

## EXECUTIVE SUMMARY

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### A. PRODUCT AND THE MARKET

#### *Introduction*

1. India ranks as one of the largest generators of fly ash in the world, mainly from its 80 plus thermal power stations (TPS) widely distributed within the country. The low utilisation levels of fly ash in civil engineering purposes & building components, currently is at 15% (2002-03) of the total fly ash generated annually in India.
2. Research both in India and abroad has amply proved that the building components produced using fly ash are competitive, both in quality and cost, as compared to traditional building materials. A techno-feasible study on utilisation of fly ash as building material in major cities of India, beginning with Hyderabad, initiative taken by BMTPC is laudable.
3. The scope of the study can be broadly divided into two major aspects.
  - Estimating the current consumption of bricks, blocks, pavers and the market potential to replace the traditional material with cement-based fly ash bricks, blocks and pavers
  - Preparation of techno-economic feasibility outline for establishing a unit to manufacture cement based fly ash bricks, blocks, pavers at Hyderabad.
4. The data inputs for the study were generated from (i) review of secondary data, (ii) meetings & discussions with manufacturers & users for collective opinion, (iii) visits to TPS, brick/block manufacturing plants and (iv) sampled primary survey of individual manufacturers and users.

#### *Fly Ash Products: An Overview*

6. The various applications to which fly ash can be used as a replacement material in the building component industry are
  - Bricks (clay ash, fly ash sand lime, fly ash lime gypsum),
  - Blocks (hollow, solid, pavers),
  - Others (fly ash cellular concrete, flux & cold bonded fly ash blocks & tiles, wall tiles, fly ash refractories, extraction of cenospheres) and
  - Extensively in manufacture of cement.
7. Specific codes have been issued by BIS for utilization of fly ash as building components. The technical & economical benefits of using fly ash in building components, savings in raw materials, clay, energy, etc. and reduction in ecological damage has been documented.
8. The survey of manufacturers of bricks & blocks at Hyderabad was conducted to study various issues concerning this industry and perceptions on the fly ash products.
  - Majority of the manufacturers are small-scale operators, operating in the last 5 years.
  - The manufacturing units are mostly located on leased land of average size of 2 acres. This industry in Hyderabad provides employment to around 19,200 persons with nine out of ten persons employed in traditional brick manufacturing units.
  - Survey of 17 fly ash and 10 cement block manufacturers revealed the manufacture of 31 different types fly ash and 16 cement based products in Hyderabad. Bricks manufactured are of 9"X4"X3" size. Blocks manufactured commonly are 11.5", 12" or 16" length, with varied breadth & depth.

- Four out of 5 bricks manufactured in Hyderabad are traditional clay bricks. Estimated total annual production of bricks in and around Hyderabad is approx. 131 crore, i.e. 4 lakh fly ash bricks, 5.1 lakh cement bricks and 43 lakh traditional bricks per day. The share of fly ash bricks in the brick industry is around 9%.
  - Adoption of IS standards by manufacturers is scanty, evident from poor quality of bricks available in Hyderabad.
9. Perceptions of brick & block manufacturers on fly ash products
- Fly ash is available continuously and of satisfactory quality. It is perceived that technical support initially was provided by INSWAREB of Vizag, but technology transfer & support from Government is non-existent.
  - The current prices of fly ash bricks & blocks are in the same range of cement blocks & traditional bricks. The manufacturers are equally divided on the pricing of fly ash bricks & blocks as against traditional bricks & blocks.
  - High preference for fly ash products is observed among those customers contacting manufacturers. Increased media coverage & favourable policies are considered key to increasing utilization of fly ash bricks & blocks.
  - Very high willingness is observed among traditional manufacturers regarding use of fly ash in their products. Technical assistance & increased product awareness among the public are considered important for promoting the shift in the manufacturing practices.

### ***Current Market Scenario***

10. Manufacturing technologies for utilizing fly ash in building components have been developed various research agencies in India like CFRI, CBRI, NCBM, AEC, INSWAREB etc.
11. The survey of users in Hyderabad was conducted to study the utilization pattern and perceptions on the fly ash products.
- Most of the bricks & blocks used are light in weight and used chiefly for construction of buildings, and procured directly from manufacturers & suppliers alike within Hyderabad.
  - Users are of the opinion that strength, durability, finish, availability, price are the important qualities in bricks or blocks. The number of users satisfied and dis-satisfied with traditional products are equally divided.
  - Awareness level among users regarding fly ash products and willingness to adopt them in their projects is high. Despite their low availability, 35% of the users desire to use fly ash bricks & blocks.

## **B. COMMODITY FUTURE**

### ***Market Potential***

12. The growth of households in Hyderabad Urban Agglomeration in the last decade has increased by 32%, while the population increased by 27%, indicative of increased household formation rate, and consequently increase demand for housing.
13. The housing stock in Hyderabad UA in 2001 is around 10,22,106. The housing stock between 1991-2001 has increased by 33%.
14. At current growth rates, the total housing stock to be added by 2010 including replacement for ageing & dilapidation is approx. 3,77,400. The proportion of permanent structures in the total housing stock is likely to increase from 87% in 2001 to more than 90% in this decade, thus necessitating increased building components into the construction industry.
15. It is perceived that current production levels of manufacturers are able to meet 70% of the market demand. Both manufacturers and users agree an increase in the annual

requirements (between 10 to 15% current manufacturing levels) in the next 5 years. The demand is perceived to be higher for fly ash bricks & blocks than traditional bricks or blocks.

### **Scope for New Entrant**

16. The annual demand of bricks by 2010 studied under different scenarios is expected to vary between 1275 million to 1495 million, while demand for fly ash bricks would be around 318 million to 373 million. This average daily demand for fly ash bricks is likely to increase from 0.4 million units in 2004 to anywhere between 0.87 to 1.2 million units by 2010. This calls for strengthening of current fly ash brick production levels by 1.5 to 2 times.
17. The increased demand can be met by increased production levels of existing units or by setting up large scale manufacturing units of 0.125 million bricks capacity.

## **C. TECHNO-FINANCIAL VIABILITY ANALYSIS**

### **Project Concept**

18. Fal-G technology is used in the manufacture of bricks and blocks in Hyderabad.
19. To meet the requirement, large-scale manufacturing plants with integrated high productive process are required. Such brick & block making plants (models R 001 & R 3000 AF) are considered for review in this study.
20. The viability of establishing fly ash plants are studied under the following criteria - demand & supply needs, acceptance & willingness of stakeholders, size & location of plant, cost of production and price comparisons
21. Various scenarios studied are

Variables	Option 1								Option 2
	Rs. 90 million								Rs. 60 million
	Sce 1	Sce 2	Sce 3	Sce 4	Sce 5	Sce 6	Sce 7	Sce 8	Sce 2 *
1. Capital outlays									
2. Location	Hyd	Hyd	Hyd	Hyd	Rgd	Rgd	Rgd	Rgd	Hyd
3. Technology	Fal G	Fal G	CeF	CeF	Fal G	Fal G	CeF	CeF	Fal G
4. Mode of transport of fly ash	Truck	Rail	Truck	Rail	Truck	Truck	Truck	Truck	Rail
5. Mode of transport of fly ash bricks	Truck	Truck	Truck	Truck	Truck	Rail & truck	Truck	Rail & truck	Truck
6. Manpower	Same								Same
7. Power supply & admixtures	Same								Same

\* Scenario 2 under Option 1 is considered most feasible, hence Scenario 2 alone is studied under Option 2 i.e. at lesser capital cost  
 Note: Sce – Scenario      Fal G – Fly ash, lime, gypsum technology      CeF – Cement Fly Ash Technology  
 Hyd – Plant located at Hyderabad      Rgd – Plant located at Ramagundam

### **Plant Location and Infrastructure**

22. The raw material source, i.e. TPS at Ramagundam or Vijayawada and the user area is Hyderabad UA, separated by 200 to 250 km. Plant location has two options – locate plant at raw material source & transport finished bricks and vice versa. In both options, mode of transport and its cost is one of the key issues for pricing the product, which can be competitive & acceptable to users. Current transport cost of fly ash from Ramagundam & Vijayawada to Hyderabad range between Rs. 320 to 400 per ton.
23. Manufacturers prefer to locate the manufacturing unit at Hyderabad & bring fly ash from Ramagundam or Vijayawada.
24. Alternate mode of transport of fly ash by rail is also considered. With efforts directed towards redesigning wagons for transport of fly ash, transport cost of fly ash is expected to come

down in future. Locations like Ghatkesar, Moula Ali & Lingampalli around Hyderabad are considered appropriate owing to existing infrastructure facilities at the stations.

### **Raw Materials: Sources and Technology Options**

25. The TPS at Vijayawada or Ramagundam could supply fly ash for manufacturing bricks & blocks at Hyderabad. While fly ash available at Ramagundam is of higher quality, the transport cost per ton from Vijayawada is cheaper. The available fly ash can be used manufacture 72 crore bricks and can be increased to 153 crore by 2010.
26. Initiatives and actions to promote fly ash utilization in building industry have been taken by GOI, MOE&F, Govt. of Andhra Pradesh, APEGenco, NTPC, etc.
27. Raw Materials sources for bricks and blocks
  - Raw materials for manufacture of traditional bricks are locally available, except coal.
  - All the raw materials required for the manufacture of cement blocks are locally available at maximum distance of 20 km from the units and transported by trucks & tractors.
  - For the manufacture of fly ash bricks & blocks, fly ash is obtained from Ramagundam & Vijayawada, lime and gypsum from Piduguralu & Cuddalore respectively. Crusher dust is available locally. Trucks are used for transport of raw materials.
28. The daily raw material requirements for manufacturing 0.125 million bricks per day under different manufacturing technologies are

Raw materials	Raw materials for Fal G Technology		Cement Fly Ash Technology	
	Mix proportions	Avg. daily requirement (tons)	Mix proportions	Avg. daily requirement (tons)
Fly ash	1.0	32.6	1.0	20.8
Lime	0.5	16.3	-	-
Gypsum	0.5	16.3	-	-
Rock dust	4.5	145.5	-	-
Chips/aggregate	0.6	21.1	5.4	111.8
Sand	-	-	4.5	93.1
Water	0.9	30.1	0.65	13.5
Cement	-	-	1.0	20.8

### **Financial Analysis**

29. The capital outlay for the proposed manufacturing unit under two options, i.e. using different machinery is approx. Rs. 95 million & Rs. 60 million
30. The annual repayment towards a loan obtained for different capital outlays under Option 1 & 2 mentioned above are Rs. 15.5 million & Rs. 9.4 million respectively.
31. The annual cost towards salaries & wages for manpower is worked out at Rs. 4.44 million. The cost of admixtures & utilities like power supply is worked at unit rate of Rs. 0.1 per brick.
32. The raw material cost, transport cost for raw materials & finished products are worked out and production costs arrived at. The selling prices of the bricks under various scenarios and at different profitability levels are compared with the current pricing levels at Hyderabad. A sum-up under all scenarios is presented below.

(Rs.)

	Parameters	Scenario							
		1	2	3	4	5	6	7	8
	Average cost of a Fly Ash Brick	1.34	1.30	1.41	1.39	1.98	1.32	1.96	1.30
Selling Price of Fly Ash Brick at margins of	15%	1.54	1.49	1.62	1.60	2.28	1.52	2.26	1.50
	25%	1.68	1.62	1.76	1.74	2.48	1.65	2.45	1.63
	35%	1.81	1.75	1.90	1.87	2.67	1.79	2.65	1.76
Current selling price of bricks in Hyderabad	Traditional	1.20 to 1.60							
	Fly ash	1.15 to 1.60							

Considering the preference of current manufacturers that it is more feasible to locate a plant at Hyderabad and transport fly ash by rail, Scenario 2 is considered as most feasible under Options 1 & 2.

33. The financial viability and cash flow statement is worked out for Scenario 2. Under option 1, break-even will be achieved by the fourth year and under option 2 break-even will be achieved by the end of the first year. The selling price of bricks will be Rs. 1.75 at 35% margins over the production cost. The working capital required is expected to increase from Rs. 9.4 million 2006-07 to Rs. 15 million by 2008-09 when the ultimate production capacity of 0.125 million bricks per day will be reached.