Study on Manufacturing of Bricks By Using Mineral Admixture In Alternate Solution

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Abstract- *The bricks with clay, lime, silica fume, and polyvinyl alcohol with a purpose to supply a higher expertise at the residences of bricks like compressive strength, water absorption and size and shape of brick was good while comparing the other kind of bricks. The scope of this project is to determine and compare the strength of the bricks by using different percentage of polyvinyl alcohol, lime and silica fume. By using lime, silica fume and PVA the project aims to create bricks that have longer life span and improved performance.*

This study will investigate to optimal proportions of lime silica fume and PVA to use in manufacturing process in order to achieve the desired strength and durability. The bricks will be tested for compressive strength, water absorption and durability. The study will also investigate the environment impact of this method and compare it with the traditional method of manufacturing. The results of the study will provide valuable information for the brick manufacturing industry and could lead to the development of more durable and sustainable bricks.

Keywords- Bricks, Lime powder, Silica Fume, Polyvinyl Alcohol etc…

I. INTRODUCTION

Brick manufacturing is a significant industry worldwide that plays an essential role in the construction sector. Bricks are widely used in building construction due to their durability,

However, traditional brick manufacturing processes have been associated with several environmental challenges, including high energy consumption, high greenhouse gas emissions, and depletion of natural resources.

In recent years, researchers and manufacturers have been exploring alternative materials and processes for brick manufacturing to address these challenges. One such approach involves incorporating silica fume, lime powder, and polyvinyl alcohol powder into the brick mix. Silica fume is a derivative of the silicon and ferrosilicon alloy manufacturing procedure this is acknowledged for its high pozzolanic activity, making it an excellent additive to enhance the mechanical properties and durability of the bricks. Lime powder, on the other hand, is a widely used construction material that can enhance the workability of the brick mix and improve the bricks' strength and durability. Polyvinyl alcohol powder is a plasticizer that can improve the flow and consistency of the brick mix, resulting in bricks with smoother surfaces and fewer cracks.

The use of these materials in brick manufacturing has the potential to improve the environmental performance of the industry by reducing the need for natural resources and energy-intensive processes. Additionally, the resulting bricks may exhibit improved thermal insulation, fire resistance, and other properties that are important for construction applications. As such, the incorporation of silica fume, lime powder, and polyvinyl alcohol powder into the brick mix represents a promising approach to sustainable and efficient brick manufacturing.

. OBJECTIVES

- To improve the fire resistance of bricks by adding silica fume and lime powder which have high melting points and can withstand high temperatures.
- To produce bricks with a smoother surface and fewer cracks by using polyvinyl alcohol powder to improve the flow and consistency of the brick mix.
- To reduce the cost of brick production by using silica fume and lime powder which are less expensive than some traditional brick-making materials.

II. LITERATURE REVIEW

MS Abo Dhaheer, HK Ammash, MT Albdiry (Year 2018): In this study, experimental studies changed into committed to analyse the residences of clay brick handled via way of means of polyvinyl alcohol (PVA). Two methods of treatment were conducted. The first contained a clay brick by submerging the specimens in 1%, 2% and 3% of PVA solution, whereas the second involved coating the brick specimens with 6% PVA (i.e., a high viscous solution). The dealt with specimens had been allowed to dry beneathneath

ambient temperature withinside the laboratory earlier than being tested. Standard checks hired for brick specimens had been applied. Regarding the specimens treated using the submerging method, results showed that there was a significant contribution of PVA to the compressive strength, general water absorption and efflorescence tests, wherein the specimens reached the pleasant overall performance whilst PVA become accelerated to 3%. However, the brick specimens lined with the aid of using PVA confirmed a mild growth withinside the compressive energy however are substantive in water absorption and efflorescence.

M Serhat Baspinar, Ismail Demir, Mehmet Orhan (Year 2010): Silica fume (SF) is an inorganic waste cloth that's generated for the duration of the fundamental silicon and ferro-silicon alloy production. Due to the specific properties, its miles applied in numerous industries. However, little or no facts is to be had at the usage capacity of SF in conventional clay brick industry. In this study, the impact of various portions of SF addition at the homes of fired clay brick become investigated. Test samples have been produced with the aid of using uniaxial urgent and fired at 800,900, a thousand and 1100°C.The microstructures of the samples have been investigated with the aid of using Scanning Electron Microscopy (SEM). The strength of the fired samples at 1000 and 1100°C were significantly improved with SF addition.It changed into concluded that the reactive amorphous nature of SF debris complements the sintering motion domestically and this offers higher electricity behaviour.SF addition additionally stepped forward the efflorescence behaviour of the bricks. It turned into concluded that the impact of SF addition at the fired clay brick particularly relies upon at the firing temperature. At low firing temperatures, SF addition has a bent to lower the majority density. However, at better firing temperatures, SF addition permits higher sintering movement with a drastic growth in bulk density.

III. MATERIALS USED

SILICA FUME:Silica fume is a highly reactive material that contains very fine particles, with an average particle size of less than 1 micron. Due to its high pozzolanic activity, silica fume is a valuable additive in construction materials, including bricks.

FIG 1: Silica fume

LIME: Lime powder is a widely used construction material that has been used in brickmaking for centuries. It is produced by heating limestone, a naturally occurring sedimentary rock composed mostly of calcium carbonate, to high temperatures. When added to the brick mix, lime powder can enhance the workability of the mix and improve the strength and durability of the bricks.

FIG2: Lime

POLYVOINYL ALCOHOL:Polyvinyl alcohol (PVA) powder is a water-soluble synthetic polymer that is widely used in various industries, including the construction industry. In brick manufacturing, PVA powder is added to the brick mix as a plasticizer to improve the flow and consistency of the mix.

FIG3: Polyvinyl Alcohol

IV. TESTS ON BRICKS

There are several tests that can be conducted to evaluate the quality of bricks the manufacturing processSome usually used checks include:

- COMPRESSIVE STRENGTH TEST:This test measures the maximum load a brick can withstand before breaking.

It is widely used to evaluate the strength and durability of bricks.

S.NO	CHEMICAL ADMIXTURES	PERCENTAGE (%)	COMPRESSIVE STRENGTH (MPA)
1	Polyvinyl Alcohol	1	9.8
2	Lime	3	8.9
3	Silica Fume	5	7.4
4	PVA+LIME+SILICA FUME	1+3+5	4.2

Table 1: Compressive Strength

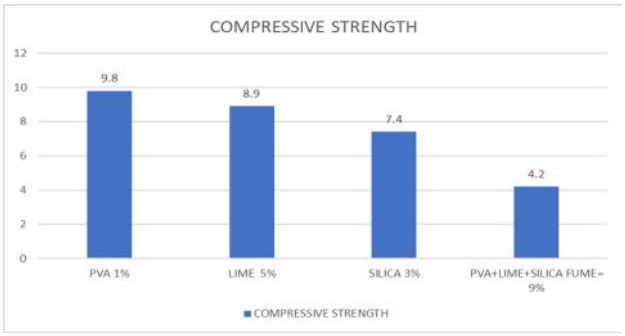

FIG4: Compressive strength of test specimen

- **WATER ABSORBTION TEST:**Water absorption check on bricks is performed to decide sturdiness assets of bricks at the side of degree of burning, fine and conduct of bricks in weathering.The degree of compactness of bricks can be obtained via water absorption test, as water is absorbed via pores in bricks. The water absorption by bricks increases with increase in pores.

S.NO	SPECIMEN	DRY WEIGHT (W_1Kg)	WET WEIGHT (W_2Kg)	WATER ABSORPTION %
1	Polyvinyl Alcohol	2.310	2.725	20
2	Lime	2.215	2.830	30
3	Silica Fume	2.230	2.890	33
4	PVA+LIME+SILICA FUME	2.045	2.640	29

Table 2: Water Absorption

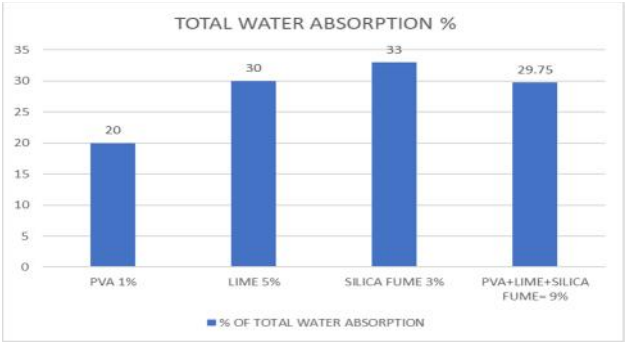

FIG5: Water absorption test of specimen

- **SOUNDNESS TEST:** Soundness check of bricks indicates the character of bricks towards unexpected impact. In this test, 2 bricks are selected randomly and struck with one another.hen sound produced need to be clean bell ringing sound and brick need to know no longer break. Then it's far stated to be correct bricks.
  1. Polyvinyl Alcohol - Metallic sound is observed (2^{nd}Class brick)
  2. Lime -Metallic sound is observed (2^{nd} class brick)
  3. Silica Fume -Metallic sound is observed (2^{nd} class brick)
  4. PVA+LIME+SILICAFUME-Metallic sound is observed (3^{rd} class brick)

- **HARDNESS TEST**: A pinnacle brick have to resist scratches in the direction of sharp things. So, for this take a look at a pointy device or fingernail is used to make scratch on brick. If there's no scratch influence on brick then it's far stated to be tough brick.
  1. Polyvinyl Alcohol -Good quality of brick
  2. Lime -Good quality of brick
  3. Silica Fume -Good quality of brick
  4. PVA+LIME+SILICA FUME -Medium quality of brick.

V. CONCLUSION

- In this project work our objective is to check the suitability of PVA powder, lime powder and silica fume in clay bricks. By using different proportions of above materials.
- We had tested the bricks under compressive strength machine the obtained results were compared with standard values.
- The bricks manufactured using PVA, lime, silica fume had a result better than the minimum value as 9.8 N/mm^2, 8.9N/mm^2 and 7.4N/mm^2 respectively.
- By using 1%PVA, 5%lime, 3%silica are the proportions of each material in their respective bricks. Their results are better with this proportion.

- The brick which is prepared by using three materials in one brick was doesn't perform well. Theis' brick can't withstand to a minimum strength.
- By our analysis these bricks have cost less than the normal clay brick and these bricks which are prepared by using PVA, lime, silica can be used in building works which are not directly subjected to the loading.

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