

## APPENDIX – 29

### ASH UTILIZATION PLAN

Ash utilization is the need of time that check the degradation of environment and helps in meeting the stipulated environmental regulations. Ministry of Environment and Forest's notification on Ash Utilization dated 14.09.1999 stipulates that new thermal power plants shall have to utilize ash to the extent of 30% in first 3 years of commissioning and to attain 100% utilization by 9th year. Keeping in view, the above stipulation CGPL/ Power developer would consider the brief study for maximum utilization of fly ash.

The study has revealed, inter alia, there will be an annual production of 14.4 crores bricks considering 10% fly ash in making bricks. If Fal-G bricks, which utilizes pozzolanic properties of fly ash without any requirement of sintering, thus saving valuable energy as well as requirement of sintering, thus saving valuable energy as well as topsoil of this fertile land being used in making conventional clay bricks, can be economically produced and marketed. Market survey will be done at appropriate time for use of manufactured bricks through Fal-G technology.

The average annual generation of ash from the 5 x 800 MW Coastal Gujarat Power Limited Mundra shall be as under:

Coal Consumption (85% PLF)	: 11-13	Tons/annum(average:12Million
		Tons/annum
Ash content in coal	: maximum 15%	
Fly Ash generation	: 1.44 Million Tons/annum	
Bottom Ash generation	: 0.36 Million Tons/annum	

Projected year wise utilisation of ash for proposed UMPP at Mundra is shown in Figure – A. While manufacturing Fal-G products including bricks the fly ash collected in ESP hoppers from 2<sup>nd</sup> field onwards are to be used in making Fal-G mix, while coarser fly ash from other hoppers can be used as aggregate. The Bottom Ash, which normally contains more un burnt carbon and clinkers, is not suitable for conversion into useful products and, as such, can only be used for land-fill for which there is not much requirement in the area. While designing the power station, separate handling system and silos will be provided for storing bottom ash, fly ash from the hoppers of Economiser, Air heater and the 1<sup>st</sup> field of ESP, and that from the hoppers of 2<sup>nd</sup> field of ESP onwards separately.

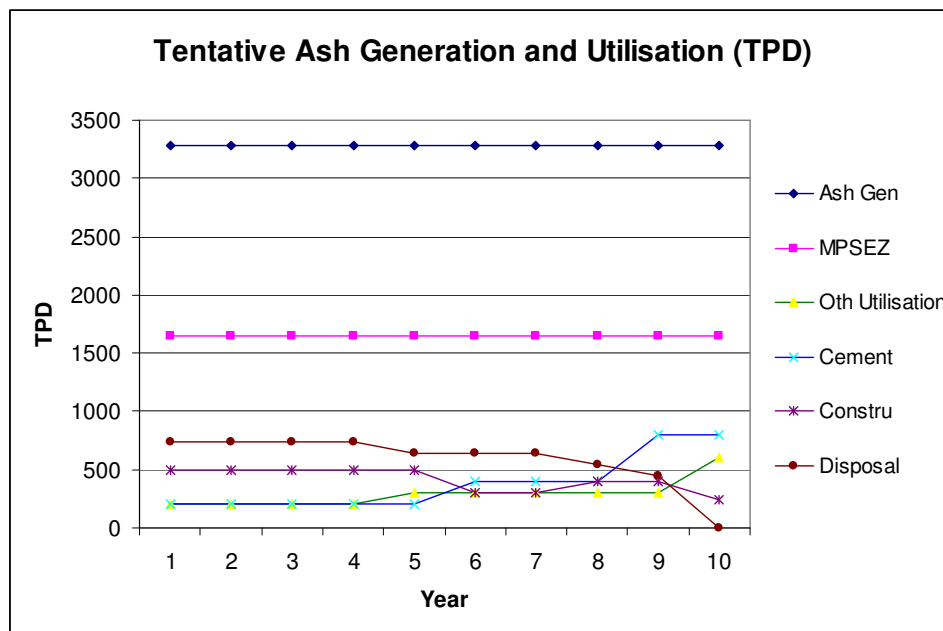
This is expected that existing manufacturers of clay bricks within the target zone may not be adverse to switch over to Fal-G brick making provided the technology is made available to them and the new product is patronized by the Government

Departments as well as certain financial incentives offered to them for the change over. Fal-G brick making process relieves the manufacturers from hassles like scarcity and high cost of coal, ever increasing cost of land and labour, large involvement of working capital, variation of weather, etc.

In fact, workshop organized at country level on Fal-G brick making evoked very positive response from the local brickmakers. If the existing brickmakers and the labour involved in the industry can be converted to Fal-G brick making it would insure against loss of employment to lakhs of labour engaged in this trade while gainfully utilizing the solid waste from the power station with the consequent protection of environment.

The approximate consumption of fly ash, both for making Fal-G mix and for using as aggregate, in manufacture of Fal-G bricks as well as for admixing in cement manufacturing grinding units are shown below. As may be seen from the calculations, 1.0 lakh MT of FA-II (ie. fly ash obtained in ESP hoppers of 2<sup>nd</sup> field onwards) and 1.67 lakh MT of FA-I (ie. fly ash of coarser variety), ie. 2.67 lakh MT of fly ash can produce 12.91 crores of Fal-G bricks of standard size (230 x 100 x 75 mm) and 3.9 Lakh MT of fly ash can produce 13 Lakh MT of cement. In order to utilize the fly ash generated at the power station as per the guidelines of the Ministry of Environment and Forest, the year-wise production of Fal-G bricks would be 12.91 crores per Lakh MT of fly ash. Tentative flysh utilisation plan is shown in following Figure:

**Figure - A**  
**Tentative Ash Utilization Plan For 5X800 UMPP**



It may be considered a good prospect of utilizing total fly ash to be generated at

the power station in manufacturing Fal-G bricks as well as in manufacturing of cement with its positive impacts on economy and ecology besides saving the degradation of agricultural land. However, certain logistical problems like the process available to the existing brick makers will have to be solved, technology to be made available, a certain amount of market awareness created and government patronage provided to the existing brickmakers for switching over to Fal-G brick making to make it a success.

CGPL/Power developer has to envisaged the following strategies towards achieving the objective:

**I. Fly Ash utilisation in manufacturing of bricks:**

- (i) Fly ash will be supplied free of cost from the plant silos to any brickmaker wishing to commence Fal-G brick making.
- (ii) Basic technology as well as initial expert advice for Fal-G brick making will be provided to local brick makers free of cost.
- (iii) Seminars and workshops will be organized at CGPL cost to create market awareness in the large urban conglomerates like Bhuj, Mundra, Mandvi, Gandhidham etc.
- (iv) The State Government will be approached to offer certain financial incentives, in line with some other States who have already done it, to the Fal-G brickmakers as well as ensuring use of Fal-G bricks in public works to the fullest extent possible. We intend to pursue the matter to bring it to a logical conclusion.
- (v) CGPL/power developer intend to use Fal-G bricks in construction of our township as well as the boundary walls, various plant/non-plant buildings of our project to instill confidence in the minds of the local consumers and to provide the initial fillip to Fal-G brickmaking activity in the area from now itself. CGPL/power developer has to establish the contact to local prospective areas, so that fly ash is provided free of cost to the intending brick makers and are in the process of arranging with some of the local brick makers to produce Fal-G bricks with guaranteed that if it materializes, the local brick makers will be induced to switchover to Fal-G brick making once fly ash is available from the Power Station. This practice will enable less consumer resistance towards accepting the new product.
- (vi) CGPL/power developer feels that the major constraint in spreading adoption of this technology will be availability of fly ash as well as lime and gypsum to the brick makers who are scattered all over the area. The State Government can provide valuable assistance in this respect by creating depots near large

consumption centers under its auspices.

The power stations may be directed to make available the fly ash in dry form to be loaded directly on brick manufacturer trucks. This practice will reduce handling cost of fly ash for brick manufacturer. The impact of this activity on power cost will be nominal only but the activity would certainly boost fly ash utilization.

The Ministry of Environment and Forests and State pollution Control Board can play a vital role in the matter by coordinating with other concerned ministries and the State Government in taking policy level decisions.

## **II. Fly Ash utilisation in cement grinding units:**

Fly ash utilization in cement admixing is gaining momentum and now a days cement manufacturers are setting their grinding / blending plants near thermal power stations to ensure easy procurement of fly ash. Number of such plants may come out in the future. M/s Sanghi Cement and Adani's may be the potential users of fly ash for cement manufacturing.

## **III. OUTLINES OF FAL-G TECHNOLOGY**

### **Basic Technology**

Fal-G is a ground blend of fly ash, lime and calcined gypsum in suitable proportions, which, upon hydration, yields strengths in the range of 200-400 kg/cm<sup>2</sup>, rendering a water impervious hard matrix, similar to that in Portland cement.

This mix can find the following use:

- (i) As an argillaceous raw material in the manufacture of Portland cement
- (ii) As a pozzolona in the manufacture of Portland Pozzolona Cement (PPC);
- (iii) In making different types of bricks and other building components;
- (iv) As one of the ingredients of concrete mix;
- (v) In the manufacture of sintered aggregates for making light-weight concrete, etc.

### **Fal-G Brick Manufacturing Process**

Fly Ash, Lime and calcined gypsum are mixed in a Pan Mixer in the ratio of 60:30:10 approximately. This mix is then moulded into bricks either manually or mechanically kept in the open for 1-2 days for drying and then water is sprinkled intermittently for the next few days. The brick becomes ready for transportation in 6/7 days time. Brick made of pure Fal-G as above may have compression strength in the range of 275-300 kg/cm<sup>2</sup>. which may be difficult to work within normal construction activity. Some aggregate, therefore, is usually mixed with the

Fal-G mix to arrive at a strength of around 150 kg/cm<sup>2</sup>. These aggregates can be coarse sand, crusher dust, clay or even coarse fly ash (with low carbon content).

The quality of Fal-G mix will depend on the quality of fly ash to be used. It has been found that fine partials of fly ash from modern thermal power plants where abrupt cooling of flue gas takes place in economizer/air heater zone, and collected by dry process is best suited for the mix design. Fly ash collected from economizer/air heater and 1<sup>st</sup> field of ESP, which is generally coarse, can be used as aggregates in making of Fal-G bricks.

#### IV. Conversion of Fly Ash into Fal-G Brick

The mix ratio of Fal-G is Fly Ash: Lime: Gypsum: : 60:30:10

Therefore, 1 tonne of Fly Ash will produce  $1/0.6=1.67$  tonnes of fal-G

Or, 1.00 lakh MT of Fly Ash will make 1.67 lakh MT of Fal-G mix:

Using coarse fly ash as aggregate in proportion of 1: 1, this mix will consume further 1.67 lakh MT of Fly Ash.

The density of this mix considered to be 1.5 gm/cc.

∴ The resultant mix of 3.34 lakh MT will produce brick of volume:

$$3.34 \times 10^5 / 1.5 = 2.226 \text{ lakh cu.m.}$$

The volume of each brick of standard size is

$$:230 \times 100 \times 75 \text{ mm} = 1725 \text{ cc} = 0.001725 \text{ cu.m.}$$

∴ 1 cu.m. of mix will produce  $1/0.001725 = 580$  nos. bricks.

∴ 2.226 lakh cu. m. of mix will produce  $2.226 \times 10^5 \times 580$

$$= 1291 \text{ lakh bricks}$$

$$= 12.91 \text{ crore bricks}$$

3288 TPD for 5X800 MW TPP units

CGPL :  $3333 \times 360 = 1.2$  MTPA

10 % of generated fly ash has been considered for brick manufacturing = 0.12 MTPA

Therefore, total number of bricks production per year =  $12.91 \times 0.12$  MTPA = 1.55 Crore bricks