Coal Blending

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Why Blending

- Adequate coal supply from Indian sources not available
- Reduce the Power generation cost
- The low-grade coals can be mixed with better grade coal
- improve the calorific value of coal being fired
- mixing high grade imported coal with the low grade high ash coals
- attempt to reduce cost, meet SO2 emission limits

Effect of blending and properties of Agglomerate

- Mixing any two coals without analysis may lead to more problems
- The properties may not be the ‘average’ properties of the mix.
- The individual constituent may retain:
  - Fusion Temperature (Ash Characteristics)
  - Grindabilty Properties (HGI)
  - Combustion reactivity
  - Swelling characteristics
- Some properties may be additive
  - Calorific Value
  - Total Moisture
  - Total ash

Before blending understand …….

- the origin of coal
- chemistry of inorganic, organic part and the combustion properties & behavior
- The grindability of coal
- The variation in ash content
- Differential Thermo gravimetric (DTG)& Differential Scanning Colorimetric (DSC) are used for Burning profile analysis before deciding to blend.
- The combustion efficiency and carbon loss will have to be also addressed during blending of coals. It is also necessary to look into the aspects of slagging, fouling and emission characteristics like NOx, SOx and particulate.

Behavior and Compatibility

- Coal with similar burning profile is expected to behave similarly in a full scale boiler.
- By comparing burning profile of an unknown coal with that of a coal with known full scale performance, compatibility can be judged.
- Comparison of burning profile temperature provides qualitative assessment of coal reactivity

Ash fusion temperature

- Ash composition of two coal from different origin may be different.
- May have different ash fusion characteristics
- It is necessary to see that blended coal ash IDT should be higher than FEGT temperature.
- Ash fusion temp is a measure to assess slagging and fouling propensity of coal

Basis for recommendation

- Flame stability
- Carbon loss
- Heat flux reduction due to slagging and fouling
- Heat flux regain ability on wall blowing
- SH and RH spray levels
- Emission
- Acid dew point
- Ash resistivity

Prime Concerns

- Boiler furnace Slagging
  - Lead to outages in many cases
  - Lead to load reduction
  - Performance parameters change
- Arriving at the right proportion
- Maintaining the right mix

Aspects of Imported Coal

Imported coal has high VM (25-45%)

- –Care to be taken to avoid spontaneous combustion in stack yard
- –Control Mill inlet air temperature to maintain low mill outlet temperatures

- Imported coal has low Ash Fusion Temp
  - –Reducing atmosphere in Furnace
  - –Clinkering & Slagging tendency

Imported coal has Compatibility issues

- –Secondary Combustion
- –High Sulphur, SOx emissions
- –Increase in Unburnt Loss
- –Operation at High Excess Air

Blending Methods

Method	How it is Done	Done Where	Benefits	Difficulties
Bed blending	Stacking of two coal in yard in layers	-Blending during reclaiming -Homogenization at transfer point	Only one system to run for bunkering coal	-Entire coal to be stacked first -More running Hours for CHP & more APC -Not possible to change ratio
Silo Bending	Imported coal from Silo is mixed with domestic coal carried by conveyer below Silo	-On conveyer below Silo - Homogenization at transfer point	V. accurate Blending ratio can be achieved -Ratio can be varied	High Capital cost
Blending by Ground Hopper	Imported is Dozed to ground Hopper Domestic coal is fed directly from track hopper wagon tippler	-At common transfer point - Homogenization at transfer point	Ground hopper is an additional Source of reclaiming	Feeding rate is not accurate
Blending on Moving Belt (Both coal reclaimed)	Two types of coal are stacked in two yard of different stacker & reclaimers	-At common transfer point - Homogenization at transfer point	Blending ratio can be changed any time	-Entire coal to be stacked first -More running Hours for CHP & more APC
Blending on Moving Belt Imported reclaimed & Domestic - track Hopper)	Imported coal is reclaimed from yard and Domestic coal is directly fed from track hopper/ wagon tripler	-At common transfer point - Homogenization at transfer point	Blending ratio can be changed any time Only imported coal need to stacked	Accuracy wise inferior to Silo blending

Practical approach

- How power stations to view
  - Look at proximate and ash analysis
  - Look for FC/VM ratio – idea on reactivity
  - Ash composition ratios – slagging
- Trial with low mixture ratio – 95% + 5%
- 95% of regular usage coal
- Watch parameters for about a week like
  - SH spray
  - Steam temp
  - Exit gas temp
  - Unburnt carbon
  - Load on bottom ash collection after maintaining load
  - Steam pressure
  - Excess air
  - Mixture ratio

Conclusion

- Compatibility of characteristics of two coals must be assessed before blending to avoid combustion related problems.
- Optimum blend ratio needs to be determined and maintained during blending (Based on AFT, Burning Profile &HGI)
- Proper Methodology for blending must be followed based on available infra structure
- Blending in transfer point before bunkering ensures good mixing in different stages & is the recommended practice
- For new projects provisions need be made for firing blended coals at design stage
- There's a need to develop models for Indian coals, that could predict impact of coal blends & coal quality variations on boiler performance

Thanks