FEP5 - Integrated Sugar Complex with Minimum Energy Consumption and Maximum Cogeneration Concept To Commissioning

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Abstract:
Assignment: To design, supply and commission, on turnkey basis, two Integrated Sugar Complexes for HPCL Biofuels Ltd. (HBL). A unit of Hindustan Petroleum Corporation Ltd., a Government of India enterprise and a global Fortune 500 company. Location: Sugauli and Lauriya in the state of Bihar in India.

Brief:
- Available cane: 630 000 tonnes
- Fibre % cane: 16.5%
- Purity of mixed Juice: 80
- Basic requirement: Energy efficient plant for maximum cogeneration

Isgec Solution:
3500 TCD Plant with 20 MW Co-gen for 180 days crushing operation - to produce sugar and ethanol following the Brazilian model of sugar production (50% juice used for ethanol production and 50% for white plantation sugar). Minimum energy consumption and maximum cogeneration controlled by an integrated DCS (Distributed Control System) from a Centralised Control Room.

Selection of Chainless Diffuser instead of Milling Train for Juice Extraction

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>4 nos. Mills</th>
<th>Chain type Diffuser</th>
<th>Chainless Diffuser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushing rate</td>
<td>TCD</td>
<td>3500</td>
<td>3500</td>
<td>3500</td>
</tr>
<tr>
<td>Fibre % cane</td>
<td>%</td>
<td>16.5</td>
<td>16.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Pol % Cane</td>
<td>%</td>
<td>13.2</td>
<td>13.2</td>
<td>13.2</td>
</tr>
<tr>
<td>Imbibition rate</td>
<td>% on fibre</td>
<td>280</td>
<td>320</td>
<td>320</td>
</tr>
<tr>
<td>RMFL (Ml/day)</td>
<td>%</td>
<td>96</td>
<td>98.6</td>
<td>98.6</td>
</tr>
<tr>
<td>Raw Juice Quality</td>
<td></td>
<td>Base</td>
<td>Lower starch</td>
<td>Lower starch</td>
</tr>
<tr>
<td>Bagasse Moisture</td>
<td>%</td>
<td>About 50</td>
<td>About 50</td>
<td>About 50</td>
</tr>
<tr>
<td>Pol % Bagasse</td>
<td>%</td>
<td>1.60 - 1.80</td>
<td>1.9 - 1.25</td>
<td>1.5 - 1.25</td>
</tr>
<tr>
<td>Power consumption kWh/t</td>
<td>13-14</td>
<td>11-12</td>
<td>11-12</td>
<td></td>
</tr>
<tr>
<td>Capital cost</td>
<td>%</td>
<td>Base</td>
<td>70-80</td>
<td>49-56</td>
</tr>
<tr>
<td>Maintenance cost</td>
<td>%</td>
<td>Base</td>
<td>70-80</td>
<td>35-40</td>
</tr>
<tr>
<td>Expandability</td>
<td></td>
<td>Very limited expandability</td>
<td>Zero expandability</td>
<td>Easy to expand</td>
</tr>
</tbody>
</table>

Selection of Energy Saving Devices

- Elimination of live / exhaust steam for Sulfur Melting, Super heated wash water system, Pan washing, Sugar melting, Molasses Conditioning, Sugar Dryer
- Low Pressure Heating Module (LPHM) for Diffuser Juice Heating - by using Low Pressure Vapour
- Common Condensate Flash Recovery System - reduction of steam consumption by 2-2.5% on cane
- Use of Power saving devices

Selection of High Pressure Boiler for Maximum Cogeneration

Traveling Grate Boiler of 110 t/h, 110 bar, 540°C with 20MW Extraction and Condensing Turbine for Cogeneration

- Power & Fuel Balance of Plant

Parameters | Unit | Value
---|---|---
Moisture of bagasse | % | 49–50
Calorific value of bagasse | KJ/Kg | 9510
Feed water Temperature | °C | 210
Steam Temperature | °C | 540
Pressure Steam | bara | 110
Steam Enthalpy | KJ/kg | 3464
Boiler efficiency | % | 70.50

Results

- Crushing rate
- Reduced Mill Extraction
- Power consumption of Sugar Plant kWh/TCH
- Moisture % Bagasse
- Reduced Boiling House recovery
- Steam Consumption of 75 TCH Process House at 150 TCH crush rate % on cane
- Sugar Colour

- TCD | 3500
- % | 97.70
- 17.20
- % | 49.20
- % | 91.50
- % | 21.90
- IU | 70-80