Sharing of Best Practices - TATA POWER

Knowledge Exchange Platform

26th February 2015, New Delhi
"Cheap and abundant electric power is one of the basic ingredients for the economic progress of a city, a state or a country"
Introduction
## Trombay – Thermal Power Station

<table>
<thead>
<tr>
<th>Unit</th>
<th>Inception Year</th>
<th>Capacity (MW)</th>
<th>Type of Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 5</td>
<td>1984</td>
<td>500</td>
<td>Coal, Oil &amp; Gas</td>
</tr>
<tr>
<td>Unit 6</td>
<td>1990</td>
<td>500</td>
<td>Oil &amp; Gas</td>
</tr>
<tr>
<td>Unit 7 (CCPP)</td>
<td>1993-94</td>
<td>120+60 = 180</td>
<td>Gas</td>
</tr>
<tr>
<td>Unit 8</td>
<td>2009</td>
<td>250</td>
<td>Coal</td>
</tr>
</tbody>
</table>

Covered in PAT Scheme
Challenging Environment Norms

Most Stringent environment

Daily SO2 emissions

24TPD

Maximum Ash generation limit

766 MT / Day

Source: PwC Report

Tata Power
Lighting up Lives!
First 150 MW unit in India (1965)
First 500 MW unit in India (1984)
Multi-fuel firing capability viz. Coal, Oil and Gas for generation
First to Use Bombay High Gas in 1977
First Flue gas Desulphurization Plant for removal of SO2 emission
State-of-the-Art Distributed Control System (Touch Screen)
Plant Information System (2009)
Screw Unloader, Stacker Reclaimer & Pipe Conveying system (2009)
Variable Frequency Drives for 6.6 KV Fan and Pumps applications
Energy Saving Projects
Major Energy Saving Initiatives

• 415 V VFD for 6.6 KV Heater Drip Pump in Unit 5 & 6.

• Compressed Air Pressure Controller for Unit 5

• ACW Pump impeller coating to improve efficiency in Unit 5 & 6

• Installation of Vacuum Pumps for Fly Ash Removal in place of Hydro-ejector based Ash Water Pumps in Unit 5

• Coro –Coating of CW pumps in Unit 5 & 6

• HPBFP impeller trimming (Stage removal) in Unit7.

• VFD for Condensate recirculation pump & Low pressure boiler feed pump.

• Combustion optimization in Unit 5 & 6

• Modification in Air & flue gas path along with CFD analysis in Unit 8

• Silt Curtain in CW Jetty
415 V VFD for 6.6 KV Heater Drip Pump: Earlier CASE

- Drain receiver
- Level Cont.
- 0.5 Bar
- 26.7 Bar
- 69% Open
- 11.8 Bar
- 12.2 Bar

**Pump parameters at 500 MW without VFD**
- Flow: 20 Kg per Sec
- RPM: 1450
- AMP: 25-26
- KW: 220-230
Options Available

1) Installing High Voltage (6.6KV) Variable Speed Drive.
   Limitation : High Cost of Drive ( Rs. 1 Crore / Drive)

2) Heater Drip Pump Motor to be replaced by 415V Motor which is controlled by the low voltage drive.
   Limitation : Major modification required in the system which increased the cost & downtime of the equipment.

3) Using 415V drive for the 6.6 KV motor.

selected
Line diagram of 6.6 KV VFD for heater drip pump

Scheme Outline

- Existing 6.6KV Switchgear
- Arrangement for bypassing the drive & transformers on 6.6 kV side

- BASIC DRIVE 415V
- Input Trf
- Output Trf
- 6.6KV Heater Drip Pump Motor
**415 V VFD for 6.6 KV Heater Drip Pump: After VFD Installation**

- **Drain receiver**
- **Vary RPM**
- **0.5 Bar**
- **14 Bar**
- **100% Open**

**Pump parameters at 500 MW with VFD**
- Flow: 20 Kg per Sec
- RPM: 1060
- KW: 80-85

**Investments**: 50 Lakhs  
**Savings**: 34 Lakhs
BLINDING ONE STAGE OF BOILER FEED Pump ( HPBFP ) OF UNIT 7

• Earlier case: 70 MW

- Flow: 55 Kg per Sec
- Pr: 134 Bar
- Power: 1470 KW
- RPM: 2950

Investments: 57 Lakhs
Savings: 27 Lakhs

• Present Case

- Flow: 55 Kg per Sec
- Pr: 123 Bar
- Power: 1130 KW
- RPM: 2950
Combustion Optimization in Unit 5: 500 MW

**Before:**
1. Lack of oxidizing atmosphere at Furnace exit.
2. Coal Mill Fuel Air Ratio (1:2)
3. Fouling in final RH & SH section of the boiler (convection region of the boiler)
4. Coal fineness is lower (between 50 to 60% from 200 mesh)
5. Only one O2 probe in each side of RAPH.
6. Coal mill fuel air damper is kept 40% open.

**After:**
1. To create oxidizing atmosphere at furnace exit by identifying & attending leakages between furnace exit & RAPH inlet, SADC optimization.
2. Coal Mill Fuel Air Ratio (1:1.8).
3. Clearing the fouling in convection region of the boiler.
4. To improve coal fineness in Mills (> 70% from 200 mesh)
5. Install at least 6 O2 probes in each side of RAPH inlet & use average value for combustion control.
6. Optimizing fuel air damper.

### KPI Impacted

<table>
<thead>
<tr>
<th>KPI</th>
<th>Savings (Rs. Million)</th>
<th>Investment (Rs. Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat rate</td>
<td>36.3</td>
<td>1.3</td>
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</tbody>
</table>

**Seeking**

| Idea Source: External Audit Recommendations | Replicated in Unit 8 in FY13 |

**Sharing**

| Witnessed at TNEB utility at Tuticorin | Shared with other Tata Power Sites viz. Jojobera & CGPL, Mundra. Will be executed in FY14 / 15 |
| Shared in various forums e.g. Shared in CII summit 2012 as a case study |
Combustion Optimization in Unit 5 : 500 MW

APH Inlet Draft
Design: -76mmwc
Before: -138.5mmwc/ NOW: -96.8mmwc

APH Outlet / ESP Inlet Draft
Design: -276mmwc
Actual: -353.06mmwc/ NOW: -302.5mmwc

ID Fan Inlet Draft
Design: -255mmwc
Actual: -387.6mmwc/ NOW: --333.2mwc
Modification in Air & Flue gas path in 250 MW Unit 8

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation loss</td>
<td>20-25MW</td>
</tr>
<tr>
<td>Reduced Equipment Availability</td>
<td></td>
</tr>
<tr>
<td>High aux power consumption</td>
<td></td>
</tr>
<tr>
<td>ESP Performance</td>
<td></td>
</tr>
</tbody>
</table>

Trigger

Financial Impact

Considering load achieved with high pressure drop is 225 MW.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of MWH / day</td>
<td>600</td>
</tr>
<tr>
<td>Total Generation loss per annum (Mus)</td>
<td>55.2</td>
</tr>
<tr>
<td>Increase in APC AT 0.6%(Mus) / day</td>
<td>0.85</td>
</tr>
<tr>
<td>Total Loss in Rupee in Cr / Annum ( At Unit cost of of 3.6 Rs/kwhr )</td>
<td>20.18</td>
</tr>
</tbody>
</table>
Pictorial view of Pressure drop:-

- Provided Bypass Damper for RAPH to overcome load limitations & hence the generation (Achieved 100% PLF at the cost of 1% boiler efficiency)

- RAPH with low DP basket was installed

- CFD analysis was carried out for Flue gas path from RAPH outlet to Stack

- Recommendations of CFD analysis were implemented
## Results

<table>
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<tr>
<th>Location</th>
<th>Pre</th>
<th>Post</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Pass A</td>
<td>Pass B</td>
</tr>
<tr>
<td>APH</td>
<td>-170</td>
<td>-185</td>
</tr>
<tr>
<td>APH Outlet 1 to APH Outlet 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APH Outlet 2 to APH Outlet 3</td>
<td>-32</td>
<td>-38</td>
</tr>
<tr>
<td>APH Outlet 3 to APH Outlet 4</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>APH Outlet 4 to ESP Inlet 1</td>
<td>-22</td>
<td>-2</td>
</tr>
<tr>
<td>APH Outlet 4 to ESP Inlet 2</td>
<td>-26</td>
<td>-6</td>
</tr>
<tr>
<td>ESP inlet 1 to Esp Outlet 1</td>
<td>-15</td>
<td>-15</td>
</tr>
<tr>
<td>ESP inlet 2 to Esp Outlet 2</td>
<td>-28</td>
<td>-6</td>
</tr>
<tr>
<td>ESP Outlet to ID fan inlet</td>
<td>-88</td>
<td>-89</td>
</tr>
<tr>
<td></td>
<td>-372</td>
<td>-337</td>
</tr>
<tr>
<td></td>
<td>-354</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-202</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-177</td>
</tr>
<tr>
<td>NET DP</td>
<td></td>
<td></td>
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</table>

### 6.6 KV Fan Currents

<table>
<thead>
<tr>
<th></th>
<th>PA Fan A</th>
<th>PA Fan B</th>
<th>FD Fan A</th>
<th>FD Fan B</th>
<th>ID Fan A</th>
<th>ID Fan B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Outage</td>
<td>53.50</td>
<td>53.80</td>
<td>40.92</td>
<td>39.34</td>
<td>111.22</td>
<td>107.42</td>
</tr>
<tr>
<td>Post Outage</td>
<td>48.31</td>
<td>48.48</td>
<td>33.93</td>
<td>34.18</td>
<td>88.55</td>
<td>87.21</td>
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<tr>
<td>Delta</td>
<td>5.19</td>
<td>5.32</td>
<td>6.99</td>
<td>5.16</td>
<td>22.67</td>
<td>20.21</td>
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<tr>
<td>%age Improvement</td>
<td>10%</td>
<td>10%</td>
<td>17%</td>
<td>13%</td>
<td>20%</td>
<td>19%</td>
</tr>
</tbody>
</table>
Highlights of the Project

- Innovative approach to resolve the issues especially the bypass duct concept which was in-house designed & fabricated. Same was installed without Unit outage.
- Involvement of all. Right from Top management to the Technicians.
- Overcoming the Operating limitations for the Air & flue gas path

<table>
<thead>
<tr>
<th>Investment for the project</th>
<th>: 38 Million Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Savings from the project</td>
<td>: 19 Million Rupees</td>
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</tbody>
</table>

Innovatively designed by pass damper
Installation process & images

Velocity Plot: Existing AH outlet Duct
Delta P at Section A'A' to B'B' : 2.342 mm WC

Velocity Plot: Modified AH outlet Duct
Delta P at Section A'A' to B'B' : 4.847 mm WC
Installation process & images

Static Pressure Plot: Existing_ESP Inlet Duct

Static Pressure Plot: Modified_ESP Inlet Duct

Velocity Plot: Existing_ESP Inlet Duct

Velocity Plot: Modified_ESP Inlet Duct
To improve the quality of Cooling water – Using Silt curtain

Problems & Triggers

• Purity of water after dredging is getting disturbed.

Financial Impact

• Cleaning of silt from low lying portion of cooling water pipe line- 3Lakhs
• Cleaning of Barnacles from cooling water pipe line- 8 Lakhs
• Cleaning of Condenser tubes- 9.35 Lakhs
• Total- 20.35 Lakhs
• Apart from this there is Generation loss due to unavailability of the condenser.
To improve the quality of Cooling water – Using Silt curtain

Impact on functioning of plant
Silt Deposition in Underground portion of Tunnel

- Condenser
- Underground portion of tunnel
- Anchor Block
- CW Jetty
- Accumulated silt
- GL
Invented system with in-house material and in-house design.

- Floater: floats on water
- Curtain: To confine the silt
- Heavy Ballast: To hold curtain in position
Difference of Silt Levels

- **Natural Sea water**
  - Water Quality outside the silt curtain

- **Turbid Sea**

- **Natural Sea water**
  - Avg Turbidity 322 mg/l

- **Water Quality when silt curtain is in use**
  - Avg TSS 1092 mg/l

- **Silt Curtain in Use**
As silt spreading is avoided by using silt Curtain, it has following advantages on marine eco system and Performance of plant.

**Tangible Benefits**

- Purity of sea water is maintained, as area outside of the frame is free from silt
- Better performance of condenser as suspended silt gets trapped in to curtain
- Reducing the favorable condition for barnacle formation.
- Continuous power generation.
- Less maintenance of cooling water pipe line as less barnacle formation inside the pipe.

**Intangible**

- Surrounding marine environment is not affected by change in the water quality.
Eco Affection & Carbon Emission Reduction projects
Reduction in Pollution from Coal Dust at Coal Stock Pile

Before Plantation

Plantation

After 15 days

Fully developed creepers

After 35 days
Care For Environment - Fuel handling

- Captive Jetty with Screw Unloader to unload coal without any spillage.

- Pipe Conveyors ensure transfer of coal without any spillage.
Turbo-Ventilator Fans & Transparent Roof Tops  
(ISO 18001-2007)
• Trombay Stores has been installed with Turbo-ventilator fans & transparent roof tops which has provided natural lighting & ventilation. This has resulted in savings of approximately 3Lacs/yr

Light Pipes in BTC Training Centre  
(ISO 14001-2004)
• This advanced eco-friendly system was installed on pilot basis in BTC training centre in Trombay.  
• This has resulted in saving of the lightings which was otherwise being used in very effective manner.

Transparent Roof Tops in 3 Cell collector  
(ISO 14001-2004)
• Replacing roof tops with alternate transparent Polycarbonate sheets at roof has resulted in availability of natural light to whole unit from top to bottom. This has helped in reducing auxiliary consumption of unit.  
• Also installation of windows on each floor resulted in natural ventilation.
Thermal Storage System AC Plant
(ISO 14001-2004)

- Under the concept of DSM (Demand Side Management) this project was implemented in Trombay Colony Ladies Gymnasium.
- In this application, a standard chiller runs at night to produce an ice pile. Water then circulates through the pile during the day to produce chilled water that would normally be the chillers’ daytime output.

Turbo-Ventilator Fans on Unit 8 TG
Trombay Unit 8 has been installed with Turbo-ventilator fans for natural ventilation.
Care for Environment: Waste Management
Paper & Steel Recycling

Use of Recycled Paper Pads within the plant

The waste papers are collected, shredded & recycled in the form of Paper Pads. These Paper pads are then used internally for training purposes.

Use of Scrap Steel within the plant
(ISO 18001-2007)

- Bottom Ash Trench line in Trombay needed to be covered which would have costed nearly 20 Lakhs if material had been procured.
- Hence team Trombay utilised scrap gratings from U7 outage material for the same as and where possible. This has resulted in saving of around 17.5 Lakhs.
Care For Environment: Waste Management (Development of greenbelt Using Bottom Ash)

Before Landscaping

After Landscaping
Innovatively designed aerators for reducing outfall cooling water temperature before entering the sea. With this the differential temperature of the cooling water is maintained well below the consent limit of 7 Deg C. (Drop of 0.5 to 0.7 degC achieved)
Energy Saving
Monitoring & Analysis
Monitoring: Energy Management System

Energy Management System - Unit 6

Date: 1-Jul-14

UNIT 6

<table>
<thead>
<tr>
<th>Auxiliary Consumption</th>
<th>Mus</th>
<th>% of APC</th>
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<tbody>
<tr>
<td>0.270 Mus</td>
<td>5.09%</td>
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<table>
<thead>
<tr>
<th>Generation</th>
<th>Mus</th>
<th>% of APC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.297 Mus</td>
<td>44.14%</td>
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Boiler Auxiliaries

<table>
<thead>
<tr>
<th>ID Fans</th>
<th>FD Fans</th>
<th>GR Fans</th>
<th>SGWCP</th>
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<tbody>
<tr>
<td>30.8</td>
<td>0.029</td>
<td>10.65%</td>
<td>2.75%</td>
</tr>
<tr>
<td>90.7</td>
<td>0.042</td>
<td>15.67%</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>0.000</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>31.8</td>
<td>0.007</td>
<td></td>
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Feed Cycle

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<tr>
<th>CEP</th>
<th>MBFP</th>
<th>ACWP</th>
<th>HDP</th>
<th>CWP</th>
<th>SWBP</th>
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<tbody>
<tr>
<td>60.7</td>
<td>0.0</td>
<td>10.8</td>
<td>13.0</td>
<td>99.0</td>
<td>71.7</td>
</tr>
<tr>
<td>0.042</td>
<td>0.000</td>
<td>0.010</td>
<td>0.003</td>
<td>0.092</td>
<td>0.067</td>
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<tr>
<td>15.74%</td>
<td>0.00%</td>
<td>3.73%</td>
<td>1.12%</td>
<td>34.24%</td>
<td>24.80%</td>
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</table>

Transformer Loss

<table>
<thead>
<tr>
<th>Transformer Loss</th>
<th>Amp</th>
<th>Mus</th>
<th>% of APC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>19.86%</td>
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Shared with various divisions, sectors & power summits e.g. CESC, Shree Cement, Boiler workshop in Tata Power
Analysis: Specific Energy Consumption

Unit #6 FD Fan Power Consumption

<table>
<thead>
<tr>
<th>Date</th>
<th>Power Cons (MU)</th>
<th>PLF (%)</th>
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<tbody>
<tr>
<td>30%</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>18-May</td>
<td>0.010</td>
<td>31%</td>
</tr>
<tr>
<td>19-May</td>
<td>0.011</td>
<td>36%</td>
</tr>
<tr>
<td>20-May</td>
<td>0.011</td>
<td>37%</td>
</tr>
<tr>
<td>21-May</td>
<td>0.012</td>
<td>38%</td>
</tr>
<tr>
<td>22-May</td>
<td>0.010</td>
<td>35%</td>
</tr>
<tr>
<td>23-May</td>
<td>0.010</td>
<td>32%</td>
</tr>
<tr>
<td>24-May</td>
<td>0.010</td>
<td>31%</td>
</tr>
</tbody>
</table>

FD Fan 6A Ideal: 0.009
FD Fan 6B Ideal: 0.010
FD Fan 6A Actual: 0.010
FD Fan 6B Actual: 0.010
PLF: 31% to 38%
## Monitoring: Unit 5 PI Dash Board

<table>
<thead>
<tr>
<th>05-Aug-13 10:13:13</th>
<th>Expansion</th>
<th>-5.0</th>
<th>-5.0</th>
<th>-10.0</th>
<th>0.0</th>
<th>0.0</th>
<th>160.6</th>
<th>Design Coal CV</th>
<th>5125 Kcal / Kg</th>
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<tbody>
<tr>
<td>Load MW</td>
<td>502.1</td>
<td>176.57</td>
<td>426.96</td>
<td>40.61</td>
<td>ON</td>
<td>43.47</td>
<td>58.35</td>
<td>225.43</td>
<td>18.5</td>
</tr>
<tr>
<td>Plant Load Factor</td>
<td>100.20%</td>
<td>32.35</td>
<td>387.61</td>
<td>30.98</td>
<td>ON</td>
<td>42.98</td>
<td>58.31</td>
<td>190.29</td>
<td>18.2</td>
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<tr>
<td>Air Flow</td>
<td>1789.13</td>
<td>-0.07</td>
<td>6.58</td>
<td>0.00</td>
<td>OFF</td>
<td>0.27</td>
<td>59.60</td>
<td>123.27</td>
<td>2.3</td>
</tr>
<tr>
<td>Sp Steam cons</td>
<td>3.56</td>
<td>15.20</td>
<td>60.62%</td>
<td>32.39</td>
<td>ON</td>
<td>40.34</td>
<td>59.72</td>
<td>195.24</td>
<td>19.0</td>
</tr>
<tr>
<td>Ratio of Air / load</td>
<td>174.60</td>
<td>0.93</td>
<td>57.31%</td>
<td>0.00</td>
<td>OFF</td>
<td>0.37</td>
<td>34.13</td>
<td>92.11</td>
<td>1.8</td>
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<tr>
<td>Sp Fuel Cons</td>
<td>0.352</td>
<td>0.00</td>
<td>-313.47</td>
<td>517.32</td>
<td>198.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Design Mkcal</td>
<td>1237</td>
<td>2.474</td>
<td>RAPH 5A</td>
<td>182.08</td>
<td>87.05</td>
<td>168.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual Mkcal</td>
<td>1263</td>
<td>2.516</td>
<td>RAPH 5B</td>
<td>185.85</td>
<td>120.44</td>
<td>170.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected Coal TPH</td>
<td>249</td>
<td>117.80%</td>
<td>RAPH 5C</td>
<td>185.85</td>
<td>120.44</td>
<td>170.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Equivalent to Coal TPH</td>
<td>-1</td>
<td>CDEFGH</td>
<td>Economiser FG temp</td>
<td>169.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Equivalent to Coal TPH</td>
<td>88</td>
<td>IN</td>
<td>OUT</td>
<td>DT</td>
<td>428.39</td>
<td>341.03</td>
<td>87.36</td>
<td></td>
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</tr>
<tr>
<td>Excess Air</td>
<td>4.4</td>
<td>3.6</td>
<td>428.39</td>
<td>341.03</td>
<td>87.36</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>FD Fan Current</td>
<td>87.13</td>
<td>48.69</td>
<td>181.37</td>
<td>428.39</td>
<td>341.03</td>
<td>87.36</td>
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<td>FD Fan Flow tph</td>
<td>786.75</td>
<td>754.87</td>
<td>H P Heater 6</td>
<td>210.6</td>
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<td>PA Fan Current</td>
<td>119.66</td>
<td>119.56</td>
<td>H P Heater 5</td>
<td>175.3</td>
<td>210.6</td>
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<td>PA Fan Flow M3/S</td>
<td>87.01</td>
<td>84.25</td>
<td>Dearator</td>
<td>134.1</td>
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<td>PA Fan Disc press</td>
<td>975.13</td>
<td>925.27</td>
<td>L P Heater 3</td>
<td>108.8</td>
<td>134.1</td>
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<tr>
<td>ID Fan Current</td>
<td>54.09</td>
<td>158.36</td>
<td>L P Heater 2</td>
<td>70.2</td>
<td>108.8</td>
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<tr>
<td>Plant Set Points</td>
<td>147.31</td>
<td>139.68</td>
<td>L P Heater 1</td>
<td>50.4</td>
<td>70.3</td>
<td>-0.9</td>
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</tbody>
</table>

### Designed In-house

- **Load MW**: 502.1
- **Plant Load Factor**: 100.20%
- **Air Flow**: 1789.13
- **Sp Steam cons**: 3.56
- **Ratio of Air / load**: 174.60
- **Sp Fuel Cons**: 0.352
- **Design Mkcal**: 1237
- **Actual Mkcal**: 1263
- **Expected Coal TPH**: 249
- **Oil Equivalent to Coal TPH**: -1
- **Gas Equivalent to Coal TPH**: 88
- **Excess Air**: 4.4
- **FD Fan Current**: 87.13
- **FD Fan Flow tph**: 786.75
- **PA Fan Current**: 119.66
- **PA Fan Flow M3/S**: 87.01
- **PA Fan Disc press**: 975.13
- **ID Fan Current**: 54.09

### Design Coal CV: 5125 Kcal / Kg

- **PA In temp**: 225.43
- **PA Flow**: 18.5
- **Oil CV**: 10500 Kcal / Kg
- **FG CV**: 13000 Kcal / Kg
- **Unit 5 Heat Rate**: 2465.39 Kcal / Kwhr

### Design Coal CV: 5125 Kcal / Kg

- **FG flow TPH**: 40.83
- **HRH Steam Flow**: 57.06
- **CM status**: ON
- **Current Amps**: 43.47
- **Coal Air Temp**: 43.47
- **PA In temp**: 225.43
- **PA Flow**: 18.5
- **Oil CV**: 10500 Kcal / Kg
- **FG CV**: 13000 Kcal / Kg
- **Unit 5 Heat Rate**: 2465.39 Kcal / Kwhr
## Heat Rate Analysis on Daily basis using PI dashboards

### Designed In-house

<table>
<thead>
<tr>
<th>Date</th>
<th>30-Jul-13</th>
<th>31-Jul-13</th>
<th>01-Aug-13</th>
<th>02-Aug-13</th>
<th>03-Aug-13</th>
<th>04-Aug-13</th>
<th>05-Aug-13</th>
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<tbody>
<tr>
<td>Load</td>
<td>416.1</td>
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<td>Loss due to FGET deviation</td>
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<td>Loss due to vacuum deviation</td>
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<td>Loss due to Throttle pressure deviation</td>
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<td>3.57</td>
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<td>5.54</td>
<td>4.96</td>
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<td>Loss due to SH temp deviation</td>
<td>2.3</td>
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<td>1.5</td>
<td>0.7</td>
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<tr>
<td>Loss due to RH temp deviation</td>
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<td>0.0</td>
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<td>Loss due to SH spray deviation</td>
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<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.8</td>
<td>0.1</td>
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<tr>
<td>Loss due to RH spray deviation</td>
<td>20.6</td>
<td>17.8</td>
<td>15.1</td>
<td>13.4</td>
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<td>MAKEUP LOSS (above 2 %)</td>
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<td>Loss due to RH Steam Pr. Drop</td>
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<td>Loss due to Increase in Excess Air</td>
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<td>Loss of Heat due to Excess steam in BFP</td>
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</tbody>
</table>
“Journey Continues..
We value your inputs, suggestions and critique.”

We take pride in Lighting up Lives!

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Email ID: aabhat@tatapower.com