

## Washery slurry and its Fruitfull utilisation

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The presently adopted beneficiation and recovery system in the existing coal washeries produce a large quantity of coal slurry that gets settled in nearby areas. Due to high ash content, it can not be mixed with clean coal and is used for non metallurgical purposes, such as domestic coke making, brick making etc., while a significant amount goes as a waste, polluting a large extent of neighborhood areas and river. In India, broad estimates suggest that the total stock of slurry/tailing accumulated at different washeries of Coal India Ltd. (CIL), is in the tune of 3.0 million tonne. Added to this there is a regular slurry discharge of about 60,000 t/month. The factors affecting the quality of slurry pond fines are :-

- (i) *Parent Coal Characteristics.*
- (ii) *Mining technique*
- (iii) *Preparation procedure*
- (iv) *Efficiency of preparation plant*
- (v) *Degree of oxidation.*

These discarded coal fines which contain significant amount of vitrinite enriched coking material, are not being properly utilised due to the following reasons.

- i) **Inability of existing coal washing circuit to beneficiate these coal fines from slurry.**
- ii) **Environmental restriction regarding waste disposal are not stringent.**
- iii) **Non availability of suitable technology to recover the coal fines at desired quality.**

In general, Indian coking coal fines contain high ash (> 30%) and have distinct characteristics different from the Foreign coal like Australia, China, USA etc. (10-13% ash). Indian coal is of drifted origin which contain intermixed bands and mineral matter

and are intimately associated with the organic matrix. They also contain lesser amount of clay materials in the liberated fine coal.

### **Treatment of Slurry**

Among the process available for treatment of fine coal/slurry (below 0.5 mm) mention may be made of Hydrocyclone, Froth flotation, oleo flotation, microbubble flotation, oil Agglomeration, Jameson Cell Flotation, Selective agglomeration and so on. Selective flocculation is also some times used for separation of fines. Spray flotation is still in the developmental stage.

The scope of application and limitation of all these processes mentioned above is total depended on flotability characteristics of coal fines and particle size distribution also. Fine Coal beneficiation basically depends on physico chemical parameters.

For the treatment of coal slurries, froth flotation technique continues to be the widely accepted process. In this process coaly fraction attached themselves selectively to air bubbles created in liquid medium with the help of reagents. The clean fractions thereafter is recovered as froth concentrate. It is a common practice in many countries to adopt flotation for upgrading fines below 1 mm or 0.5 mm. Further, for a 50 percent reduction of ash say 30 to 15% the total yield in the froth flotation process can seldom exceeds 60%. No doubt, the froth flotation process is accepted through out the world for beneficiation of fine coal, it fails to operate efficiently for super fines (below 53 micron) or difficult washing coal, when clay content is very high.

Central Fuel Research Institute, Dhanbad has developed a low cost, Eco-friendly fine coal treatment process that can abate the problems associated with disposing of tailing and coal fines as slurry. The process produces low ash (10-15%) cleans, with 55-60% recovery (yield of flotation cleans) by beneficiation of coal slurry having ash content 25-30%. The beneficiated coal slurry can be used to produce low ash metallurgical/industrial grade coke. The beneficiation circuit/process adopted in CFRI technology is unique and no where in the world the same has been adopted to beneficiate the coal slurry having high ash content to recover prime coal.

The first Mini flotation plant in commercial scale was taken up M/s Tetulia Coke (P) Ltd. Nirsa, Dhanbad. On the basis of CFRI design & consultancy modern coal slurry up gradation unit (5 tph) was installed and commissioned in 1994 at Tetulia.

Novelty of this Process :

1. Recovers the finest coal particles having low ash content from the slurry accumulated as waste material in the coal washeries.
2. The recovered coal particles (cleans) have very high vitrinite content. This can act as a component to produce low ash metallurgical /industrial grade coke required for Iron and Steel Industries. The product can partially substitute the low ash imported coal (10-13%) at a cheaper price and help to reduce the import of coking coal/metallurgical coke for the industries.
3. The whole technology works under complete closed water circuit system. This prevents severe environmental pollution in the vicinity of the working site.
4. It converts a waste material to value added product.

The present paper deals with salient feature of the technology design and up-scaling to commercial stage. Three mini flotation plants, based on CFRI technology have been commissioned of throughput capacity 5 to 10 tph in small scale sector, they are successfully producing cleans (yield 50-60%) and moisture (<20%) from high ash coal slurry. The cleans have been successfully used by to M/s IISCO, Burnpur as a coking blend constituents for metallurgical coke. This project was undertaken by CFRI in March'99 for proper utilisation of Moonidih slurry/BCCL.