforcing materials, , we selected polyester fabric as replacement alternatives. This paper reviews on the polyester fabric material, which is used as a partial replacement of fly ash in brick manufacturing. Different properties of fresh and hardened bricks, when admixed with polyester fabric wastes are reviewed. It has been seen that the polyester fabric brick showed better workability than their counterparts did. Flyash brick containing polyester-fabric achieved their required strength by 15% of replacement as fly ash. Close relations were analized among compressive strength, water absorption, efflorescence test of polyester fabric brick. After the review, it is of considerable finding that more research is deserved on all fly ash replacing polyester fabric materials,which can give more certianly on their utilization in construction.*

KEY WORDS: *Textile waste, Polyester fabric, Flyash bricks.*

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I. INTRODUCTION

Fly ash bricks are commonly used bricks in construction they are gray in colour and does not required plastering during construction. They are good fire resistance. They have 6-12% of moisture absorption rate and shows more durability. It act as a construction material unless it act as a non-toxic product when combined with other materials. These bricks are lighter in weight and absorb less heat than other bricks. It required less mortar during construction and they show higher compressive strength. It absorbs less water while constructing buildings.

Not all fly ash bricks are suitable for building. Fly ash bricks are suitable for constructions. These bricks are only suitable for subtropical regions or places with warm climates since they don't absorb heat. However, it is useless in cold climates. It is vital to exclusively utilise high quality fly ash brick.So we found some alternative to cast brick using certain percentage of textile waste (polyester fabric) as a replacement for fly ash in the manufacturing of fly ash bricks. Polyester fabric has dense molecular structure and they are extremely elastic in nature. They are very resilient and durable.

The Polyester fabric are not an environmental friendly material as they does not decompose. So we have made an attempt of costing a brick by replacing certain percentage of fly ash to reduce textile waste and act

as a replacing material for fly ash. The polyester fabric brick has been cast and some common test for brick has been done and results are taken.

II. MATERIAL AND METHODS

To cast a Polyester fabric brick a mixed proportion is made and quantity of the material taken are calculated. We cast a three trails of brick with different proportion by replacing fly ash with 5%, 10% and 15% of polyester fabric.

Nominal mix for casting a normal fly ash brick . Design of standard fly ash brick as per IS 12894:2002,

Table 1: Nominal mix ratio for fly ash brick

S. NO	Materials	Proportion of materials
1	Fly ash	35%
2	Quarry dust	55%
3	Gypsum	5%
4	Lime	10%

As a total of 6 bricks are casted in order to test the strength of brick obtained at 7 days, 14 days and 28 days.

Casting of Polyester fabric brick with different proportion mix.

1.1 *TRIAL NO-1 (5% of PF)*

Table 2: Quantity of material for trail no.1

S.no`	Materials	Proportion of materials	Quantity of materials	No of specimens	Total quantity Of materials in Kg
1	Fly ash	33.25%	0.7066	6	4.2396
2	Quarry dust	55%	1.186	6	7.116
3	Gypsum	5%	0.228	6	1.368
4	Lime	10%	0.376	6	2.256
5	PF	1.75%	0.0328	6	0.1968

1.2 TRIAL NO-2 (10% of PF)

Table 3: Quantity of materials for trail no.2

S. NO	Materials	Proportion of materials	Quantity of materials	No of specimens	Total quantity of materials in kg
1	Fly ash	31.5%	0.669	6	4.014
2	Quarry dust	55%	1.186	6	7.116
3	Gypsum	5%	0.228	6	1.368
4	Lime	10%	0.376	6	2.256
5	PF	3.5%	0.0658	6	0.3948

1.3 TRIAL NO-3 (15% of PF)

Table 4: Quantity of material for trail no.3

S. NO	Materials	Proportion of materials	Quantity of materials	No of specimens	Total quantity of materials in kg
1	Fly ash	29.75%	0.6322	6	3.7932
2	Quarry dust	55%	1.186	6	7.116
3	Gypsum	5%	0.228	6	1.368
4	Lime	10%	0.376	6	2.256
5	PF	5.25%	0.0893	6	0.5358

III. RESULTS AND DISCUSSIONS

Few test has been conducted to examine the quality of the Polyester brick and results are taken.

1. COMPRESSIVE STRENGTH

Compressive strength of fly ash brick is important to determine before using in a project or industry, since the fly ash brick is made by mixing fine aggregate, fly ash, gypsum and lime in certain ratios, so we are in a situation of unable to assure the strength of fly ash brick prepared. The standard code for the preparation of fly ash brick is prescribed in the code IS 12894:2002.

COMPRESSIVE STRENGTH AT 7 DAYS:

Compressive strength of specimens are tested after 7 days from the date of casting.

Table 5: compressive strength at 7 days.

S no	% of PF	Age at testing (days)	specimen	Compressive strength (N/mm^2)	Average Compressive strength (N/mm^2)
1	CC (0% of PF)	7 days	A1	5.71	5.77
2			A2	5.83	
3	5% of PF	7 days	B1	4.81	5.23
4			B2	5.65	
5	10% of PF	7 days	C1	8.53	8.78
6			C2	9.02	
7	15% of PF	7 days	D1	10.7	10.52
8			D2	10.34	

COMPRESSIVE STRENGTH AT 14 DAYS:

Compressive strength of specimens are tested after14 days from the date of casting

Table 6:Compressive strength at 14 days.

S no	% of PF	Age at testing(days)	specimen	Compressive strength (N/mm^2)	Average Compressive strength (N/mm^2)
1	CC (0% of PF)	14 days	A1	8.13	8.22
2			A2	8.3	
3	5% of PF	14 days	B1	6.85	7.45
4			B2	8.05	
5	10% of PF	14 days	C1	12.16	12.5
6			C2	12.84	
7	15% of PF	14 days	D1	15.24	14.98
8			D2	14.72	

COMPRESSIVE STRENGTH AT 28 DAYS:

Compressive strength of specimens are tested after 28 days from the date of casting

Table 7: Compressive strength at 28 days

S no	% of PF	Age at testing (days)	specimen	Compressive strength (N/mm^2)	Average Compressive strength (N/mm^2)
1	CC (0% of PF)	28 days	A1	9.5	9.6
2			A2	9.7	
3	5% of PF	28 days	B1	8	8.7
4			B2	9.4	
5	10% of PF	28 days	C1	14.2	14.6
6			C2	15.0	
7	15% of PF	28 days	D1	17.8	17.5
8			D2	17.2	

Comparison of Compression Test at 7 Days, 14 days and 28 days.

Table 8: Compresion of compressive strength for different days.

Mix	Compressive Strength (N/mm^2)		
	7 Days	14 days	28 days
1(cc 0% of PF)	5.800	8.220	9.600
2 (5% of Polyester fabric)	5.900	8.480	8.772
3 (10% of Polyester fabric)	6.050	8.750	14.632
4 (15% of Polyester fabric)	6.400	9.120	17.54

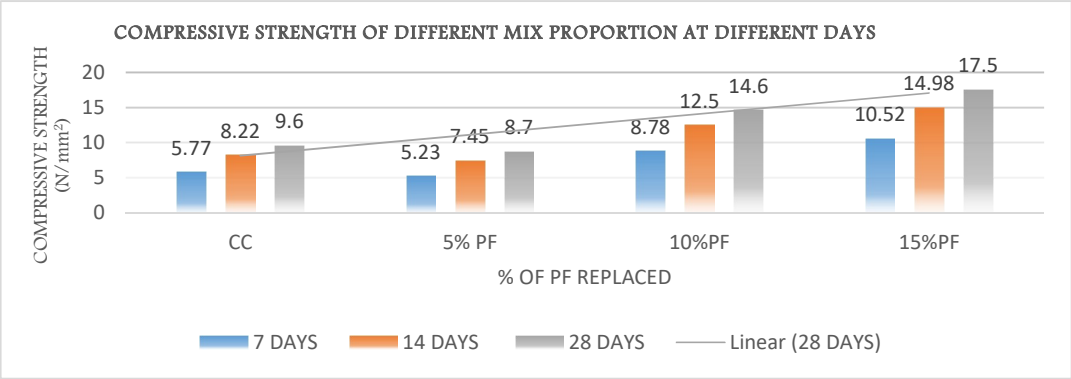

Fig 1 : Graphical representation of Compressive strength of different mix proportion at different days

2.2. WATER ABSORPTION TEST

Water absorption of fly ash brick is tested as per IS: 3495 Part-II. It ensures the quality of brick to be used in the project. The test result may vary from 12% to 20% of its dry weight.

Table 9: Water absorption in percentage

SPECIMEN	WATER ABSORPTION %
CC (0% PF)	12.9%
5% PF	12.2%
10% PF	12.0%
15% PF	11.6%

2.3.EFFLORESCENCE TEST

Efflorescence test describes the percentage of salt content deposited after the procedure laid down in the code IS 3495 part-III.

Table 10: Efflorescence test results.

SAMPLE	EFFLORESCENCE DEFECTIVES
CC(0% PF)	MODERATE
5%	SLIGHT
10%	SLIGHT
15%	SLIGHT

IV. CONCLUSIONS AND RECOMMENDATIONS

In this project we experimentally replaced fly ash partially with polyester fabric to increase the compressive strength of brick. In this experimental study, the addition of 15% polyester fabrics in fly ash brick resulted in the highest strength of 10.600 N/mm^2 after 28 days. Use of polyester fabric aids in preventing environmental degradation and also a recycled material so far. And also efficient and low cost material with high strength compared to the normal bricks and it is economical too. The main motive of this project is to construct multi story building with load bearing structures, even though the experiment does not meet the required strength but attains its maximum compressive strength. The use of Polyester fabric also contributes to environmental preservation as a recycled material. Overall, its considered an efficient and low-cost solution compared to traditional bricks.

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