

### Characteristics of Indian coal: (98% gondwana & 2% tertiary coals):

Most of the Indian coals contain higher percentage of inorganic impurities compared to the coals of western world and Australia. The inorganic impurities present in Indian coals are intimately mixed with the coal matrix. As such, its removal is difficult. In spite of high ash and poor washability characteristics, Indian coals have many positive fractures with respect to combustion characteristics and eco-friendly nature. Some of the important characteristics of Indian coals includes :

- 1) Indian coals like any other gondwana coals are of high ash content which due to the nature of formation of the coal deposits. In general Indian Coals are of drift origin, i.e the original plant materials, which were later transformed into coal, were transported by rivers and laid down as fluvial, lacustrine or deltaic deposits. As a result the plant material were contaminated with clay and other detritus minerals, giving rise to high ash content. Whereas the carboniferous were formed in situ, i.e. plant materials grow on the spot where the coal seam is found. Or in other words the forests submerged and transformed into coal. In this case there is hardly any chance of having much of extraneous mineral matter, as such, the coals are low in ash content.
- 2) Due to the mode of origin of Indian coal, thick seams are quite common in India. Unlike the carboniferous coal which the most part were associated with geosynclinal development in an unconsolidated region, the Indian coals like any other gondwana coals were found in continental platform basins in a fairly consolidated area. These platform basins must have been shallow and they generally rank a little at a time (although, for short periods possibly at a high rate) in contrast to the geosynclinal basins which had a faster rate of subsidence. The slower rate and prolonged duration of sinking platform basins were much more favorable for the accumulation of plant materials. Consequently, coal seams of extreme thickness formed under favorable conditions of accumulation of plant materials.
- 3) Most of the carboniferous seams of the northern hemisphere are sharply defined with abrupt transition from floor to coal and coal to roof. By comparison many Indian coal seams are less defined by having gradations of coal seams through carbonaceous shale (both vertically and laterally) at roof and floor and, in some instances, by containing numerous mineral rich bands. Similarly there is lateral transition from coal to carbonaceous shale in many coal seams.
- 4) Well defined layers of mineral rich material are common in many Indian coal seams, especially thicker seams. They may be centimeter thick and persist over many square kilometer, or several centimeters thick but fairly lenticular within one area of a colliery.
- 5) Some coal seams are very prone to splitting. So that a single seam, may over a distance of one or two kilometer split into several members, each separated from the next by meters or tons of metres of intervening coals.
- 6) The coals deposits of north-eastern are the most important tertiary deposits in India. The coal is a very good quality coking coal with low ash content. Unfortunately nature has given by one hand but taken by the other. As such Assam coals inspite of being of good quality coking coal could not be used properly because of high sulphur content. Sulphur content of Indian coal is, in general, around 0.5 – 1%.
- 7) High ash with difficult cleaning characteristics.
- 8) In general contains less trace elements
- 9) Coal ash, in general, is of refractory nature
- 10) Silica-alumina ratio in coal ash is favourable from slag viscosity point of view
- 11) Alkali content in coal ash is generally low
- 12) Ash fusion temperature is generally high
- 13) But for high ash (which can be brought down on beneficiation), Indian coals are more environment and combustion friendly.

### Washing Characteristics of Indian Coal

Coal and mineral particles

Closely intermixed in the overall coal matrix

High ash content

Coking Coal	:	20-35% mostly 25-35%.
Non-Coking Coal	:	15-50%; mostly 30-45%

Exhibit difficult to very difficult washability characteristics.

Washability Number (WN) for washability characteristic (CFRI nomenclature-lower the number more difficult to wash)

- Difficult Indian coal; WN : 25-75(Limited)
  - very difficult Indian coal;WN: <25 (Mostly)
- (The washability Number for American and Continental coal is 90-150)

Near Gravity Material (NGM)

- At desired separation density 25-30%, sometimes as high as 50%  
(For American and Continental coal; NGM; 10-15%)

Coking Coal Washing

- Total washing
- Feasible upto about 17% (quality stipulated by Steel Plants), as raw coal ash is 30-35% and mineral intermixed in the coal matrix.
- Washing to 17% also requires finer crushing for better liberation of locked-up coal.
- Washing of large quantity of fines.
- Needs complex washing circuit.
- 3 Product (Clean coal, Middlings, reject) washing essential.
- Low yield of clean coal.
- Difficult to crush (HGI ; 55-60)
- Moisture 1-2% (under equilibrated conditions of 60% RH and 40<sup>0</sup>C).

Non-coking Coal Washing

- Difficult to crush (HGI : 50-55).
- Limited washing for removing extraneous dirt desirable.
- Also difficult for deep washing (for more ash reduction).
- Limited/Partial washing of coarse coal (for 6-8 units ash reduction) only economical.
- 2 product (clean coal & rejects ) washing desirable.
- Moisture : 5-7.5 (under equilibrated condition of 60% RH and 40<sup>0</sup>C).