

A Study on Customer Preference for Fly Ash Bricks

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ABSTRACT

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The purpose of this study, which was based on a market survey, was to pinpoint the factors that influence fly ash brick quality from the standpoint of customers. With a focus on those working in the building and construction industries, questionnaires and in-person interviews were used to gather data on fly ash and clay bricks. This experiment demonstrates the benefits fly ash bricks have over traditional clay bricks. From the study, it was found that the six factors (price, weight, strength, water absorption, lesser breakage, durability) are found to be significantly related to the preference of the consumer for the fly ash bricks. It was also found that fly ash bricks were comparatively better in the aspects of price, weight, strength, durability and water absorption capacity.

Keywords: Fly Ash, Bricks, Strength, Water Absorption, Lesser Breakage, Smooth Surface, Durability, Cementsaving

1. Introduction

The money most of us in business desire is customer preference. However, what do we understand about client preferences and how can we strategically manage them? When it comes to genuinely thinking like a customer and figuring out how to stand apart from the competition in easily recognizable ways, the majority of us have a serious blind spot. Without bricks, no structure is possible. The activity of manufacturing bricks has been carried out by humans for many centuries. Bricks may now be produced quickly and easily thanks to machinery and modern technology. Bricks made of common burnt clay are created by pressing into moulds. After drying, these bricks are burned in a kiln. Common burnt clay bricks are employed in everyday work; they don't have any particularly eye-catching appearances. These bricks need plastering or rendering when they are used in walls. All across the world, bricks are used to build buildings and pave roads. Brick is now more frequently utilized as a decorative surface than as a roadway material in the United States, where it was historically used as a paving medium. In order to maximize a structure's stability and strength, bricks are typically laid flat.

FLY ASH BRICKS IN CONSTRUCTION

The recommendation and projects are being passed to utilize fly ash brick for the construction job because it

has not been employed frequently or on a significant scale. These bricks have been employed for building purposes up until this point. A number of new types of construction materials that are now widely utilized and in high demand were developed as a result of the changing times, styles of construction, and types of construction work that are being done today. Bricks are currently the most significant building material that has undergone periodic alteration. For all types of construction, it is the most important material. Without it, every structure's construction is still in progress. The amount of bricks needed varied depending on the construction project. The type of building work that will be done affects the bricks that are used as well. For instance, mud bricks were used to create a comfortable temperature, etc. A new sort of brick called "FLY ASH BRICKS" is now rapidly becoming available for use in construction. Despite not being widely desired, it has been utilized in a number of significant undertakings. The customer preference for fly ash bricks, their applications, and their economic viability in comparison to other bricks will all be demonstrated in this report analysis.

2. Review of Literature

P. Dixit et al. (2014) investigated the factors that affect fly-ash brick quality from the consumer's point of view. The brick industry has enormous potential and has to be investigated. When compared to clay

bricks, fly-ash bricks are more affordable from a pricing perspective. The study gave credit to a number of variables, including shape, weight, durability, breaking, seepage, and strength. The snowball sampling method was used to sample a total of 78 consumers, and the Pearson's correlation coefficient was used to analyze the data and evaluate the hypotheses. The results showed a substantial correlation between weight, strength, durability, breakage, seepage, surface smoothness, and shape with quality, with p-values less than 0.05.

According to A.Agrawal et al. (2014), bricks are just one of the many building materials used in the construction industry. Fly ash bricks are safer, more affordable, and stronger than clay bricks. The customer's perception of the quality (i.e., the advantages) is more significant than the quality itself when examining the quality from the standpoint of adoption. The goal of the study is to determine how perceptions of the quality of fly ash bricks affect their intended use. The study gave credit to a number of elements, including price, strength, durability, the use of less cement, light weight, and less water absorption. A total of 78 respondents were chosen using the snowball sampling method, interviewed, and their responses were then examined using Pearson's correlation. As the p-values are less than 0.05, the results showed that there is a significant association between these two.

According to Aakash Suresh Pawar and Devendra Bhimrao Garud (2014), the manufactured fly ash bricks could weigh as little as 10.60% less than clay bricks. The compressive strength of bricks made from fly ash is higher than that of regular bricks. Compared to fly ash bricks, clay bricks can bear higher weight. The amount of water absorbed by fly ash bricks is less than what is required by I.S. Bricks made of fly ash and clay do not effloresce. The goals of the study were to: I determine the impact of adding fly ash to bricks;

(ii) build bricks without sacrificing their strength; and

(iii) safeguard the environment by disposing of fly ash. Fly ash bricks were subjected to a number of tests to compare their load-bearing capabilities to those of clay-made bricks.

Ajish George (2015) says that use of fly ash bricks to be mandatory. The central government is planning to

make it compulsory to use bricks made out of fly ash in 20 construction hotspots in the country. Fly ash is a residue generated during the combustion of coal. Fly ash is available in plenty since a large quantity of coal is burned in thermal power generation. The present move by the government is to make use of this hazardous waste product in an environment friendly manner. All construction activity within this area will also have to use fly ash based products for construction. However there have been some health concerns regarding the use of fly ash as it is a toxic substance and it is considered as an inferior building and construction material.

Balaraju Sivagnanaprakash (2015) investigated the risks associated with clay brick and the benefits of fly ash brick extending. In comparison to traditional clay bricks, QFAC bricks' compressive strength, tensile strength, durability, water absorption, impact resistance, and thermal conductivity were examined. QFAC brick had a 15% better compressive strength than clay brick. It was discovered that QFAC brick had twice the flexural strength of clay brick.

Ravi Kumar et al (March 2014) studied the behavior of fly ash bricks. Compressive strength tests, water absorption tests, efflorescence tests, weight tests, and structural tests were carried out in order to compare the results with those of regular bricks. The outcome showed that the test results for compressive strength, water absorption and efflorescence, and reduced weight were superior to those of ordinary brick.

Ravi Kumar, Deepankar Kr. Ashish, Najia L.(June 2015) looked at how to make non- traditional bricks more affordable. The goal of this study is to prepare materials for low-cost housing projects without sacrificing their robustness and endurance. The non-traditional brick will be simple to handle and transport, take less labor to handle during industrial activity, and lower construction costs without sacrificing the strength of the building.

Statement of the Problem

The market has a wide variety of brick and block varieties that can be used to build walls. Each business competes on the basis of strong performance, value, novel features, and promotions. Many customers are using clay bricks (a conventional bricks) due to its early existence and no other alternatives. This in turn have resulted in infertility of the soil. Also there are large emissions of thermal coal in terms of thermal energy production. This poses a serious threat to the

environment. To overcome this problem, Fly Ash brick plays a predominant role in replacing clay bricks. But the perception towards the Fly Ash bricks is not highly commendable. With this scenario, the researcher had made an attempt to study the preference towards the Fly Ash bricks.

The market study may be the greatest source to learn about builders' perceptions and expectations of Fly Ash Bricks because the company also has future plans to introduce new building materials that fall within the area of eco-friendly building materials.

3. Objective of the Study

To find out the customer (especially Builders) preferences towards Fly Ash Bricks in Erode district. To identify the customer preference on Fly Ash bricks among the construction professionals in Erode district. To compare the fly ash and clay bricks in terms of price, weight, strength, water absorption, Lesser breakage, Smooth surface ,Durability and cement saving. To access the factor that influences the purchase of Fly Ash Brick. To access the performance of Fly Ash Brick on various factors.

4. Scope of the Study

The construction operation did not make extensive use of these bricks. However, it has a bright future because fly ash, a waste product typically derived from industrial waste, is used to make these bricks. The production of these bricks will broaden their application in construction. The specific qualities of the Fly Ash brick such as high compressive strength, better workability and fire resistance will increase its future scope in construction work. Since this product is eco-friendly and economical product there would be a large scope in terms of its usability. The study on the preference towards the Fly Ash brick would further enable the researcher to get an insight into market proportion, changing trends in construction material, adaptability and alternate source of raw material etc. This would further help the company to understand its market position and its future possibility for expansion

5. Limitation of the Study

It is difficult to measure the preference of the respondents exactly. Therefore the result of the study cannot be considered to be precise. The customer's preferences change from time to time, thus the project's outcome might not be applicable in the long run. Data collection was very difficult because the respondents do not spare adequate time to respond for

the Questionnaire. Difficulty in communicating the questionnaire to the direct customer and dealers to the company (perception barrier). Some customers were not willing to give appointment due to their busy schedule.

6. Research Methodology

The research is done for the academic purpose. Therefore the research design adopted is ‘Descriptive Research’, where the objectives are set as the first step. Then necessary data collection tools are used to collect the data and finally a report is prepared after the collected data is analyzed. The primary goal of descriptive research is to explain the current situation as it stands. It usually entails fact-finding investigations and surveys of various kinds. In connection to the preference factor involved in the purchasing of Fly Ash Brick, this researcher seeks to characterize the respondent's traits. The customer who visit or purchases the fly ash brick in the Erode District constitute the population for the study. Since the number of people who prefer to buy fly ash brick is unknown and the approximate number of people cannot be predicted approximately, the population for the study could not be defined. The sample for the study is selected in two ways. The people who visited the company for purchase and the people in company’s customer database constitute the sample for the study. The sample for the study is 117 customers. Since the population size is unknown, the researcher has adopted convenience sampling (non-probabilistic) technique to select the sample.

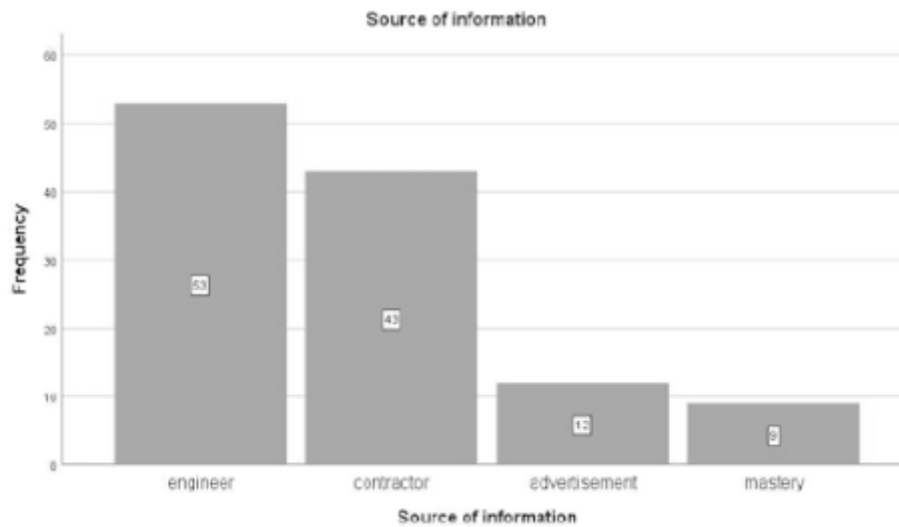
7. Analysis and Interpretation

Table 1 Purpose of Purchase					
Purpose of purchase		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	self use	45	38.5	38.5	38.5
	commercial use	57	48.7	48.7	87.2
	business use	15	12.8	12.8	100.0
	Total	117	100.0	100.0	

The above table shows that 45% of the respondents purchase the fly ash bricks for self use, 357% of the respondents purchase the Fly ash bricks for commercial use and 15% of the respondents purchase the fly ash bricks for business use.

Figure 1 Source of Information

The above table shows that 53% of the respondents received information from Engineers 43% of



the respondents got information from contractor, 13% of the respondents got information from advertisement and 9% of the respondents source of information was from its mastery.

Table 2 Type of bricks brought					
Types of bricks brought		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	fly ash bricks	60	51.3	51.3	51.3
	clay bricks	8	6.8	6.8	58.1
	both	49	41.9	41.9	100.0
	Total	117	100.0	100.0	

Table 3 Types of health issues faced					
Types of health issues faced		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	skin related	15	12.8	12.8	12.8
	breathing issues	37	31.6	31.6	44.4
	heat effect	49	41.9	41.9	86.3
	others	16	13.7	13.7	100.0
	Total	117	100.0	100.0	

Table 4 Usage for weathering course					
Usage for weathering course		Frequen	Percent	Valid Percent	Cumulative Percent
Valid	better usage	43	36.8	36.8	36.8
	at par with clay bricks	61	52.1	52.1	88.9
	no use at all	13	11.1	11.1	100.0
	Total	117	100.0	100.0	

CORRELATION BETWEEN OPINION ON USING FLY ASH BRICKS AND PRICE

Null Hypothesis (Ho): There is no significant correlation between opinion on using fly ash bricks and price.

Alternate Hypothesis (Ha): There is a significant correlation between opinion on using fly ash bricks and price.

Table 5 CORRELATION BETWEEN OPINION ON USING FLY ASH BRICKS AND PRICE

		Opinion towards fly ash bricks	Price
Opinion towards fly ash bricks	Pearson Correlation	1	.831**
	Sig. (2-tailed)		.000
	N	117	117
Price	Pearson Correlation	.831**	1
	Sig. (2-tailed)	.000	
	N	117	117
**. Correlation is significant at the 0.01 level (2-tailed).			

From the correlation table, it is observed that the significant value ($p=0.000$) is lesser than critical value (0.05) for this study. Hence, H_a is accepted and H_o is rejected. So it is concluded that there is a strong correlation between opinion on using fly ash bricks and price.

CORRELATION BETWEEN OPINION ON USING FLY ASH BRICKS AND WEIGHT

Null Hypothesis (Ho): There is no significant correlation between opinion on using fly ash bricks and Weight.

Alternate Hypothesis (Ha): There is a significant correlation between opinion on using fly ash bricks and Weight.

Table 6 Correlation between opinion on using fly ash bricks and weight

		Opinion towards fly ash bricks	Weight
Opinion towards fly ashbricks	Pearson Correlation	1	.861**
	Sig. (2-tailed)		.000
	N	117	117
Weight	Pearson Correlation	.861**	1
	Sig. (2-tailed)	.000	
	N	117	117
**. Correlation is significant at the 0.01 level (2-tailed).			

From the correlation table, it is observed that the significant value ($p=0.000$) is lesser than critical value (0.05) for this study. Hence, H_a is accepted and H_0 is rejected. So it is concluded that there is a strong correlation between opinion on using fly ash bricks and Weight.

CORRELATION BETWEEN OPINION ON USING FLY ASH BRICKS AND WATER ABSORPTION

Null Hypothesis (H_0): There is no significant correlation between opinion on using fly ash bricks and water absorption.

Alternate Hypothesis (H_a): There is a significant correlation between opinion on using fly ash bricks and water absorption.

Table 7 Correlation between opinion on using fly ash bricks and water absorption

		Opinion towards fly ash bricks	Water absorption
Opinion towards fly ashbricks	Pearson Correlation	1	.913**
	Sig. (2-tailed)		.000
	N	117	117
Water absorption	Pearson Correlation	.913**	1
	Sig. (2-tailed)	.000	
	N	117	117
**. Correlation is significant at the 0.01 level (2-tailed).			

From the correlation table, it is observed that the significant value ($p=0.000$) is lesser than critical value (0.05) for this study. Hence, H_a is accepted and H_o is rejected. So it is concluded that there is a strong correlation between opinion on using fly ash bricks and water absorption.

ONEWAY ANNOVA ANALYSIS

DIFFERENCE BETWEEN TYPE OF THE BRICKS USED AND PRICE

Null Hypothesis (H_o): There is no significant difference between type of the bricks used and price.
Alternative Hypothesis (H_a): There is a significant difference between type of the bricks used and price.

Difference between type of the bricks used and price

Table 8								
Descriptives								
Reason to use fly ash bricks								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
strongly agree	429	1.761	.53573	.08266	1.5950	1.9288	1.00	3.78
agree	503	2.513	.60771	.08594	2.3406	2.6860	1.11	3.56
neutral	187	2.882	.71245	.16793	2.5284	3.2370	2.00	4.22
disagree	42	4.222	.18144	.09072	3.9335	4.5109	4.00	4.44
strongly disagree	34	4.407	.33945	.19598	3.5642	5.2506	4.11	4.78
Total	1174	2.407	.86165	.07966	2.2496	2.5652	1.00	4.78

Table 9	
ANOVA	
Reason to use fly ash bricks	

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	47.302	4	11.826	34.117	.000
Within Groups	38.821	112	.347		
Total	86.123	116			

From the above table it is observed that the p value is 0.000, which is less than the critical value 0.05. So Ho is rejected and Ha is accepted. Hence we conclude that there is a significant difference between type of the bricks used and price.

DIFFERENCE BETWEEN TYPE OF THE BRICKS USED AND WATER ABSORPTION

Null Hypothesis (H0): There is no significant difference between type of the bricks used and water absorption.
Alternative Hypothesis (Ha): There is a significant difference between type of the bricks used and water absorption.

Table 10 ANOVA -Reason to use fly ash bricks					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	67.678	4	16.919	102.734	.000
Within Groups	18.446	112	.165		
Total	86.123	116			

From the above table it is observed that the p value is 0.000, which is less than the critical value 0.05. So Ho is rejected and Ha is accepted. Hence we conclude that there is a significant difference between type of the bricks used and water absorption.

Difference Between Type of the Bricks Used and Lesser Breakage

Null Hypothesis (Ho): There is no significant difference between type of the bricks used and Lesser Breakage.
Alternative Hypothesis (Ha): There is a significant difference between type of the bricks used and Lesser Breakage.

Table 11 Difference between type of the bricks used and lesser breakage

Descriptives								
Reason to use fly ash bricks								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	14	1.4524	.36061	.09638	1.2442	1.6606	1.00	2.00
2	45	1.9012	.37171	.05541	1.7896	2.0129	1.22	3.00
3	39	2.6553	.51790	.08293	2.4874	2.8232	1.78	4.22
4	10	3.5667	.45194	.14292	3.2434	3.8900	2.89	4.33
5	9	4.0617	.44135	.14712	3.7225	4.4010	3.44	4.78
Total	117	2.4074	.86165	.07966	2.2496	2.5652	1.00	4.78

ANOVA					
A					
Table 12 Reason to use fly ash bricks					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	64.764	4	16.191	84.90	.000
Within Groups	21.359	113	.191		
Total	86.123	116			

From the above table it is observed that the p value is 0.08, which is less than the critical value 0.05. So H_0 is rejected and H_a is accepted. Hence we conclude that there is a significant difference between type of the bricks used and durability.

8. Findings

57% of the respondents purchase the fly ash bricks for commercial use. 28% of the respondents buy fly ash bricks for its less price. 53% of the respondents received information on fly ash bricks from engineers. 58% of the respondents use the bricks for building industrial house. 60% of the respondents rely only on fly ash bricks. 57% of the respondents were using fly ash bricks for less than 2 years. 63% of the respondents use fly ash bricks for building interior wall. 62% of the respondents preference it for wall without structural stability.

Opinion on Various Attributes of Fly Ash to Clay Bricks

42% of the respondents said that the fly ash was strong when compared to clay bricks was strong. 58% of the respondents said it was convenient. 66% of the respondents said that there was less delivery time. 68% of the respondents felt there was no health problem in using fly ash bricks. Out of 49%, 37% of the respondents faced breathing and heat issues. 54% of the respondents felt to be low price. 52% of the respondents said that no difference in the quantity of cement. 50% of the respondents felt that the wall appeared good. 58% of the respondents felt that fly ash bricks were convenient for interior design work. 61% of the respondents felt that it was in par with clay bricks for weathering course.

Relation Between Opinion on using Fly Ash Bricks and Various Attributes

It was found that there is significant difference in

using fly ash bricks to various attributes such as (price, weight, water absorption and lesser breakage). The significance was due to the qualities such as fly ash being economical, easy to handle, less water absorption and lesser breakage.

Difference Between the Bricks used and Various Attributes

It was found that there is a significant difference between the types of bricks used and various attributes such as (price, water absorption, lesser breakage and durability). The difference exist due to the specialties like cheaper than other form of bricks, absorbs less water and have lesser breakage while handling and transporting.

9. Suggestion

Since awareness of fly ash bricks are found to be low among customer, higher promotional campaign could be done to improve its awareness level. Availability can be increased by manufacturer so that the three will be increase in the number of customer. It was proposed by many business customers that mixing of lime and gypsum could improve the strength of the brick. So the company can take an initiative to improve the bricks strength further. For an increase in sales, the manufactures should concentration more on commercial building than individual residential consumers. Availability of the fly ash bricks have to be made extensively. The company can strengthen its dealer network either by opening a number of direct retail Outlets or finding new distributors. Dealers can be educated about the importance and feasibility of using fly ash bricks, So that the dealers in turn educate their customers.

10. Conclusion

Fly ash is now used more frequently in the production of construction materials since it is now more readily

available and because fly ash disposal causes enormous challenges. According to the study, six of the eight fly ash brick parameters examined (price, strength, weight, water absorption, lower breakage, and durability) are found to substantially differ from one another in terms of how fly ash bricks are perceived, with a p-value of less than 0.05. It was determined that fly ash brick was superior in terms of cost, strength, and weight. These are strong and barely absorb any water. Bricks made of fly ash reduce construction costs overall. Fly-Ash bricks are environmentally beneficial because they save topsoil and make use of leftover coal from thermal power plants, both of which help to safeguard the environment.

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