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

• 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