Paper No. 492
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Brick kilns are the main consumers of over one million tonnes of the coal produced annually in Pakistan. Among the significant industrial units, 15 MW thermal plant of Wapda at Quetta is the only concern using coal as a fuel coal. The occurrence of coal at Lakhra in Dadu District of Sind province has been known for the last 100 years. The mining of coal started in 1960 after Geological Survey of Pakistan estimated the coal resource over an area of 250 Sq Km to be 240 million tonnes. A feasibility study conducted by Wapda in 1985-86 through American Consultants established the presence of 174 million tonnes of inplace and 123 million tonnes of recoverable coal reserves. The Lakhra Coal, classified as liginite, has a sulphur content of 7.65% as the most significant of its impurities.

Tests performed in USA on a sample of Lakhra coal to determine its combustion performance indicated a severe slagging potential, medium to high fouling propensity, substantial corrosion and high erosion/abrasion capability. The boiler design for such a coal requires a conservative approach. The washed sample tested to find the change in its combustion characteristics, revealed a reduction in over all heat content by 25%. The burn-test also indicated that the slagging and fouling properties became rather worse. Using washed coal was therefore uneconomical in the boiler designed on a conservative approach for unwashed coal.

It is highly desirable to remove sulphur as it causes corrosion in the boiler and also contributes to environmental pollution. There are several methods of eliminating sulphur such as coal washing before burning, chemical treatment during combustion, chemical treatment after combustion and fluidised bed combustion technology. In case of Lakhra liginite coal washing is not a justifiable treatment because washing not obly reduces the overall heat content by 25% per tonne of delivered coal but also worsens the slagging and fouling properties of the coal. Chemical treatment during combustion is normally applied to coal with low sulphur content to neutralise sulphur dioxide produced during combustion. Lime and coal in pulverised form are mixed in a pre-determined ratio and fed into the furnace, where sulphur oxides are consumed in chemical reactions. Chemical treatment after combustion or Flue Gas Desulphurisation (FGD)is suitable for high sulphur coal. This process also involves the use of lime. Lime and sulphur ratio has to be carefully determined for each type of coal. The process operates by allowing contact of flue gas with an alkaline slurry or liquid or dry powder which absorbs sulphur oxides. Western countries are employing this process even for low sulphur coals but this technology cannot be used in Pakistan because of prohibitive costs.

In 1985 Wapda conducted a feasibility study for installing a 300 MW power plant at Lakhra. The possibility of installing 700 MW thermal plant was also considered, but with a bigger plant, the sulpur dioxide emission exceeded the limit of 1000 tonnes/day at 85% plant factor specified by World Bank which was one of the donor agencies for the project. The only options left were either to have FGD equipment for the bigger plant or to reduce the size of plant to keep the Sulphur dioxide emission below the prescribed limit. It was finally decided to have 3x50 MW unit based on Fluidised Bed Combustion (FBC) Technology. The utility application of this technology has started in recent years and is especially suited to high sulphur coal. The purpose of FBC is to trap most of the sulphur dioxide in the furnace. Three types of systems are atmospheric FBC, Pressurised FBC, and Recirculating FBC. Lakhra Power Plant will be designed on Atmospheric Fluidised Bed Combustion system (AFBC). The problems of slagging and fouling for which Lakhra Coal has high propensity are virtually eliminated. A sulphur trap of 90% can be achieved with a calcium/sulphur ratio of 2.5. However some years of operating experience are still needed to identify the problems associated with

this technology that holds a good promise for the poor quality lignite at Lakhra.

The feasibility studies for installation of a power plant at Lakhra has led to following conclusions :

1. In view of the potential emission of sulphur dioxide, the use of conventional boilers should be avoided as far as possible.

2. Generation from Lakhra lignite should be based on FBC technology.

3. For the projected power plant of 3x30 MW to be commissioned in 1990-91 AFBC boilers of 50 MW size will be suitable. The proposed plant provides an optimum approach within the framework of World Bank's environmental guidelines. Bigger FBC units may be chosen for future projects.

4. Another power plant of 2x50 MW being installed by private sector will be oprated by 3x35 MW AFBC boilers. The energy available from the power plant will be sold to Wapda. Other provinces of Pakistan can also adopt this technology to consume domestic coal for generation of energy. The challenge of existing power shortage can sucessfully be met if both the private and the public sector participate in the national programme of resolving the power crisis.