

# Use and Cost Comparison of Pond Ash with Fly Ash for Bricks Casting

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**Abstract** – The project aims to find out the possibility of using pond ash and stone crusher dust in fly ash manufacturing bricks. A part of cement is replaced by pond ash and stone crusher dust is used as an additive in different composition as per the conventional standard code of practice at brick manufacturing plant. The properties are analyzed and compared with those of the conventional bricks. This project deals with the engineering properties such as chemical composition, compressive strength, water absorption and characteristics of pond ash, its application as a sustainable material in construction industry, to bring in environmental and economic benefits. And as the pond ash is waste material and it is not used in any type of construction material, due to this there is large amount of waste generation and it is difficult to store such amount of waste. therefore to overcome this problem manufacturing of pond ash bricks can play very crucial role. The pond ash brick and fly ash brick are light in weight, with less absorption, high performance, high tensile strength and more durability. The bricks produced were about 28% lighter than clay brick. In this project work an attempt is made to find out the possibility of using pond ash instead of burnt clay brick and conventional cement bricks with utilization of industrial waste by replacing fly ash with it.

**Keywords**-Pond ash, crushed sand, grit, fly ash, cement.

## I- INTRODUCTION

Any country's economic and industrial growth depends on the supply of power. In India also, coal may be a major source of fuel for power generation. About 60% power is produced using coal as fuel in thermal power plant. In thermal power plants, coal is burnt to

heat the water so as to get steam, which is successively went to run the turbines. Ash may be a byproduct of power generation with coal. Indian coal has low calorific value (3000-3500 Kcal) and really high ash content (30-45%) leading to huge quantity of ash is generated within the coal based thermal power stations. During 2005-06 about 112 million tonne of ash has been generated in 125 such power stations and this massive generation was difficult to dump. With this growth in power sector, ash generation has reached 175 million tons once a year in 2012. Any coal based thermal power plant contains the subsequent residues after processing. the development industry in India contributes 8% to national GDP (Gross Domestic Production) in 2010-11 is 308 billion. With increasing thrust on developing infrastructure and attractive housing industry is booming and resulting rapid climb in near future. Another new concept Green Building refers to both construction and therefore the use of processes that are environmentally responsible and resource efficient throughout the building life cycle. For this life cycle waste and residual materials from different processes are used and are considered as ecofriendly material.

## II-METHODOLOGY

Fly ash brick (FAB) may be artifact, specifically a masonry unit. due to the high concentration of quicklime in ash, the brick is described as "self-cementing". The manufacturing method saves energy which also reduces mercury pollution, and roughly costs 20% but traditional

clay brick manufacturing. The very high popularity and utilization of ash brick overshadows the potential of pond ash as a cloth for generation of masonry units. Having similar physical and chemical properties as ash, pond ash utilization in building materials even have many advantages like cost effectiveness, environmental friendliness, increase in strength and also conservation of natural resources and materials. Other environmental benefits to recycling ash include reducing the demand for virgin materials that might need quarrying and cheap substitution for materials like hydraulic cement.

Similarly, stone crusher units and quarrying sites leave a residue referred to as Stone Crusher or Quarry Dust. It retains all properties of the parent stone and thus using it as a staple within the pond ash brick further increases durability and warmth resistance of the brick. Being a waste which in spite of getting used in construction of roads is discarded in large quantities, it fulfills the aim of cost effectiveness and environmental friendliness of the project. Using grit further helps withholding capacity of brick.

Making a brick using such materials directly reduces the number of pricy cement utilized in bricks, without compromising with overall standard requirements. These bricks thus can also replace conventional burnt clay bricks in construction works.

**WORK DONE** -The procedure involved complete manufacturing of an innovative brick using waste and discarded raw materials along side cement. the most steps involved testing the materials and therefore the brick as per Indian Standard code of specifications, developing its mix design and costing. The detailed step-by-step procedure is as follows: **RAW MATERIALS**-The project utilizes the waste and residual materials obtained from thermal power plants and quarries and therefore the initiative included obtaining these materials from their respective sites. The raw materials used in the brick were collected from the stated plants at the respective rates as depicted in Table

Material	Source	Rate
Fly Ash	Koradi Thermal Power Plant, Koradi	Rs. 445 per ton
Pond Ash	Reliance Power Plant, Butibori	-
Stone Crusher Dust	Telgaon, Hingna	Rs. 185 per ton
Cement	Market	Rs. 250 per bag (50 kg)

#### Advantages Of Pond Ash

- It is durable.
- Low energy consumption.
- It is economical and ecofriendly.
- It has low water absorption tendency.
- No emission of green house gases.

#### Disadvantages of Pond Ash

- Needs skilled labor.
- Need lot of care while manufacturing.

### III-MIX DESIGN

The process of choosing suitable ingredients of mix and determining their relative amounts with the target of manufacturing a mixture of the specified strength, durability, and workability as economically as possible is termed the concrete mix design. Mix design is the most important step in casting of bricks. During the production of fly ash and pond ash bricks using stone crusher dust and grit, various combinations were tried in order to obtain proper slurry and in turn, solid bricks. A batch of 95 bricks each was then casted for fly ash and pond ash bricks. The proportioning which resulted in acceptable brick formation as calculated from the batch is as follows. The average weight of a conventional burnt clay brick is 2.8 Kg and the manufacturing cost is as high as Rs. 4. Thus cost per fly ash and pond ash brick is then calculated in order to evaluate economic considerations and make comparisons.

#### Mix Design for Pond Ash Bricks

Attempt I :

Pond Ash	37 Kg	15.8%
Crusher Dust and Grit	175 Kg	75%
Cement	20 Kg	8.6%
Water		0.6%
Total Mix		100%

#### Failed Proportion of Pond Ash Bricks (Attempt I)

Observation: The batch of bricks failed as the brick did not provide sufficient binding.

Attempt II:

Fly Ash	49 Kg	20.96%
Crusher Dust and Grit	163 Kg	70%
Cement	20 kg	8.5%
Water		0.54%
Total Mix		100%

Particular	Weight (kg) Pond ash	Cost (Rs.) Pond ash	Weight (kg) Fly ash	Cost (Rs.) Fly ash
Crusher Dust and Grit	1.60	0.321	1.57	0.321
Cement	0.20	1.16	0.178	1.05
Labor	----	0.40	----	0.4
Electricity	----	0.05	----	0.05
5% Losses	----	0.09	----	0.12
Total		2.02		2.19

Failed Proportion of Pond Ash Bricks (Attempt II)

Observation: The batch of bricks failed as the brick lacked strength and broke easily.

Attempt III:

Fly Ash	54 Kg	23.23%
Crusher Dust and Grit	160 Kg	68.30%
Cement	18 Kg	8%
Water		0.47%
Total Mix		100%

Failed Proportion of Pond Ash Bricks (Attempt III)

Observation: The batch of bricks failed as the corners break.

#### Successful Mix Design:

For casting a batch of 95 bricks, 61 Kg of pond ash, 152 Kg of stone crusher dust and 19 Kg of cement were mixed along with steady addition of water unit thick slurry was formed. The bricks were then casted and curing was done after 24 hours.

#### Mix Design for Pond Ash Bricks

Pond Ash	26.12%
Crusher Dust and Grit	65.30%
Cement	8.16%
Water	0.42%
<b>Total Mix</b>	<b>100%</b>

#### Cost Comparison

Cost Comparison

- Manufacturing cost of one conventional brick = Rs. 4  
Manufacturing cost of one fly ash brick = Rs. 2.19  
Manufacturing cost of one pond ash brick = Rs. 2.02  
∴ Pond Ash bricks are more economic.
- Weight of one conventional brick = 2.8 Kg  
Weight of one fly ash brick = 2.378 Kg  
Weight of one pond ash brick = 2.45 Kg  
∴ Pond Ash bricks are lightweight.

#### IV- OBJECTIVES

- To determine efficient use of waste pond ash for manufacturing bricks.
- Determining the strength of bricks by performing several tests.
- Comparison of pond ash brick with conventional clay bricks from various aspects.
- To determine the need of pond ash brick in modern construction.
- To study the use of pond ash as a construction material.

#### V-CONCLUSION

As per the above study it is clearly defined that the pond ash utilization can be done effectively and can be utilized for manufacturing construction bricks. The results are similar to standard size conventional brick and also the strength is as per the specifications. The cost of pond ash brick is less as compared to conventional red brick therefore from economy point of view the brick is very economical.

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