NTPC Limited
ANTA GAS POWER STATION
Anta (Rajasthan)

Unit Profile

NTPC Anta is a Gas-Based Combined Cycle Power Plant situated near Anta village in Baran District of Rajasthan State. The power plant has capacity of 419.33 MW and works on combine cycle principle. The project was installed to meet the power demand of northern region states - Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Chandigarh, Punjab, Rajasthan, Utter Pradesh and Uttaranchal. Station has completed 25 years of its commercial operation on 01/04/2014.

CONFIGURATION

There are three gas turbines at NTPC Anta with 88.71 MW capacities each. These turbines work on Brayton Cycle principle. There is one steam turbine which works on Rankine cycle and has a capacity of 153.2 MW. In Combined Cycle module, three gas turbines, three heats Recovery Steam Generators (HRSG) and one Steam Turbine put together. Thus station has a total installed capacity of 419.33 MW.

Fuel

The gas turbine is designed for firing multi-fuel such as Naphtha, HSD and Natural gas. The primary fuel for the project is lean natural gas supplied from Western offshore gas fields (Bombay high, South Basin, etc.). The gas is transported from the gas fields to project site by GAIL through HBJ pipeline. These units are also capable of
firing Naphtha. The annual natural gas requirement is about 490 Million SCM for 60% PLF.

**PLANT PERFORMANCE AND ENERGY CONSUMPTION**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FINANCIAL YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012-13</td>
</tr>
<tr>
<td>GENERATION (MUs)</td>
<td>2176.42</td>
</tr>
<tr>
<td>PLANT LOAD FACTOR (%)</td>
<td>59.25</td>
</tr>
<tr>
<td>MACHINE AVAILABILITY FACTOR (%)</td>
<td>96.768</td>
</tr>
<tr>
<td>GROSS HEAT RATE (KCAL/KWH)</td>
<td>2079.97</td>
</tr>
<tr>
<td>EFFICIENCY (%)</td>
<td>41.347</td>
</tr>
<tr>
<td>APC (%)</td>
<td>2.36</td>
</tr>
</tbody>
</table>

**MAJOR ENERGY CONSERVATION INITIATIVES**

1. **Plant Auxiliaries optimization during shutdown**

Reduction in running hours of CW pump, CT pumps and ARCW pump when STG goes under shutdown. By modification, in ARCW discharge line, fire hydrant line connected to discharge of ARCW to supply cooling water during STG shutdown. During Steam Turbine shutdown ACRW pump (30 KW) is required to run for min 72 hrs for cooling of STG rotor shaft and its auxiliaries like CEP, HP / LP BFPs etc. As suction of this ARCW pump is from main CW line, hence one CW and one CT pump is required to be in service during running of ARCW pump. A modification has been carried out through which water has been taken from hydrant header line and connected to discharge of ARCW pumps. It has resulted in stopping of one CW, one CT two ARCW pumps, 2 No of lube water pumps for CW and CT Pump each, CW Screen wash pump. One Jockey pump of 15 KW runs continuously. Total saving achieved during the year was 257458 Kwh.

2. **Plant Solar lightings**

Solar Power will be the best and the most reliable source of energy in the future. In 2013-14, NTPC Anta has installed 220nos 11W LED based Solar Street Lighting in Reservoir area. The total investment is Rs. 43.14 Lakhs. Though in terms of quantity of energy it may be small but it’s a step towards renewable energy and the benefits are sustainable in nature at Rs 0.245 Lakhs per year.

3. **Plant Auxiliaries optimization**

Modification in water supply arrangement to CCR : Due to Chocking of clarified water pump (15 Kw) discharge line to CCR Over head tank, Pumps were continuously running to meet the water requirement at CCR. As a part of modification, discharge
line of clarified water pump was connected with the DM plant over head tank. By this modification 24 hr running of clarified water pump saved while Running of DM plant O/H tank filling pump (15 KW) increased by 4 hrs/day.

4. Stopping of CT fans after canal charging/closure:

During the closed cycle Cooling Water operation 10-11 CT fans run continuously. When RMC (Right Main Canal) is charged, all CT fans are stopped. Also at the time of closure of RMC, canal gates provided about 1.5 km away from the gates of plant intake channel are closed to create the pondage for using the available water in the canal, plant circulate this pondage water till it start losing on account of condenser vacuum. As the water temperature rises, CT fans are put in service one by one to maintain the condenser vacuum. Out of total 10 no. of CT Fans, only 5-7 No. of CT Fans run during partial open cycle operation.

5. Offline water washing of gas turbine compressor

In Gas Turbine (GT) plant GT compressor consumes approximately two-third of the power generated by the GT. The efficiency of compressor degrades due to fouling of blades over the time, which reduces the power output at Generator end. In order to clear off the fouling on blades, off-line water wash is carried out when machine is off. Gas Turbine is cranked to 750 rpm and hot water at 60 deg. C is sprayed through off-line water wash nozzle along with detergent solution. Subsequently, the compressor is rinsed to remove the dirt, fouling etc. until we get specified turbidity at exhausting water. The machine down time requirement is not less than two days. Based on cost benefit analysis, the gain due to off-line wash has been optimized with on-line wash.

6. Optimized operation of SWYD AC compressors

The temp of Electrical/C&I Panel room is maintained around 22° C for proper functioning of the control panels. This temp. is maintained by running Air Conditioning System. There are 2 Nos of Centralized AC Systems installed. One for cooling CCR Building and One for cooling control panel room at Switchyard Control Room. During the winter season when ambient temp goes down, requirement of running AC System also decrease. Compressors are stopped during night hours and only AHU (Air Handling Unit) is kept running for air circulation. Stopping of AC compressor & its pumps in each system (2 Nos of Condensate Pump, 2 nos of Chilled Water Pumps and One Cooling Tower Fan), Stopping of GT lube oil cooler fan, generator CW fan and two roof extractor fan of GT and STG hall.
LANCO ANPARA POWER LIMITED
Anpara (Uttar Pradesh)

Unit Profile

Lanco Anpara Power Limited (LANPL) is an ISO 9001, 14001 & OHSAS 18001 certified company having a total capacity of 1200 MW (2 × 600 MW). Unit#1 started its commercial operation on 10.12.2011 and Unit#2 commercial operations started on 18.01.2012.

Sub critical units of 600MW comprising of Boiler Manufactured by M/s. Don fang Boiler Group Co. Ltd., and Turbine designed and manufactured by Dongfang Steam Turbine Works. The Boiler is a Single drum which adopts subcritical natural circulation, opposed burning of front and rear wall, single reheating, single-furnace balanced draft, all-steel framework and all-suspension structure, wherein, reheating temperature is regulated by dampers and the rotating type air preheaters are set in the main post of the boiler. Steam turbine used in this project is a subcritical, single reheat, condensing, tandem, three-cylinder steam turbine.
TECHNICAL SPECIFICATION OF STEAM TURBINE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>FY 2013-14</th>
<th>FY 2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Capacity</td>
<td></td>
<td>600MW</td>
<td></td>
</tr>
<tr>
<td>Main Steam Pressure</td>
<td>Mpa</td>
<td>16.67</td>
<td></td>
</tr>
<tr>
<td>Main Steam Temperature</td>
<td>°C</td>
<td>537</td>
<td></td>
</tr>
<tr>
<td>Reheat Steam Temperature</td>
<td>°C</td>
<td>537</td>
<td></td>
</tr>
<tr>
<td>Main Steam Flow (TMCR)</td>
<td>t/h</td>
<td>1866</td>
<td></td>
</tr>
<tr>
<td>Rated Speed</td>
<td>rpm</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>LP Exhaust pressure (TMCR)</td>
<td>Mpa (a)</td>
<td>0.01013</td>
<td></td>
</tr>
</tbody>
</table>

PLANT PERFORMANCE AND ENERGY CONSUMPTION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>FY 2013-14</th>
<th>FY 2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERATION</td>
<td>(MU)</td>
<td>6918.20</td>
<td>3979.17</td>
</tr>
<tr>
<td>PLF</td>
<td>(%)</td>
<td>65.81</td>
<td>37.85</td>
</tr>
<tr>
<td>AVAILABILITY</td>
<td>(%)</td>
<td>83.90</td>
<td>55.14</td>
</tr>
<tr>
<td>Sp. OIL CONSUMPTION</td>
<td>(ml/kWh)</td>
<td>0.48</td>
<td>1.79</td>
</tr>
<tr>
<td>Sp. COAL CONSUMPTION</td>
<td>(kg/kWh)</td>
<td>0.67</td>
<td>0.67</td>
</tr>
<tr>
<td>GROSS HEAT RATE</td>
<td>(kCal/kWh)</td>
<td>2360.2</td>
<td>2560.4</td>
</tr>
<tr>
<td>AUX. POWER</td>
<td>(%)</td>
<td>7.53</td>
<td>8.99</td>
</tr>
<tr>
<td>Sp. DM WATER CONSUMPTION</td>
<td>(%)</td>
<td>0.61</td>
<td>1.44</td>
</tr>
</tbody>
</table>
LANPL (2 x 600 MW) is consistently focused on continual improvement in Heat rate, Auxiliary Power consumption, specific oil consumption, and specific DM Water consumption. Initiatives and Performance Optimization Plans have resulted in reduction of Heat rate, specific oil consumption and Auxiliary Power consumption continuously. LANPL management has taken up more stringent targets for FY 2014-15 in Heat rate and APC for which actions are formulated and taken up.

**ENERGY CONSERVATION ACTIVITIES DONE IN FY: 2013-14**

1. **Stopping of Cooling Tower Fans during favourable ambient**: There are certain periods when plant gets favourable ambient condition in terms of atmospheric wet bulb temperature. To take the advantage of the same plant started to stop eight CT fans in each unit (i.e. 16 CT Fans) for four months in a year. 8 fans in each unit, i.e. 16 fans of 90 KW stopped for 120 days. Before all the 44 CT fans were made to run throughout the year, but now for the four months only 28 CT fans are running.
   - Saving of 4147.2 MWH achieved in the year
   - Investment: Nil
   - Energy savings: 4147.2 MWh
   - Financial savings: Rs.124.41 lacs

2. **Induced Draft Fans’ eroded blade set change in Unit#2**: It has been identified that energy consumption of ID Fans increased in Unit#2. On inspection it was found that its blades were eroded. To increase the fan efficiency, Induced Draft Fans’ blade set replaced with new blade sets in Unit#2. The saving is considered from Oct 13 to March 14 i.e. 6 months for one unit
only. Before it was 200 MWh per day, and after 193 MWh per day. Saving of 1260 MWH achieved in the year.

- Investment: 290 lacs
- Energy savings: 1260 MWh
- Financial savings: Rs.37.80 lacs

3. **Stopping one Cooling Water Pump During favorable ambient:** There are five cooling water pumps out of which four pumps are designed to run for two units and one pump is standby. In days when ambient is favorable in terms of atmospheric wet bulb temperature, only three pumps are made to run without compromising with condenser vacuum. Saving considered for Nov13 to Feb. 14 i.e. 4 months. One CW Pump of 3200 KW is stopped for 120 days. Saving thus achieved in one year is 9216 MWh.

- Investment: Nil
- Energy savings: 9216 MWh
- Financial savings: Rs.276.48 lacs

4. **Stopping of Bottom Ash Low Pressure (BALP) pumps in AHP:** There are three Bottom Ash Low Pressure (BALP) Pumps out of which two are working and one is standby. During bottom ash handling, these pumps were used to fill the bottom ash hoppers. After one modification, economizer hopper slurry line diverted to both bottom ash hoppers thus eliminating the use of BALP pumps. Saving is considered from Oct.13 to Mar.14 i.e. six months. Saving of 2 pumps of 35 KW each for 24 Hours, consumption 32 KW for each pump. Saving thus achieved in one year is 276.48 MWh

- Investment: 0.5 lacs
5. **Loading/unloading Set-Point change and attending leakages in Instrument air compressors:** There are three instrument air compressors out of which two are in service and the third acts as standby. Leakage points and unnecessary tapping points identified and sealed in instrument compressed air line, and then pressure unload set point of compressors reduced from 7.2 bar to 6.8 bars. Saving considered from Dec’ 13 to Mar’ 14, i.e. 4 months. Before consumption was 575 KW for 2 instrument compressors, after 450 KW for 2 instrument compressors. Saving thus achieved in one year is 360 MWh

- **Investment:** Nil
- **Energy savings:** 360 MWh
- **Financial savings:** Rs. 10.8 lacs

6. **Fire Fighting system made in auto after modifying the water usage in Coal handling Plant:** In Coal handling Plant pre-wetting of coal and dust suppression of track hopper was fulfilled by fire water line as per original design. Efforts were made to change the pre-wetting and dust suppression line from fire water to reject cooling water of crushers. Then Fire Fighting system then kept on auto and now only jockey pump runs to maintain the pressure of fire fighting pipe line in place of higher rated main fire hydrant pump, unless there is some usage of fire water. Saving considered from June 13 to Mar 14, i.e. 10 months. Before the consumption was 5.76 MWh per day for Fire Fighting & after it is 4.08 MWh per day. Saving thus achieved is 504 MWh in one year.

- **Investment:** Nil
- **Energy savings:** 504 MWh
- **Financial savings:** Rs.15.12 lacs
7. **Cooling Tower Fans’ blade replacement with energy efficient FRP blades:** Three CT Fans’ existing blade replaced with energy efficient FRP blades in FY-2013-14. It is planned to complete the replacement of all the CT Fan blades with FRP blades in FY-14-15. Saving considered for 3 Fans and from Jan14 to Mar 14, i.e. 3 months. On the basis of, if 3 fans are considered for 90 days with a saving of 20 KW per fan, saving achieved is 129.6 MWh in the year.
   - Investment: Rs.16.5 lacs
   - Energy savings: 129.6 MWh
   - Financial savings: Rs.3.88 lacs

8. **Coating inside CCCW pumps’ casing:** Coating of casing internal was done to increase the pump efficiency of 2 working CCCW Pumps (one in each unit). Saving considered from 30 days, as the work completed in Feb 2014. 12 KW saving achieved after coating, before it was taking 628 KW, after coating reduced to 616 KW. Saving thus achieved is 17.28 MWh
   - Investment: Rs.5.2 lacs
   - Energy savings: 17.28 MWh
   - Financial savings: Rs.0.518 lacs
9. **Reduction of Ash-Water ratio in slurry from 1:7 to 1:6:** Reduction of ash-water ratio in slurry from 1:7 to 1:6 by minimizing make up water and thus reducing slurry pump running hours. Saving considered for 8 months from August 13 to Mar 14. Before 40 MWh energy consumption was there for AHP, after it was reduced to 33.93 MWh. Saving thus achieved is 1460.36 MWh in the year.
   - Investment: Nil
   - Energy savings: 1460.36 MWh
   - Financial savings: Rs.43.81 lacs

10. **Single Vacuum Pump Running by identifying condenser air ingress:** Repeated flood tests carried out for condensers of both the units and all the leakage points were arrested, thus desired vacuum could be maintained with one vacuum pump only. Hence one vacuum pump out of two stopped in each unit. Saving considered from 10 months, (June13 to Mar 2014). Basis: 120 KW saving achieved by stopping one vacuum pump. Saving that could be achieved by this is 1728 MWh in the year.
   - Investment: Nil
   - Energy savings: 1728 MWh
   - Financial savings: Rs.51.84 lacs

11. **APH seal and sector plate repair to reduce APH leakage of Unit#1:** During energy audit it was found that APH leakage increased considerably. Thus APH seal and sector plate repair work was taken in annual overhauling of Unit#1. Saving considered for 45 days only. Draft system power consumption was 367 MWh/day before AOH, and 308 MWh after AOH. Saving thus achieved is 2655 MWh in the year.
   - Investment: Rs.50 lacs
   - Energy savings: 2655 MWh
   - Financial savings: Rs.79.65 lacs

12. **Burner Diffuser rectification in Unit#1 for reduction of Super- heater/reheater spray:** Burner Replacement project was taken in annual overhauling of Unit#1 in which new modified strengthened diffuser was installed. This led to reduction of superheater and reheater attemperation spray. Before loss of 15 Kcal/KWh due to high spray (220T/H superheater spray & 35T/H Reheater
spray), but after modification loss is only 6 Kcal/KWh (140T/H superheater spray & 9 T/H Reheater spray). Saving Considered for 45 days. Thus 1666 MT of coal could be saved in the year.

- Investment: Rs.300 lacs
- Fuel savings: 1666 MT
- Financial savings: Rs.41.65 lacs

**13. Reduction in DM Water Make up by attending various leakages in Steam/Water system:** So many leakages were there in boiler and turbine side in Steam/Water system, most of them are identified and attended. Moreover operation of CBD also optimized and Boiler water quality ensured, resulting in DM water make up rate reduction to 0.61% in FY 2013-14 comparing to a much higher value of 1.44% in FY 2012-13. For every 1 % of DM Make up, 15 Kcal/KWh loss is there. Thus saving of 4700 MT of coal could be achieved.

- Investment: Nil
- Fuel savings: 4700 MT
- Financial savings: Rs.117.5 lacs

**14. Modification in startup Procedure to reduce Oil consumption:** OEM suggested that during startup, coal mills to be taken only after synchronization. But after thorough study the startup procedure modified and it was started to take the coal mills before synchronization. In cold startups, saving of 50 KL of Oil saving can be considered. There are10 cold startup incidents, hence 500 KL of oil saving can be taken in the year.

- Investment: Nil
- Fuel savings: 500 KL
- Financial savings: Rs.285 lacs
**Second Prize**

**Thermal Power Stations**

(****Coal fired plants > 100 MW capacity****)

**ANPARA THERMAL POWER PLANT**

Anpara (Uttar Pradesh)

**Unit Profile**

Anpara thermal power plant is one of the prestigious thermal power plant of Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited Lucknow UP, which is located near village Anpara on the bank of the Rihand reservoir. It is called as the pit head power plant. The coal to all these units is fed from Kharia, Kakri and Beena open coal mines of NCL, by means of a marry-go-round system, maintained by UPRVUNL and the required water is taken from the Rihand Reservoir(Govind Vallabh Pant) having two stages which are as follows:

All the units of Anpara TPS are coal-fired thermal power plants, having a total generating capacity of 1630 mw and consist of following units:-

**CONFIGURATION:**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Unit No</th>
<th>Original Capacity</th>
<th>De-rated Capacity</th>
<th>Date of First Commissioning</th>
<th>Original Equipment Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>210 MW</td>
<td>210 MW</td>
<td>24.03.1986</td>
<td>M/S BHARAT HEAVY ELECTRICALS LTD.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>210 MW</td>
<td>210 MW</td>
<td>28.02.1987</td>
<td>-DO-</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>210 MW</td>
<td>210 MW</td>
<td>12.03.1988</td>
<td>-DO-</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>500 MW</td>
<td>500 MW</td>
<td>19.07.1993</td>
<td>M/S MITSUBISHI CORPN. JAPAN</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>500 MW</td>
<td>500 MW</td>
<td>04.07.1994</td>
<td>-DO-</td>
</tr>
</tbody>
</table>
FUEL

Total consumption of coal per day is approximately 25000 MT/day, if all above units running at full capacity, which carry out through MGR system from open coal mines to track hopper of Anpara ‘A’ thermal power plants (10000MT/day) and track hopper of Anpara ‘B’ thermal power plants (15000MT/day). Liquid fuel LDO is used during initial light-up or during un stable flame conditions in the boiler. The normative value of liquid fuel consumption allowed by UPERC is 02 ml/kWhr.

PLANT PERFORMANCE AND ENERGY COSUMPTION

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FINANCIAL YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012-13</td>
</tr>
<tr>
<td>GENERATION (MUs)</td>
<td>10213.492</td>
</tr>
<tr>
<td>PLANT LOAD FACTOR (%)</td>
<td>71.53</td>
</tr>
<tr>
<td>MACHINE AVAILIABILITY FACTOR (%)</td>
<td>87.18</td>
</tr>
<tr>
<td>Hrs.</td>
<td></td>
</tr>
<tr>
<td>GROSS HEAT RATE (KCAL/KWH)</td>
<td>2278</td>
</tr>
<tr>
<td>EFFICIENCY (%)</td>
<td>37.75</td>
</tr>
<tr>
<td>APC(%)</td>
<td>9.01</td>
</tr>
</tbody>
</table>

MAJOR ENERGY CONSERVATION INITIATIVES

1. REPLACEMENT OF RADIAL & AXIAL SEAL OF AIR PRE HEATER OF UNIT NO 1, 2, 3, 4&5 OF ANPARA TPS

Due to poor performance of radial and axial seals of APH of all most all the units there was heavy air mixing in Flue gas. The percentage of measured oxygen profile after air pre heater was significantly high. The exit flue gas temperature at the stack was lower, making a false indication that heat recovery from flue gas to primary air is all right but actually it was due to mixing of air with flue gas. The temperature of primary air at mill inlet was 2490°C before replacement of seals. It was improved and became 3190°C after the replacement of seals. The air buckets damaged due to corrosion at cold end also replaced resulting better heat recovery by APH. For same grinding mill power was reduced up to 7-8%. The thermal as well as electrical energy was saved by improving the performance of APH and arresting the leakage through seals.
2. REPLACEMENT OF LINERS OF TUBE MILLS & HELIXES OF SCREW CONVEYORS

The coal fineness was very poor approximately 55-62%, wear rate grinding media (balls) was very high 150mg/ton and due to lean mixer of primary air there was frequent explosion in Mill pipes. The liner of tube ball mills of unit no 4&5 were replaced. Helixes of screw conveyor were replaced reducing over burden on mills and reduction in power consumption of mills for same grinding action. Though apparently mill current was not reduced but mill current (power) better grinding of coal was achieved (a reduction in mill power consumption was achieved by replacements of liner).

3. ATTENDING TUBE LEAKAGE OF HPH 5B/6B SERIES IN UNIT NO#5

By attending tube leakage in HPH 5B, this series has been taken in to service. Before attending FW temperature was eco in let 2310C and flue gas temperature at APH in let 3420C. Coal consumption of performance coal was 400-425T/H. After attending leakage APH in let temperature improved to 3980C and coal consumption reduced to 340T/h. Corresponding PA/FD/ID current reduced.
4. **REPLACEMENT OF COAL BURNER IN 2 X 500 MW ANPARA**

Due to deformation of coal burner tips, there was improper mixing of air in coal. So there was high unburnt carbon in bottom ash found and specific coal consumption was high. After replacement of coal burner specific coal consumption and unburnt in bottoms ash was reduced. By this action fuel consumption was reduced. The power consumed by boiler side auxiliaries i.e. the Mill/PA/FD/ID fans was also reduced.

5. **ARRESTING STEAM LEAKAGE OF BOILER & TURBINE SIDE VALES/DRAINS/FLANGES & INTRUMENTS IMPULES LINES**

Make up water consumption was on higher side due to steam & water leakage from boiler & turbine side valves/drains/flanges & instruments impulse lines. The same was attended and make up water consumption was reduced.

6. **REPAIRING OF FLUE GAS DUCT TO ID FANS**

Due to excessive damage of Flue gas duct, there was heavy loading on ID Fans. Loading on ID Fans was up to 390A in 2X500MW machine which was 100A above the design value. After repairing flue gas duct ID Fan current drop to 310A. In 3X210MW unit margin in ID Fan was not available, so furnace draft frequently fluctuated towards positive side. Same was improved after repairing of Flue gas ducts.

7. **TUNING OF AUTO LOOPS OF RH HEATER SPRAY TO IMPROVE HRH TEMP**

Due to improper functioning of shut off spray water valve in 2 X 500 MW units, there was unwanted flow of 18-20 T/H RH spray water in boiler. HRH temperature was maintaining at 5220C which was below the designed value. After auto loop tuning HRH Temperature improve to 538 0C, RH spray water flow became zero and steam flow reduced by 14-15 T/h. Electrical energy as well as thermal energy was saved by this corrections.
8. MODIFICATION IN THE DESIGN OF CEPs OF 2X210 MW UNITS

The condensate Extraction Pumps (CEPs) installed in Anpara ‘A’ TPS units were running below their designed capacities since the commissioning of units due to which both the CEPs had to be taken into service to achieve the full load capacity on the units. As per the design, only one CEP is sufficient to have full load generation. The matter was taken up with the OEM firm and as per their suggestion one no. CEP was sent to their works for necessary modification in its design against work orders during the overhauling of unit 1 & 3 in May 2012 & Oct./Dec., 2013 respectively. After the necessary modifications, the installation and commissioning of the pumps were done at site by the firm and it has been found that the modified CEPs are capable of meeting out the full load requirements of the unit generation by itself without the need to run the other CEP for this purpose. This has resulted into appreciable energy saving and the efforts are being made to get the similar modifications done in other CEPs also.

**Total Saving of Electrical & Thermal Energy**

<table>
<thead>
<tr>
<th>On annual basis</th>
<th>Electricity m(kWh)</th>
<th>Coal (Tones)</th>
<th>Gas (Nm3)</th>
<th>Oil(KL)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption before</td>
<td>920.483</td>
<td>7605343</td>
<td></td>
<td>13480.77</td>
<td></td>
</tr>
<tr>
<td>Energy Consumption after</td>
<td>861.363</td>
<td>7598806</td>
<td></td>
<td>10838.37</td>
<td></td>
</tr>
<tr>
<td>Net Saving in Energy Units</td>
<td>59.12</td>
<td>6537</td>
<td></td>
<td>2642.4</td>
<td></td>
</tr>
<tr>
<td>Energy tariff Rs./kwh/Tones /KL</td>
<td>Rs. 3.34/kwh</td>
<td>Rs.1698/ ton</td>
<td>Rs.69800/ KL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Cost Saving in lacs</td>
<td>Rs.1844.4 lakhs</td>
<td>Rs.111 lakhs</td>
<td>Rs.1974.6 lakhs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Energy cost saving in lacs</td>
<td></td>
<td></td>
<td></td>
<td>Rs. 3930 lacs</td>
<td></td>
</tr>
<tr>
<td>Other saving in terms of recovery of fix charges due to Reliable sustained generation</td>
<td></td>
<td></td>
<td></td>
<td>Rs. 5400 lacs</td>
<td></td>
</tr>
</tbody>
</table>
Total Thermal Energy Savings (435394.84 mKcl)

1. REPLACEMENT OF AIR PRE HEATER SEALS
2. REPLACEMENT OF LINERS OF TUBE MILLS
3. ATTENDING TUBE LEAKAGE OF HPH 5B/6B
4. REPLACEMENT OF COAL BURNER IN 2X500MW UNITS
5. ARRESTING STEAM LEAKAGES
6. REPAIRING OF FLUE GAS DUCTS
7. TUNING OF AUTO LOOPS

Total Electrical Energy Saving (59.12 mKWh)

- Reduction in ID Fan Power due to activity No. 1 & 6
- Reduction in PA Fan Power due to activity No.1 & 6
- Reduction in Mill Power due to activity No. 2
- Reduction in M-BFP Power due to activity No. 3 & 5
- Reduction in CEP Power due to activity No. 8
- Other miscellaneous efforts
**Unit Profile**

Meghalaya Power Ltd is a CPP for Star Cement with installed capacity of 43 MW. Meghalaya Power Ltd is situated at Lumshnong, Dist.- East Jaintia Hills of Meghalaya state.

The power project was installed to meet the power requirements of its sister concern "Star Cement", This is largest capacity CPP in the state of Meghalaya. The project started its operation on 28 February, 2013.

**CONFIGURATION**

The Power plant has 2x90TPH CFBC Boiler – Thyssen Krupp India Ltd. make and a 43 MW BHEL turbine. To reduce water consumption Air Cooled Condenser have been installed.

Fuel for Boiler: - CFBC Boiler is an environment friendly boiler and utilizes low GCV coal.

**PLANT PERFORMANCE AND ENERGY COSUMPTION**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FINANCIAL YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012-13</td>
</tr>
<tr>
<td>Generation(MUs)</td>
<td>4.407</td>
</tr>
<tr>
<td>Plant Load Factor (%)</td>
<td>21.35</td>
</tr>
<tr>
<td>Machine Availability Factor (%)</td>
<td>5658</td>
</tr>
<tr>
<td>Gross Heat Rate(KCAL/KWH)</td>
<td>4275</td>
</tr>
</tbody>
</table>

**ANNUAL ENERGY SAVING RECORDS**

1. Electrical Energy Saving: Auxiliary Power consumption of 15.54% achieved in current financial year (2013-2014), whereas previous year auxiliary power consumption was 23.07%.
2. Coal Energy saving: Overall station HEAT RATE achieved is 3219Kcal/KWh in the financial year 2013-2014, whereas previous year it was 5658Kcal/KWh. (however designed heat rate is 2800 Kcal/KWh)
**Major Energy Conservation Initiatives**

1. **ESP-1st field fly ash recirculation**

   Fly ash of ESP-1 field is being re-used by feeding it with coal & cyclone ash as a homogeneous mixture. By mixing these ashes to the fuel plant is increasing the combustion timing of coal, so that 100% combustion can take place. Also by using fly ash of ESP-1st field & of cyclone ash, the un-burnt carbon in ash is taken again for combustion. Thus the wastage of fuel energy is minimized. For this purpose a diverter in ash conveying line has been introduced as well as an intermediate silo for ESP ash has been installed on boiler, so that proper mixing of ESP fly ash with coal can take place.

2. **Bed Ash cooler system taken in line**
Bed ash cooler system is designed & installed to reduce the heat loss through bed drain, as when we drain the bed ash it comes out with very high heat energy as waste, but using bed ash cooler we are heating primary air from ambient temperature to 280 °C, also unburned carbon which are lighter in weight are being returned to boiler with hot air coming out from Bed Ash Cooler.

3. **Variable Frequency Drive Installed In LT Drives**

Variable Frequency Drives (VFDs) were installed in all main motors, pumps & compressors to optimize the operation without wastage of power.

4. **Power Management System**

In control room, plant has PMS SCADA for Power system control. From this PMS plant is able to operate (open/close) the breakers of switchyard at our 132 KV Substation. Plant can also synchronize the TG Set with grid from remote i.e., from PMS SCADA.

5. **Equipment’s Interlocking**

For 100% combustion excess air is required but excess air also leads to loss of ignition as some amount of unburned carbon also migrates with excess air, for reducing that loss plant interlocked ID fan’s RPM with furnace Draft, so that optimum operation can take place and minimum migration of unburned carbon will take place. For reducing excess air loss coal feeder’s RPM are interlocked with excess air & drum pressure so that the drum pressure will be maintained with minimum excess air loss.

6. **HP Heaters for feed water heating**

HP heaters are taken in line to improve the boiler feed water temperature, by introducing HP Heaters around 70° C temperature rise takes place in boiler feed water.