

PROJECT PROFILE ON
FLY ASH BUILDING PRODUCTS

PRODUCT : FLY ASH BUILDING PRODUCTS

NIC PRODUCT CODE : 320901009: BRICKS
32091500X: HIGH STRENGTH BRICKS

QUALITY STANDARDS : IS:12894-1990:
Specn. for Fly ash Lime Bricks.
IS:4139-1989:
Specn. for Calcium Silicate Bricks

PRODUCTION CAPACITY : QUANTITY: 18 LAKHS BRICKS
(PER ANNUM) VALUE : Rs.26.1 Lakhs.

MONTH & YEAR
OF PREPARATION : MARCH, 2010

PREPARED BY : G&C DIVISION
MSME-DEVELOPMENT INSTITUTE
GOVT. OF INDIA, MINISTRY OF MSME
111 & 112, B.T.ROAD, KOLKATA- 700 108.
TEL. 2577-0595,0596,0597,0598.

A. INTRODUCTION

Fly ash based building products are manufactured by using Major percentage of fly ash generated from Thermal Power stations and plants like (i) NTPC, Farakka, (ii) Kolaghat Thermal Power Station, (iii) DSP, Durgapur. ((iv) NALCO, Orissa (v) RSP, Rourkela, etc. and many Paper Mills , Aluminium Industries, who uses Boiler & captive power plant produces bulk quantity of Fly Ash in the Eastern Region of our country. Other raw materials used along with Fly Ash are lime and calcined gypsum. FAL-G Bricks are popular out of all building products can be manufactured with low investment in comparison to Fly ash lime bricks and Clay fly ash bricks. Other building products are Fly Ash concrete blocks , solid & hollow types , Fly Ash low cement concrete, Fly Ash castable & many other low moisture Fly

Ash ready-mix. At present FAL-G building bricks technology is much popular in State Andhra Pradesh and Orissa who have accepted this eco-friendly technology being inspired and encourages by the Govt. authority and promotional agencies like Fly Ash Mission, IREDA, and different Environmental Programme of State Govt. .

FAL-G bricks do not lose strength unduly even upon soaked in water continuously. Hence plastering is optional rather than necessity. Well cured Fal-G bricks absorb 4-12% water only. On account of less water absorption, rationalisation of plastering and mortar, a finished Fal-G brick wall is lighter and cheaper in comparison to finished clay brick wall. Fal-G bricks can be made to order with engineering properties comparable to cement concrete befitting for specialized applications such as canal liming, dam construction, water tanks etc.

The Fal-G mix is nothing but a slow setting pozzolana cement mix. The process is same as making cement in cement factories where clay and lime stones are burnt with coal and gypsum is mixed and ground to make cement. When fly ash, hydrated lime powder and gypsum are mixed and ground in a pan mixer the resulting mixture acts as slow setting pozzolana cement and thus a cement bonding property is attained in the said mixture. Sand or crushed stone dust may be added to bring down the cost of mix.

The above mix is pressed with lower moisture cement in a brick press, specially and indigenously designed to give high pressure load at slow rate, in the order of 350 kg./sq. inch.

Thus Fal-G bricks are the substitute to common burnt clay bricks which every class of people can easily accept for constructional activities.

B. MARKET

There are around 25 FAL-G bricks manufacturing units functioning in the state of Orissa and many more prospective entrepreneurs are going for the said project. As the production of building bricks in the state and country, as well falls far below the market demand due to increase in constructional activities and standard of living of the countrymen, the shortfall is likely to increase in manifold. Hence there is a promising market potential for Fly Ash based building bricks, however, the quality and cost have to be maintained at par with the conventional red clay burnt building bricks. There is also vast scope on use of Fly ash bricks in cyclone devastated areas of the state.

India needs around 60 billion bricks every year that would exhaust 180 million tones of top soil, making barren 7500 hectares of fertile land. To overcome this problem the use of Fal-G bricks is the need of the hour. People have started realizing the importance of use and application of Fal-G bricks. Hence in all modern civil engineering constructional activities Fal-G bricks will occupy a key position.

As the manufacture of clay fly ash bricks and lime fly ash bricks need higher investment, the manufacture of Fal-G bricks can be well accepted by small scale entrepreneurs.

Since 60% of country's electricity comes from coal based power station, the country has a huge stock of fly ash amounting to 60 million tones annually. Despite all the efforts present scenario is not too encouraging as only 5% of country's total ash has been consumed in different sectors.

Considering the gravity of the situation of disposal of fly ash, which is hazardous, both the central and State Governments and R&D organizations have been constantly finding out appropriate means for best utilization of fly ash. Fal-G bricks is the outcome of the developmental works done by Institute of Solid Waste Research & Ecological Balance (INSWAREB), Visakhapatnam.

The need of the hour is to find wealth from wastage and eco-friendly technologies for our progress and prosperity.

With the rise in population and increase in constructional activities considering the improvement in the standard of living the demand for building bricks is increasing day by day.

C. **BASIS AND PRESUMPTION**

1. The unit will work 300 working days in a year on two shifts basis and will be able to utilize its full capacity utilization after one year of regular production. However, the efficiency of capacity utilization has been considered as 80%.
2. Labour and wages will be as per the prescribed minimum wages.
3. The rate of interest for both the fixed and working capital has been considered as 17%.
4. Margin money of around 25% of the project cost has to be arranged by the entrepreneur.

5. Operative period of the project has been considered as 10 years considering technology obsolescence rate and period of repayment of loan.
6. the cost of land, construction cost, cost of machinery and equipment, etc. has been considered as per the prevailing market rate and as per quotation of machinery obtained.
7. The unit has to be situated in close proximity to the deposit/availability of fly ash and lime. However, calcined gypsum has to be procured from Tamil Nadu or Rajasthan.

The unit will also use lime sludge and phosphor-gypsum within the permissible limit.

D. IMPLEMENTATION SCHEDULE

The regular commencement of production will take around six months after availability of finance from financial Institution.

- | | | |
|-------|--|---|
| i) | Survey for collection of data in respect of Demand, availability of power, water and Raw materials, etc. | 0-1 st month |
| ii) | Preparation of Project document regn. | 1 st – 2 nd month |
| iii) | Financial assistance | 2 nd – 4 th month |
| iv) | Selection of site and development of land | 3 rd – 4 th month |
| v) | Power and water tie up for availability | -do- |
| vi) | Construction of building and shed | 4 th – 6 th month |
| vii) | Purchase of Machinery & equipment | 4 th – 6 th month |
| viii) | Procurement of raw materials & recruitment of personnel . | 7 th – 8 th month |
| ix) | Trial production | 9 th month. |

E. TECHNICAL ASPECTS

1) Process of Manufacture :

Process of manufacture of Fal-G bricks involve the following stages of operations.

- i) Proportioning and mixing of batch materials such as fly ash, lime, calcined gypsum, sand and water.
- ii) Shaping of bricks in the press.
- iii) Drying of green bricks over wooden pallets.
- iv) Curing of the bricks by spraying/sprinkling water for 10 to 15 days.
- v) Sorting, inspection and quality control tests prior to sale.

Fly ash, lime, calcined gypsum, sand and aggregate are the raw materials Required for making fly ash bricks and blocks. The raw materials of brick mix in desired proportion (ash 60-65%) Lime, 20-25% and calcined gypsum 10% by weight) are blended intimately in dry or wet form in a suitable blender/mixer. The wet brick mix is fed into the machine mould. The vibration is given for a while the mould is again fed. The stripper head is pressed and vibration is given simultaneously for about 10 seconds. The mould is lifted and four bricks produced pallet is removed and kept on the platform for air drying.

The next day the bricks produced on the previous day are put in the stack. The stack is formed with much care to see that curing water and air for drying reaches to every brick. After 3 days warm water aon small quantity is poured in the stacked bricks without any pressure. After 5 days hot water is sprinkled on the brick stack for 2 times a day. The bricks stack after each watering are immediately covered with black PVC sheets. The bricks are then left in the stack for drying for 7 days. The bricks are ready for dispatch after 22 days from the date of manufacture. The compressive strength of the bricks produced from the brick mix and manufacturing process suggested herein would be 80 Kg./cm² to 110 kg./cm.²

2) Quality Specifications :

Bureau of Indian Standards formulated specifications for clay fly ash bricks, lime fly ash bricks, common burnt clay bricks and calcium silicate bricks which can be referred to as regards to the quality of Fal-G bricks.

IS: 12894:1990	Specification for Fly Ash Lime bricks.
IS:13757:1976	Specification for Burnt clay fly ash building Bricks.
IS:4137:1989	Specification for calcium silicate bricks.
IS:3102:1976	Classification of burnt clay solid bricks. The other relevant BIS specifications are :
IS:3812:1981	Specification for Fly Ash for use as Pozzolana and admixture.
IS:712:1984	Specification for Building limes.
IS:3495(Pt.I)1976	Methods of tests of burnt clay building bricks.

For production of good quality fly ash bricks the quality of Fly Ash should be as follows :

- i) Moisture content of fly ash should not exceed 5% .
- ii) Visual appearance of fly ash should be of light steel grey or smoky grey colour.
- iii) Unburnt carbon content in the fly ash be around 5% .

The typical physical requirement of Fal-G bricks as per customer's specifications is as follows :

a)	Compressive strength	60-250 kg/cm. ²
b)	Water absorption	5-12%
c)	Density	1.5 gms./c.c.

3) Production capacity per annum

- a) Quantity : 18 lakh bricks.
b) Value : Rs. 26.1 lakhs.

4) Approximate Motive Power : 60 H.P.

5) Pollution control needs :

Workmen working with Fly Ash and at the mixing area are to be provided with protective equipment like dust masks and safety goggles.

6) Energy Conservation Needs :

The management has to be vigilant in ensuring higher productivity by the best utilization of man and machine hours. Periodic checks over working stages, functioning of machinery and their preventive maintenance and timely repair etc. will help in energy conservation.

F. FINANCIAL ASPECTS :

Fixed Capital :

1. Land: 0.5 acre	Rs. 1,25,000/-
<u>Building/Shed :</u>	
Work Shed: 100 Sq. Mtr. @ Rs. 1500/- Per Sq. Mtr.	Rs. 1,50,000/-
Office & Store: 20 Sq. Mtr. @ Rs.2500/- Per Sq. Mtr.	Rs. 50,000/-
Tube well with over head tank, pipe line and other civil construction including Boundary and Gate etc.	<u>Rs. 60,000/-</u>
	Rs. 2,60,000/-

2. Machinery & Equipment :

- i) Brick press(semi-automatic) with 7.5 H.P.
Motor and 500 bricks/hr.cap. and complete
with all accessories . 1(One) Set Rs. 1,85,000/-
- ii) Pan mixer with 7.5 HP motor, 150 Kg.Cap.
& complete with all accessories 1(One)Set Rs. 85,000/-

iii)	Hydraulic Pellet Truck, 500 Kgs. Cap. 2(Two) Sets	Rs. 45,000/-
iv)	Wheel barrows : 250 Kgs. Cap. 2(Two) Sets	Rs. 10,000/-
v)	Wooden pellets(3'x2' size, 6 bricks cap. And 72 bricks / pellet) 50 Nos.	Rs. 20,000/-
vi)	Installation & electrification	Rs. 30,000/-
vii)	Weighing machine, platform type and of 100 Kgs. Cap. 1(One) Set	Rs. 20,000/-
viii)	Office equipment & furniture L.S.	<u>Rs. 21,000/-</u>
		Rs. 4,15,000/-
3.	Pre-operative expenses	<u>Rs. 15,000/-</u>
		Rs. 4,30,000/-
	Total fixed capital : (1+2+3)=	Rs. 8,15,000/-

4. Working Capital (P.M.)

(i) Personnel (P.M.) :

1.	Manager 1 (One) @ Rs.3000/- p.m.	Rs. 3,000/-
2.	Supervisor-2(Two) @ Rs.2500/-p.m.	Rs. 5,000/-
3.	Machine operators 2(Two) @ Rs.2000/-p.m.	Rs. 4,000/-
4.	Skilled workers 4(Four) @ Rs.1800/- p.m.	Rs. 7,200/-
5.	Un-skilled workers 10(Ten) @ Rs.1200/-p.m.	Rs 12,000/-
6.	Watchman-cum-peon 2(Two) @ Rs.1000/-p.m.	<u>Rs. 2,000/-</u>
		Rs. 33,200/-
	Perquisite @ 15%	<u>Rs. 5,000/-</u>
		Rs. 38,200/-

(ii) Raw materials (P.M.) :

1.	Fly ash 150 MT @ Rs.120/- per MT	Rs.18,000/-
2.	Sand/Crushed stone dust 200 MT @ Rs.80/- MT	Rs. 16,000/-
3.	Lime(Slaked) 20MT @ Rs.1700/per MT	Rs. 34,000/-
4.	Lime sludge 20MT @ Rs.800/- per MT	Rs. 16,000/-
5.	Calcined gypsum 10MT @ Rs.2300/- per MT	Rs. 23,000/-
6.	Phospho-gypsum 10MT @ Rs.800/- per MT	<u>Rs. 8,000/-</u>
		Rs. 1,15,000/-

(iii) Utilities (P.M.) :

1.	Power	Rs. 7500/-
2.	Water	<u>Rs. 300/-</u>
		Rs. 7800/-

(iv) Other Contingent Expenses (P.M.) :

a)	Postage and stationery	Rs. 300/-
b)	Telephone	Rs. 600/-
c)	Consumable Stores	Rs. 600/-
d)	Repair and maintenance	Rs. 1000/-
e)	Transport and traveling expenses	Rs. 2000/-
f)	Advertisement and publicity	Rs. 1000/-
g)	Insurance	Rs. 500/-
h)	Miscellaneous	<u>Rs. 1000/-</u>
		Rs. 7000/-

Hence, total Recurring Expenses per month = Rs.1,68,000/-

5. Total Capital Investment :

a)	Total fixed capital	Rs. 8,15,000/-
b)	Working Capital (on one month basis)	<u>Rs. 1,68,000/-</u>
		Rs. 9,83,000/-

G. MACHINERY UTILISATION :

The pressing and curing of bricks are the bottleneck operations and the anticipated utilization of major facilities has been considered as 80% .

H. FINANCIAL ANALYSIS :

I. Cost of Production (Per year) :

i)	Total recurring expenditure	Rs.20,16,000/-
ii)	Depreciation on bldg./shed @ 5%	Rs. 13,000/-
iii)	Depreciation on machinery & equipt. @10%	Rs. 36,500/-
iv)	Depreciation on fixtures & office equipment & furniture.	Rs. 10,000/-

v) Interest on total investment @ 17% Rs. 1,67,100/-

2. Sales turnover per year : Rs. 22,42,600/-

By sale of 18 lakhs bricks @ Rs.1450/- per1000 bricks Rs. 26,10,000/-

3. Net profit per year :

$$H.2 - H.1 = \text{Rs.}3,67,400/-$$

4. Net Profit Ratio :

$$\frac{\text{Profit} \times 100}{\text{Sales turn over}} = \frac{3,67,400 \times 100}{26,10,000} = 14\%$$

5. Rate of return on Investment :

$$\frac{\text{Profit} \times 100}{\text{Total Cap. Investment}} = \frac{3,67,400 \times 100}{9,83,000} = 37\%$$

6. Break Even Point (% of total prod. Envisaged)

i) Fixed Cost

a) Total depreciation	59,500.00
b) Insurance	6,000.00
c) Int. on investment	1,67,100.00
d) 40% of salary and wages	1,83,400.00
e) 40% of other cont. expenses excluding insurance	<u>31,200.00</u>
	4,47,200.00

ii) Net profit per year : Rs.3,67,400/-

$$\text{B.E.P.} = \frac{\text{FC} \times 100}{\text{FC} + \text{Profit}} = \frac{447200 \times 100}{447200 + 367400}$$

$$= \frac{44720000}{814600} = \frac{447200}{8146} = 54.9\%$$

ADDITIONAL INFORMATION :

To ensure better economy in the process of manufacture of FAL-G bricks the following factors are to be considered .

- i) The unit has to be set up within a radius of 150 km approx. from the source of fly ash.
- ii) To economize the cost of lime a small country lime kiln can be very well constructed within the unit's premises. As the same time as an alternative measure low cost and high quality lime can be made available from oxygen, acetylene and paper manufacturing plants.
- iii) Locally available gypsum can be calcined at the factory site to get calcined gypsum at a cheaper rate. However, phosphor gypsum the by product of Paradeep Phosphates Ltd. can be used as an alternative to calcined gypsum but the same has to be made acid free.
- iv) For more details on FAL-G bricks the entrepreneur may contact Institute of Solid Waste research and Ecological Balance.
35m Sri Venkateswara Colony, Sheilanagar, Visakhapatnam-530012.
- v) Though the selling price is little higher in comparison to red clay burnt bricks but the consumption of cement will be low.

J. ADDRESSES OF MACHINERY AND EQUIPMENT SUPPLIERS :

1. M/s. Dash Engineering Works, Gandarpur, Cuttack-753003.
2. M/s. Engineer's Enterprises, 189 Bharathiyar Road, Ganapathy, Coimbatore-641006.
3. M/s. Constro Enterprises, 10/2, Athipalayam Road, Ganapathy, Coimbatore-641006.
4. M/s. Conmach Manufacturers Eastern Pvt. Ltd., 86 D, Dr. Suresh Sarkar Road, Kolkata- 700014.
5. M/s. Neervan Engg. Co., 42/8, Kashinath Dutta Road, Kol.-700014.

K. ADDRESSES OF RAW MATERIALS SUPPLIERS :

1. SOURCE OF FLY ASH :

- a) NTPC, Farakka,
- b) DSP, Durgapur .
- c) Kolaghat Thermal Power Station.
- d) NALCO, Orissa.
- e) RSP, Rourkela etc.

2. SOURCE OF LIME :

- a) M/s. Jai Bajrang Limes, Rajgangpur .
- b) M/s. Gadodia Chemicals, Rajgangpur.
- c) M/s. Rourkela Limes, Power House Road, Rourkela.
- d) M/s. stone & Stone Co., Garh Khunda, Khurda.
- e) Local traders , Kolkata.

3. SOURCE OF CALCINED GYPSUM

- a) M/s. Saravana Fertilizers and Chemicals, 27, Dharmalingapuram ,
Cuddalore-607005, T.N.
- b) M/s. Mahavir Minerals Pvt. Ltd., Ratankunj, New Bank Colony,
Ajmer Road, Beawar-305901, Rajasthan.

L. List of units set up by using this Project Profile : Not available
