

# Use of fly ash as building materials

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## ABSTRACT

*Fly ash based bricks and blocks produced in Hindalco Industries Ltd. when used for construction of residential colony premises and road pavements respaly, at Renusagar have been proved to be quite economical and better in performance than the clay bricks. The average crushing strengths of fly ash based bricks and blocks are 120 to 180 Kg/cm<sup>2</sup> and 180-200 kg/cm<sup>2</sup> respectively which are much higher than those produced from clay. The price of fly ash brick is estimated to Rupee 0.90 per brick.*

**Key words :** *Flyash utilisation, Building materials*

## 1.0 INTRODUCTION

Renusagar Power Division is the captive thermal power plant of M/s Hindalco industries Limited, the leading aluminium producer of India, situated at Renusagar, Dist. Sonbhadra. (U.P.) having an installed capacity of 575 MW.

For the purpose of effectively utilizing flyash generated from the power plant and thereby reducing the air pollution problem, after conducting 'In-Depth' studies, a FAL-G brick making pilot plant was installed and the average production being 7,000 bricks per 8 hours shift. The results were found to be quite encouraging.

The unit is running quite successfully. More than 25,00,000 bricks have been produced till Sept. 1998 and out of which 24,00,000 bricks have been used for various civil constructions in the industries' own plant/colony premises. The average crushing strength of the bricks obtained is more than 100 Kg/Cm<sup>2</sup>, i.e, class 'A' brick, which is superior than the red bricks available in the area. The price worked out during the period January to September 1998 has been Rupee 0.90 per brick.

## 2.0 COMMERCIAL PRODUCTION

### 2.1 Details of Production

#### Fly Ash Bricks

Bricks Produced	:	25.60 Lacs (Nos.)
Bricks used for	:	
Various Constructions	:	24.00 Lacs (Nos.)
Cost of Production	:	Rs.0.90 Per Brick
Compressive Strength	:	120 to 180 Kg/Sq.cm.

**Fly Ash blocks**

(For Roads)

Blocks produced : 15,000 Nos.

(For Trial Road)

Cost of Production : Rs.100 Per Sq. Cm

Compressive Strength : 180-200 Kg. per Sq. Cm.

**2.2 Cost of Production****2.2.1 Fal-G Bricks**

Raw Materials (By weight)	Percentage	Qty. for 1,000 bricks	Unit price (Rs)	Cost (Rs)
Fly Ash (waste bi-product) (Handling & shifting expenses)	66	2.0 t	50.00	100.00
Carbide-sludge (waste by-product)	18	0.54 t	425.00	229.50
Gypsum-hydrated (by-product)	3	0.12 t	1,300.00	117.00
Sand (Local)	13	0.39 cu.m.	150.00	58.50
Sub-total				505.00
Wastage @ 3%				15.15
Total cost of Raw Matetials				520.15
Labour cost per 1,000 bricks (13 labour @ Rs. 55/- per day)				143.00
Lubricants, consumables etc.				25.00
Power 30 kw for 6 hours working @ Rs. 2.00 per kwh				65.45 25.00
Water & Misc.				120.00
Interest/depreciation				
Total cost/1,000 bricks				898.60

i.e. Total cost of production Rs. 0.90 per brick

**2.2.2 Fal-G Blocks (For roads/pavements)**

Size : 200 x 200 x 400 mm

Compressive Strength : 250-300 Per sq. cm.

Raw materials : Similar as for Fly Ash bricks

Cost of production : Rs. 9 Per block : Rs. 100 Per Sq. m. of road

Initially, about 15,000 blocks were produced on trial basis in April '98 for road Construction. About 300 mtrs. stretch of road was Constructed on trial. With the regular movements of loaded trucks, the load bearing capacity of road has been ascertained.

Encouraged with the results, mass production of FAL-G blocks has been taken up from Oct. '98. These blocks shall be utilised for construction of new roads and pavements.

### **3.0 SOURCE AND SPECIFICATIONS OF RAW MATERIALS**

*Ash* : Fly ash waste By-Product from thermal power station.

*Carbide sludge* : Waste By-Product from nearby acetylene producing plants.

*Gypsum Calcined* : Waste By-Product from Hindustan Lever Ltd., Haldia.

*Sand* : Low cost local sand from nearby source, good enough for brick making.

### **4.0 MANUFACTURING PROCESS**

- a) The brick making plant of Hindalco Industries Ltd. contains three prime equipments viz Pan mixer, Conveyor and brick making machine. Raw materials are mixed in pan mixer in a given proportion. The conveyor feeds this mix to brickman brick making machine and green bricks are produced.
- b) Green bricks loaded on wooden pallets are stacked in green brick yard. Proper water curing twice a day for 20-22 days depending on weather conditions generates reasonable crushing strength and the bricks are ready for use after 30 days from the date of manufacturing.

Fly ash bricks and blocks making units are shown in Fig. 1 and construction with flyash bricks in Fig. 2

### **5.0 PROBLEMS ASSOCIATED WITH GOVT. POLICIES**

#### **5.1 Excise Duty**

The Govt. of India has withdrawn the exemption of excise duty on fly ash products in 1997-98, which was earlier exempted in the year 1991-92 to promote fly ash utilisation for various products.

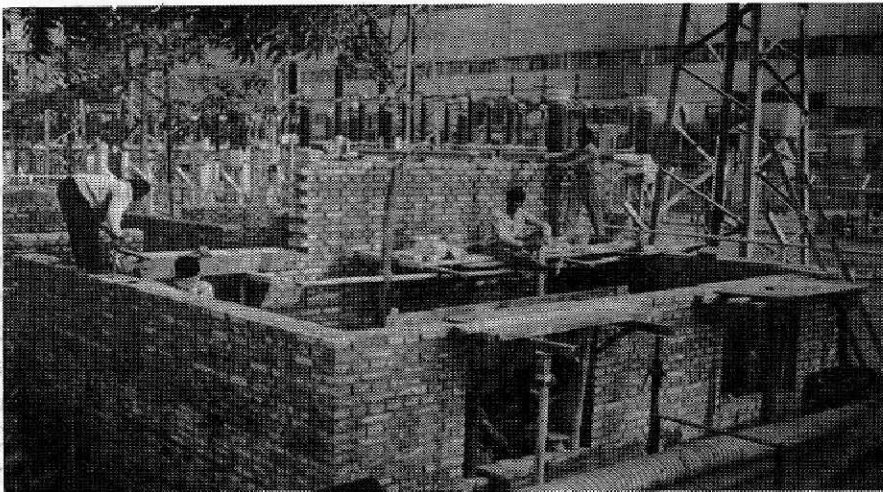
#### **5.2 Sales Tax**

There are certain incentives given by few state Governments like Punjab, Orissa etc., including exemption in sales tax on flyash products. Similar exemptions should be uniformly applicable to other states also.

In spite of Governments' efforts the promoters willing to enter/diversify into the field of fly ash brick making are reluctant due to prevailing, government policies.



*Fig. 1 : Fly Ash bricks and blocks making unit*



*Fig. 2 : Construction by using Fly Ash bricks*

## **6.0 WHAT HINDALCO CAN DO TO PROMOTE USE OF FLY ASH ?**

It has been well established atleast at Renusagar that fly ash bricks are economical and better than clay bricks in many ways. Several dozens of buildings with load bearing walls as well as with RCC roofs have been constructed. Any one interested to instal fly ash brick making unit or for successfully running its existing unit, is welcome for any help/guidance desired from Hindalco Industries Ltd.