Corporate Technical & Energy Services
ABMCPL, Taloja

ENERGY EFFICIENCY IMPROVEMENT INITIATIVES

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CTES - GROUP CPP Services

Energy Efficiency Improvement Initiatives

- Benchmarking of Plant Performance
- Performance Improvement Studies
- Knowledge Integration Programme
- Business Intelligence Tool
- Simulation Services
Key information at a Glance
ABG businesses covered - 7
Plants covered – 48
Details of Installed equipment's
 143 Power Boilers
 123 turbines
 58 DG sets
Total Installed Capacity: **4600 MW**

Web based tool for CPP data collection

Benchmark Parameters:
 PLF
 Cost of Fuel/ Cost of Power
 Boiler Efficiency
 Auxiliary power consumptions
 Boiler and TG availability
 DG Performance
 Export / Import power
Benchmarking: Group wide studies

GroupWise Comparison of Boiler Performance
- Boiler Efficiency
- Fuel GCV
- Boiler Parameters
- APH Performance
- Fan Performance

GroupWise Comparison of Turbine Performance
- Turbine Heat Rate
- Condenser Performance Water Cooled and Air Cooled
- Heater – HP & LP Heater Performance
Performance Improvement Studies

- CPP Energy Audits
- Performance Test
  - Boiler
  - Turbine
  - Air Preheater/Economizer
  - Feed water heaters
  - Condensers
  - Utilities - Pumps, Cooling tower, Compressors, fans etc.
  - Steam distribution
CPP Business Intelligence (BI) Tool

- BI tool monitors all critical parameters continuously and shows trend and variations.
- BI tool continuously monitors and calculates power plant parameters like
  - Boiler efficiency,
  - Turbine heat rate,
  - APH Performance
  - Station heat rate.
- It provides a drill down analysis up to multiple levels in case of any deviation.
- It gives a comparative analysis of power plant KPIs.
- Pilot project for UltraTech Cement, Kotputli and Tadipatri Unit.
CPP Business Intelligence (BI) Tool
Boiler

- Below Normal
- Normal
- Above Normal
- Out of Range
CPP Business Intelligence (BI) Tool

Boiler root cause analysis
**CPP Business Intelligence (BI) Tool**

Impact Analysis

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**Pilot project for UltraTech Cement, Kotputli and Tadipatri Unit.**

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### Weekly Financial Impact

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>Unit 1</th>
<th>Unit 2</th>
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<tbody>
<tr>
<td>Deviation in Boiler</td>
<td></td>
<td></td>
<td>0.72</td>
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<tr>
<td>Efficiency %</td>
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<tr>
<td>Deviation in Turbine Heat</td>
<td>kcal/kWh</td>
<td>151.8</td>
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<td>Rate</td>
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<td>Financial Impact of</td>
<td>Rs Lacs</td>
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<td>Performance</td>
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<td>Total Financial Impact for</td>
<td>Rs Lacs</td>
<td>4.78</td>
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<tr>
<td>Week</td>
<td></td>
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</table>
CPP Simulation: Ebsilon Professional

- Analysis integrated system of multiple Units
- Cogeneration plant analysis
- Operation & Maintenance Planning
- Performance prediction for new component
- Performance analysis of components
- Retrofit benefit analysis
- Design & Optimization
- What-if analysis
Simulation Methodology

Design Data collection

Operating Data collection

Simulation of operating conditions

Validation of design Model

What if /Gap Analysis

INFERENCES ON PLANT RELIABILITY AND ENERGY CONSERVATION
TG Simulation for UltraTech Cement

100% DESIGN LOAD CONDITION

Capacity: 25 MW
Steam consumption: 99.4 TPH
Gross Heat Rate: 2429 Kcal/kWh
TG Simulation for UltraTech Cement

ACTUAL OPERATION 111.6 TPH, 25.9 MW

<table>
<thead>
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<th>Parameters</th>
<th>Design</th>
<th>Actual</th>
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<tbody>
<tr>
<td>Load (MW)</td>
<td>25</td>
<td>25.9</td>
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<tr>
<td>Input steam (TPH)</td>
<td>99.4</td>
<td>111.6</td>
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<td>Heat rate (Kcal/kWh)</td>
<td>2429</td>
<td>2635</td>
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<tr>
<td>TTD of HPH</td>
<td>4.9</td>
<td>5.2</td>
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<td>DCA of HPH</td>
<td>3.0</td>
<td>14.7</td>
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<tr>
<td>TG Stage 1 η%</td>
<td>77.53</td>
<td>70.55</td>
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<tr>
<td>TG Stage 2 η%</td>
<td>89.60</td>
<td>81.80</td>
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<td>TG Stage 3 η%</td>
<td>82.47</td>
<td>71.74</td>
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<tr>
<td>TG Stage 4 η%</td>
<td>82.47</td>
<td>71.74</td>
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</table>
Root causes of 190 kCal/kWh heat rate increase was identified.

Major reason of 125 kCal/kWh heat rate increase was because of lower 3\(^{rd}\) stage efficiency.

Other reasons like performance deterioration of feed water heaters were also identified.

<table>
<thead>
<tr>
<th>Gasp Analysis</th>
<th>Difference in heat rate in kcal/kg</th>
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<tbody>
<tr>
<td>Due to turbine stages – LOSS</td>
<td>189.5</td>
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<tr>
<td>Due to heaters – LOSS</td>
<td>11.4</td>
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<tr>
<td>Due to Inlet steam condition- GAIN</td>
<td>9.5</td>
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<tr>
<td>Total Heat rate deviation</td>
<td>191.4</td>
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- Identified saving was more than INR 300 Lacs.
- Implementation is under progress
Thanks