

COAL WASHING & POWER GENERATION FROM WASHERY REJECTS

**2nd INDO-US COAL
WORKING GROUP MEETING
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Coal Washing

Problems associated with Indian run-of-mine coal

- Indian coal has drift origin, resulted in intimate mixing of mineral matter with coal, giving rise to the ash content
- The coal-ash distribution in the coal matrix in Indian coal is so interwoven that coal is essentially required to be crushed to small sizes for affecting liberation of coal and ash particles
- Coal beneficiation largely depends on gravity difference of coal and ash particles
- The Near Gravity Material (NGM) at any specific gravity of cut is high, which means at any specific gravity of cut there is quite good amount of misplacement of coal towards sink and vice versa.
- It further put hurdle to achieve sharp separation during coal washing.

Coal Washing

Technological Options

- ✓ Clean coal technology being practised in coal washeries in India, as pre-combustion clean coal technology, mainly focus on cleaning of coal by removing ash from coal
- ✓ Earlier only coking coal was being washed because steel making needs coking coal of ash of 17 to 18%. The raw coal ash in Indian coking coal varies from 25 to 30%. Now-a-days, Min. of Environment & Forests has put restriction on the use of high ash coal in power sectors, which necessitated priority to wash non-coking coal also.
- ✓ The choice of process equipment involved in coal washing depends on factors such as the type of coal being treated, the market requirement and the economics
- ✓ Continuous research and development efforts, including trial and adoption of latest equipment/ technology are being done

Coal Benefication

Technologies under trial in India

- ✓ **Barrel Washer (mainly for non-coking coal)**
- ✓ **Spiral Concentrator**
- ✓ **Column Flotation (Fine Coal Beneficiation)**
- ✓ **Air Dense Fluidized Bed Separator (Dry Beneficiation Technique designed in India)**
- ✓ **Multi Gravity Separator**

Coal Washing

- As per GoI stipulation, power houses situated beyond 1000 kms from pithead coal mine must use coal having less than 34% ash.
- Number of washeries currently in operation:

Coking	Capacity (Mt)	Non-coking	Capacity (Mt)
18	31	28	70

➤ Technologies in vogue:

- ✓ Jigs
- ✓ Heavy Media Baths
- ✓ Heavy Media Cyclones
- Froth Floatation
- Water-only Cyclones

- In view of the GoI stipulation and growing demand of coal, there will be need for more number of washeries to supply washed coal in future.

Coal Washing

Coal Washeries under operation in India

Sl. No.	Type of Coal	Sector	No.	Capacity (Mty)
1	Coking	Coal India	11	19.68
		Other PSUs	3	4.85
		Private	4	6.42
		Sub-Total	18	30.95
2	Non-coking	Coal India	7	20.20
		Private	21	50.15
		Sub-Total	28	70.35
	Total		46	101.30

Setting up of Coal Washeries in India

- During last five years about 21 washeries came into existence on private investment on “Build-Own-Operate” (BOO) concept.
- Keeping in view the future demand of washed coal, Government of India through CIL encourages setting up of washeries in India on “BOO” concept to be constructed on Company’s land.
- CIL renders logistic support on chargeable basis wherever possible to “BOO” operator such as
 - ✓ Assured supply of raw coal of requisite quantity & quality on behalf of linked consumers
 - ✓ Land for washery & disposal of rejects
 - ✓ Water & electricity (during construction)
 - ✓ Railway siding if feasible

Coal Washing

Cooperation Required

- ✓ **Because of additional cost of beneficiation, the washed coal is not yet a favoured commodity for Indian consumers.**
- ✓ **Technical upgradation in the process is required for :**
 - **Cost reduction for coal washing**
 - **Increase in yield percentage to rejects ratio**
 - **Reduction in cost as well as increase in yield percentage in case of multi stage washing**

Washery Rejects: Power Generation

Present Availability Of Rejects From CIL Washeries

- ✓ The generation of rejects from washeries in CIL in 2004-05 was 2.44 Mt
- ✓ Accumulated stock of washery rejects upto March'05 was 18.15Mt.
- ✓ Disposal of this huge quantity of rejects in an environment friendly manner poses a real problem.

Washery Rejects : Power Generation

Future Washeries Under Different Stages Of Implementation

- ✓ 21 nos. of Non-coking coal washeries are under different stages of implementation by Private Sectors having capacity of about 50.15 Mty
- ✓ CIL provided infrastructural facilities like land & siding etc. to set up 11 Mty non-coking coal washery under BOO scheme at Talcher (Orissa)
- ✓ CIL exploring the possibility to provide facilities for proposed 6.0 Mty and 3.0 Mty washeries under BOO scheme in Talcher (Orissa) and Singrauli
- ✓ Facilities for setting up of 3.5 Mty washery under BOO scheme at North Karanpura area (Jharkhand) is under active consideration.
- ✓ CIL has also taken action to set up 6.0 Mty washery at Dipka (Chattisgarh) under BOO scheme

Washery Rejects: Power Generation

➤ NEED OF FBC/CFBC POWER PLANT

- ✓ There is a real problem of disposal of washery rejects in an environmental friendly manner
- ✓ There is a need of gainful utilization of carbon content (otherwise lost with washery rejects) by generating power through FBC/CFBC based units at washery end

➤ Possible Location & Capacity of FBC/CFBC Power Plants

- ✓ There is likely concentration of existing and proposed washeries in the three major coalfields under command area of CIL such as North Karanpura (Jharkhand), Talcher (Orissa) & Dipka/Korba (Chhattisgarh).

Washery Rejects: Power Generation

Possible Location & Capacity of FBC/CFBC Power Plants

- **North Karanpura, (Jharkhand)**
Setting up of about 110 MW unit utilizing about 1.3 Mty of rejects of Piparwar washery (6.5 Mty) and an another 60 MW unit utilizing rejects of about 0.7 Mty from proposed washery (3.5 Mty) at KD Hesalong
- **Talcher, (Orissa)**
2 X 110 MW FBC/CFBC plants may be installed Kalinga and Ananta-Bharatpur in Orissa state.
- **Dipka/ Korba, (Chattisgarh)**
Installation of 2 X 110 MW FBC/CFBC power plants for utilization 3.2 Mty rejects from existing washeries at Dipka (5.0 Mty), Gevra (6.0 Mty) and Korba (5.0 Mty) in Chattisgarh State.

Modalities for installation of these power plants can be worked out for US investment

Washery Rejects: Power Generation

➤ Quality Requirement Of Rejects For FBC/CFBC Power Plants

- ✓ GCV of rejects required for efficient burning in FBC/CFBC plants should be in the range of 1360 – 2000 kcal/kg. Washery rejects from Orissa & Jharkhand have been tested & found suitable for such plants

➤ Likely Cost Of Generation

- ✓ CIL has set up 7nos of 10 MW each FBC based power plants using washery rejects at various locations
- ✓ Cost of generation from these plants varies from Rs.2.5 to Rs.3.5 per kWh due to operation of these plants in isolation mode at low PLF.
- ✓ The generation cost will reduce & will be comparable with other thermal power plant with bigger unit of FBC based plant as proposed above and operation of plant in parallel with the grid.

US Involvement in Coal Washing in India

- A 2.5 mty coal washery was setup with US technology at Dipka (Chattisgarh).
- CLI, a US company, constructed the washery.
- Tehno-economic studies were conducted with US AID.
- The study recommended technology with heavy media separation.
- Recently capacity of the washery enhanced to 5.0 mty. & is operating at +100 % capacity.
- For using rejects, washery is proposing to setup a 2x25 MW CFBC power plant in Ph-I
- Power Plant will utilise 0.5 mty rejects in blend with 0.13 mty raw coal.
- The use of rejects would result in saving of 0.2 mty raw coal per year.
- Another 2 x 25 MW power plant is proposed in Ph-II.

Washery Rejects: Power Generation

➤ Cooperation Required

- ✓ Adoption of advancement for gainful utilization of carbon content in washery rejects for generating power through advanced combustion and heat utilization procedures for these technologies available in the USA

THANK YOU