

Excellence in Energy Management

Dahanu Thermal Power Station – Reliance Infrastructure LTD.

29 April 2010

Flow of Presentation

1. Company & Plant Profile
2. Plant Performance
3. Benchmarking
4. Energy Management Systems
5. Employees Involvement & Teamwork
6. Internal Energy Audit as per CEA Guidelines
7. Replication of Best Practices
8. Carbon emission reduction project
9. Energy Conservation Projects
10. Renewable Energy Resources
11. Environmental Management
12. Innovative Projects
13. Awards & Recognition

1. Company & Plant Profile

Company Profile

Generation

Generates 940 MW of electricity through Power Stations across Maharashtra Andhra Pradesh, Kerala, Karnataka and Goa

Distribution

Distributes over 36 billion units of electricity to 30 million consumers

EPC

Leading player in India in the engineering, procurement and construction segment of the power sector

RELIANCE
Infrastructure

Anil Dhirubhai Ambani Group

Infrastructure

- Road Projects: Largest developer of road projects for NHAI totaling 467 kms
- Metro project: First and only private sector builder and operator in Mumbai and Delhi covering 34 kms

Transmission

- Parbati and Koldam Hydroelectric project
- Project under Western Region System Strengthening Scheme II in Maharashtra and Gujarat

Dahanu TPS

- First 250 MW sets in the Country
- Indigenous technology
- Coastal power plant far away from Coal Mines Annual requirements

Total Coal	☞	2.1 Million tons
Wash coal	☞	1.7 Million tons
Imported coal	☞	0.4 Million tons

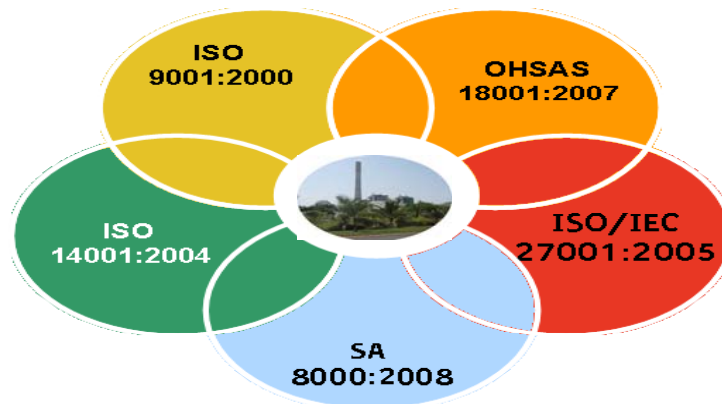
- Sea Water Open Cycle cooling system (M3/Hr.) ☞ 84,000

- Nearby Surya River dam (32 kms).

Sweet Water (M3/Hr.)	☞	300
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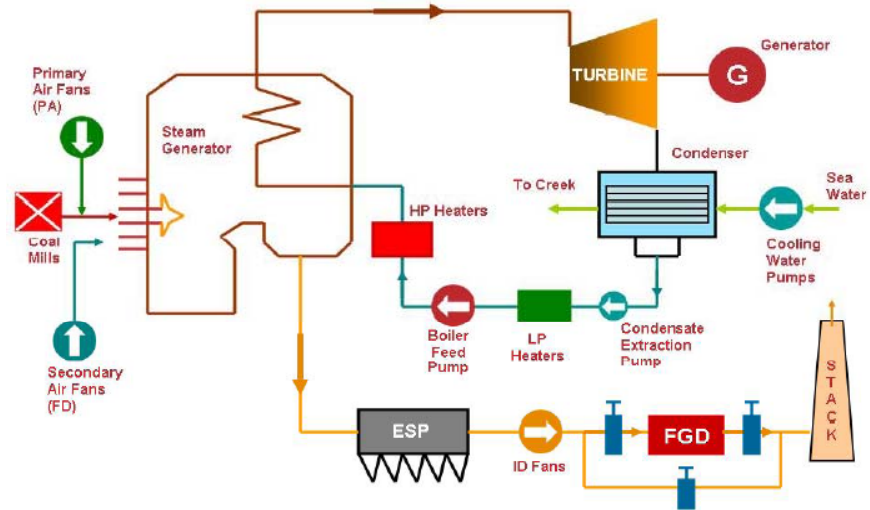


Systems Approach



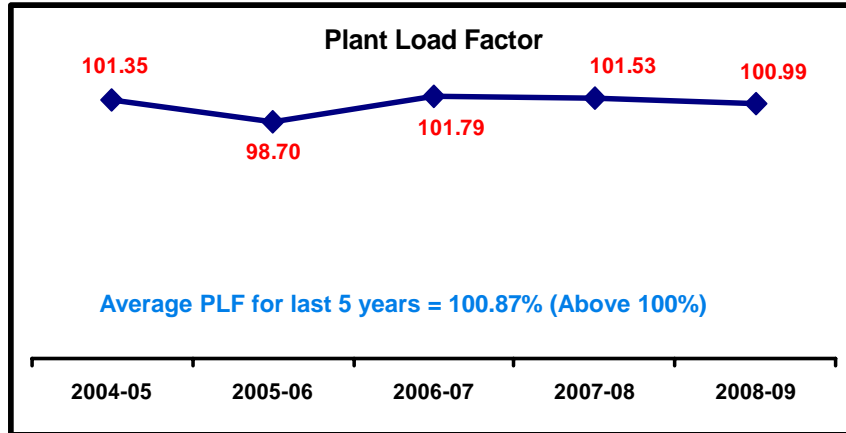
Continual improvement is ensured through improvement plans like QIP, SIP and EMP

Electricity Generation Process



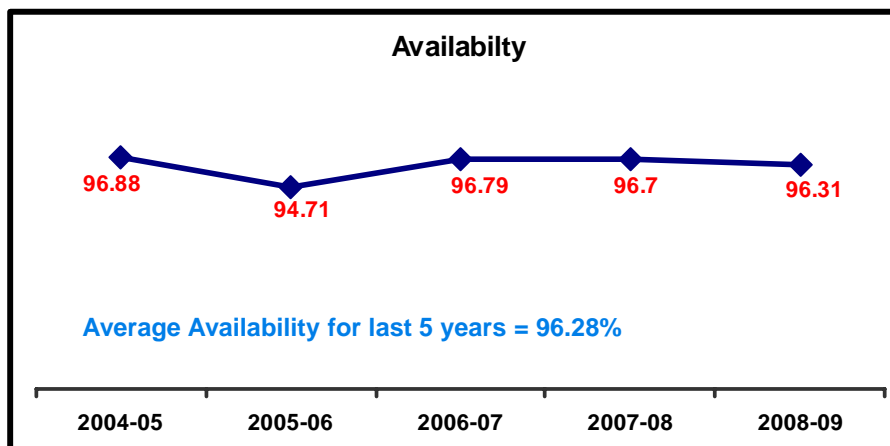
2. Plant Performance

Plant Performance- Indicators



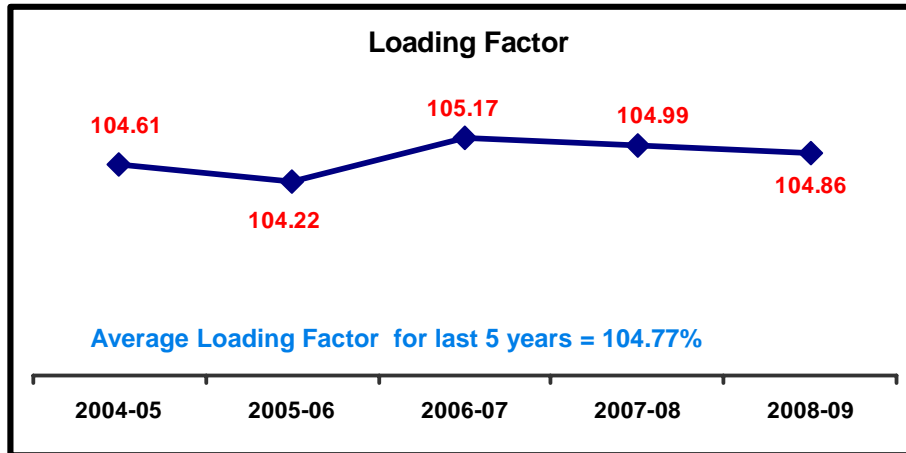
National PLF (Average Thermal units) : 78.75%

Plant Performance- Indicators

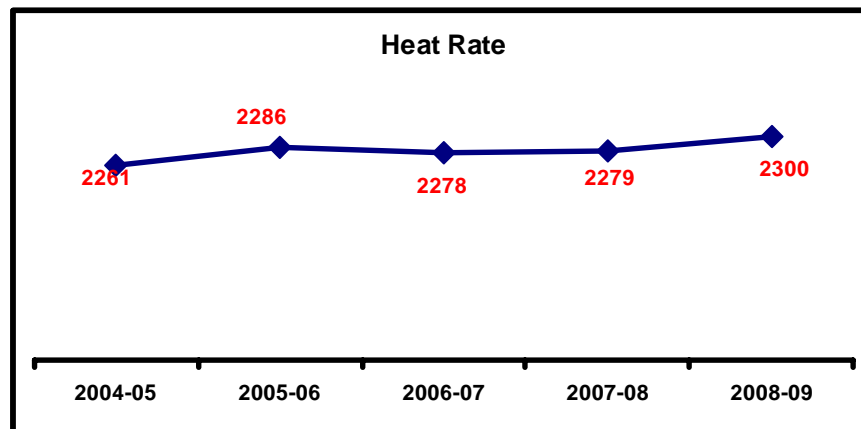


National Availability (Average Thermal units) : 84.76%

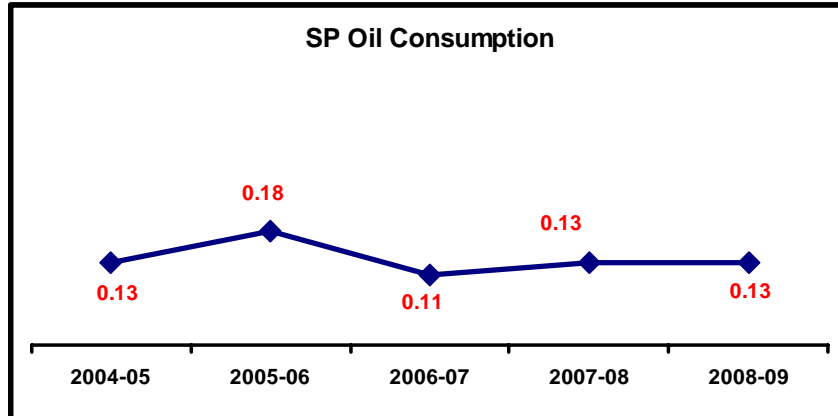
Plant Performance- Indicators



Plant Performance- Indicators

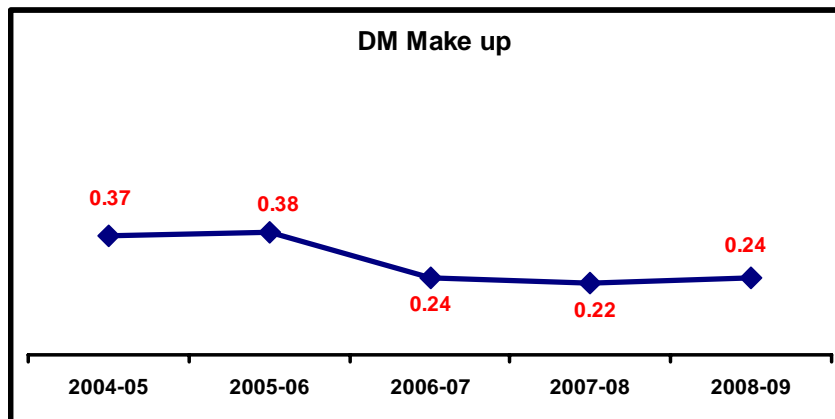


Plant Performance- Indicators



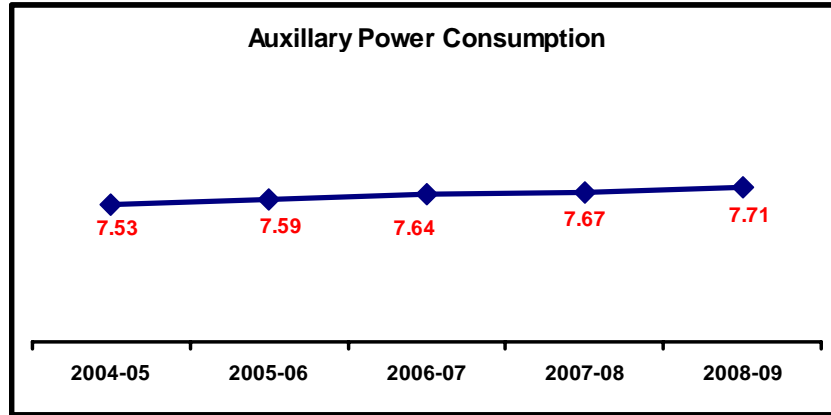
National Sp. Oil Consumption (Avg for 250MW) : 1.47ml/KWH

Plant Performance- Indicators



Design Norm : 3%

Key Performance Indicators



National Auxillary Power (Average Thermal units) : 8.17%

3. Benchmarking

Benchmarking: National (Top five Plants)

2008-09					
Plant Name	PLF	AVF	Loading Factor	Heat Rate	Sp. Oil Consumption
	(%)	(%)	(%)	(Kcal/KWH)	(ml/KWH)
DTPS	100.99	96.31	104.86	2300	0.13
Simadri	97.41	94.54	99.72	2351	0.10
Dadari	99.36	96.35	99.95	2389	0.14
Ramagundam	94.45	93.52	99.45	2372	0.16
Vindhyachal	93.15	92.18	99.82	2376	0.20

Benchmarking: National (Top five Plants)

2007-08					
Plant Name	PLF	AVF	Loading Factor	Heat Rate	Sp. Oil Consumption
	(%)	(%)	(%)	(Kcal/KWH)	(ml/KWH)
DTPS	101.53	96.7	104.99	2279	0.13
CESC	100.43	97.39	103.12	-	0.13
JINDAL	97.67	97.3	100.38	2253	0.28
AECO	97.49	95.77	101.79	-	0.68
NTPC	98.02	96.52	101.62	2393	0.112

Benchmarking: National (Top five Plants)

2006-07					
Plant Name	PLF	AVF	Loading Factor	Heat Rate	Sp. Oil Consumption
	(%)	(%)	(%)	(Kcal/KWH)	(ml/KWH)
DTPS	101.79	96.79	105.17	2278	0.11
CESC	99.77	97.04	102.81	2466	0.12
NCTPS	95.69	95.38	100.33	2399	0.11
Fg UTPS	95.59	94.69	100.95	2411	0.27
Torrent Power	92.94	93.51	99.39		1.74

Benchmarking: International 2004-05

Sr. No	Company Name	Plant Name	Location	Plant Capacity (MW)	PLF (%)	Average Heat Rate Btu/kwh	Average Heat Rate kcal/kwh
1	Reliance Energy Ltd.	Dahanu TPS	Dahanu, (M.S.), India	500	101.35	8,972	2261
2	Southwestern Electric Power Co.	Pirkey	Hallsville, TX	580	100.42	10,946	2758
3	Deseret Gen. & Trans. Coop	Bonanza	Vernal, UT	425	100.12	10,375	2615
4	Los Angeles Dept. of W&P	Intermountain Generating	Delta, UT	1660	99.00	9,409	2371
5	Electric Energy, Inc.	Joppa Steam	Joppa, IL	1002	95.94	10,732	2704
6	City Public Service Board of S A	J.K. Spruce	San Antonio, TX	595	93.97	9,778	2464
7	AES Endeavor	AES Somerset	Barker, NY	684	93.91	9,529	2401
8	Louisville Gas & Electric Co.	Trimble County (LGEC)	Bedford, KY	512	93.86	10,208	2572
9	TXU Gen.Holdings Co., LLC	Sandow 4	Not Given, TX	555	92.84	14,313	3607

4. Energy Management System

DTPS Approach for Energy Management

- Involvement of Top management
- Energy Management Policy
- Formation of Energy management cell
 - ✓ Objectives & targets
 - ✓ Cross functional team members
 - ✓ Identified role & responsibility
- Formation of water management cell
- Use of “Six Sigma Tools ” for break through improvements
- Regular Review.
- Projects implemented through QIP / EMP
- Incentive for writing BEE exam of Energy Managers / Energy Auditors

Involvement of Top Management

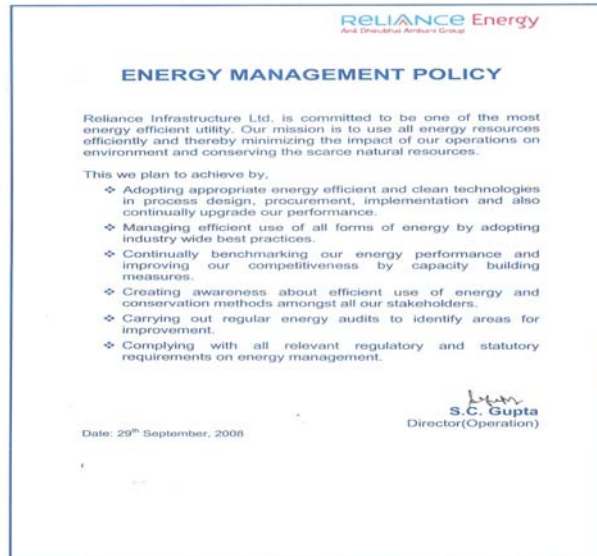
Frequency / Forum of Energy Consumption Review

- Plant Level Review
 - ✓ Plant performance, Specific Energy Consumption, Waste Utilization, Energy Conservation Projects.
 - ✓ Shift basis / Daily / Weekly/ Monthly / Half Yearly
 - ✓ Calendar year / Financial year
 - ✓ O & E and MTP - agencies for generation of MIS
- Corporate review
 - ✓ Plant performance, Profitability, Performance, Environmental reports.

Review Of Daily Energy Deviation

Daily Energy Deviation Report for the date :28 April 2010					28-Apr-10	27-Apr-10	28-Apr-10	27-Apr-10	
Equipment	PG KW/Design KW	Running hrs	Actual KW	Garanted kWh	Actual kWh	Deviation kWh	Deviation kWh	Sp. Power kwh/t	Sp. Power kwh/t
BFP									
BFP-1A	7116	24	7131	170784	171139	355	625	8.96	8.97
BFP-1B	7116	0		0	0	0	0		
BFP-2A	7116			0	0	0	0		
BFP-2B	7116	24	7057	170784	169357	-1427	-1226	8.92	8.94
CEP									
CEP 1A	590	24	522	14160	12516	-1644	-1633	0.81	0.81
CEP 1B	590			0	0	0	0		
CEP 2A	590	24	436	14160	10465	-3695	-3695	0.70	0.70
CEP 2B	590			0	0	0	0		
CW pumps									
CW pump 1	1230	24	1050	29520	25195	-4325	-2751		
CW pump 2	1230	24	1112	29520	26679	-2841	-3025		
CW pump 3	1230	17.67	1118	21734	19762	-1972	-2753		
CW pump 4	1230	6.75	1034	8303	6980	-1323	-991		

Energy Management Policy



Formation of Energy Management Cell

- Appointment of "Energy Manager" as per the EC Act 2001
- Initially 8 team members from cross functions
- Expanded to include all the certified EM / EA (20 EM/EA) & Team members from respective dept.

Objectives of EMC

- To operate the power station at highest energy efficiency & optimum cost
- To create awareness about energy conservation amongst all stakeholders

Formation of Water Management Cell

- Appointment of “Water Manager”
- Initially 4 team members from cross functions
- Expanded to include all the certified EM / EA

Objectives of Water Management cell

- To create awareness about water conservation amongst all stakeholders
- Use of Natural resources
- Zero discharge.

Approach for Energy Conservation

Identification of Energy Conservation Projects

- Reduction in Electricity consumption
- Natural Resource
 - ✓ Coal
 - ✓ Oil
 - ✓ Water
- **Reduction Environment emission**
- Use of Renewable energy for plant
- Activities Carried Out under CSR Initiative
- Use of Biomass

Approach for Energy Conservation

To achieve objective “**highest energy efficiency and at optimum cost** “

- Regular Internal & External Energy Audits
- Documentation for energy management activity
- Regular filing of energy returns to state / central level designated agency
- Enhancement of employees knowledge through internal training programme
- Establishing the efficiency test procedures & schedules for all equipments & systems
- MIS

5. Employees Involvement & Team Work

5.1 Energy Management Cell - Website

Address <http://10.125.28.33/EMCWeb/EMC/Energy%20Management%20Cell.htm>

RELIANCE Infrastructure
Anil Dhirubhai Ambani Group

RELIANCE Energy
Anil Dhirubhai Ambani Group

2 x 250 MW Dahanu Thermal Power Station

Energy Management Cell

EM Cell | Performance Tests | Audit Procedures | Audit Reports | Analysis | ENCON Projects | Documentation | O&E Reports

"Save Energy, for yourself, your family future, organization, society, Nation and for World."

Why Energy Management Cell? [EC Act 2001](#) [Energy Calculator](#) [DTPS VISION AND MIS](#)

1. Regular internal energy audits. 2. Documentation and analysis of energy management activities. 3. Regular energy audits through accredited energy auditing firm requirements by the EC act, 2001. 4. Regular filing of energy returns to the state level designated agency as per the EC act, 2001. 5. Enhancement of em knowledge about energy conservation and energy efficiency through internal training programmes. 6. Energy conservation projects – identification, evalud implementation. 7. Application of energy conservation techniques in the entire gamut of activities of DTPS including purchase, training, O & M, inspection & testing, f 8. Establishing the efficiency test procedures and schedules for various equipments and system. 9. MIS accounting.

DTPS Performance F.Y. as on 12 Nov 09

Generation (Mus)	2753.319
Plant Load Factor (%)	101.52
Availability (%)	96.59
Aux. Power-Including FGD (%)	8.92
Aux. Power-Excluding FGD (%)	7.66
D.M. Makeup (%)	0.32

[Steam Table](#) | [A to Z Energy Tools](#) | [BEE- EM/EA Exam Study Material](#) | [ASME PTC4-2008](#) | [ASME PTC6-2004](#) | [Formula & Constants](#) | [Visitor No: 001, 27,](#)

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5.2 Employees Involvement & Team Work

Functions of Energy Management Cell to achieve objective "Awareness drive"

- Display of posters and slogans in plant area
- Training for all employees
 - ✓ By Internal faculty – 3392Man-days
 - ✓ By External Faculty - 155 Man-days
- Create awareness among local school children about energy conservation
- Employees suggestion scheme
- Celebration of Energy Conservation week
 - ✓ Competition of posters & slogans
 - ✓ MEDA , BEE's Films show
 - ✓ Display of energy conservation projects
 - ✓ Energy conservation walk involving all employees

5.3 Employees Involvement- 3L Programme with BEE

- 14 and 15 May 2009. In this programme following presentation was presented by DTPS.
- Total 65 participants were presented from, Kota TPS, Godrej Boyce LTD, NTPC, Tata Power etc.
- Site Visit was also arranged for above participants for actual running and performance of energy saving projects established at DTPS

Sr Nos	Presentation by DTPS
1	Energy Efficiency of Chinese Equipment in Power Sector by Shri B.N Sheth GM (Operation)
2	Energy management systems at DTPS by Shri P.S jalkote
3	Effective Utilization of Resources to enhance energy efficiency-A case study of DTPS by Shri A. M. Joshi
4	New Technologies - Installation of VFD's at DTPS by Shri Piyushkumar Pandya,
5	Reduction in cycle time of Start up and Shut down process in case of forced outage by Shri Suhas Patil
6	Reduction of DDC card failure to improve energy efficiency by Shri Dinesh Mantri, GM, (C&I),

5.4 External Programme with BEE



5.4 Employees Involvement And Team Work



1&2 . Walk for Energy Conservation

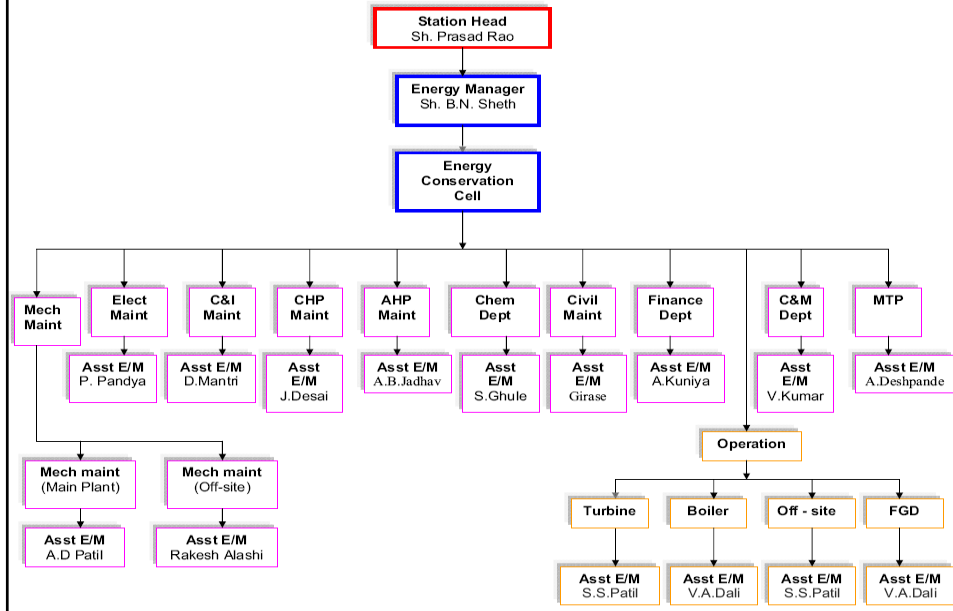
3. Oath to conserve Energy.

4. Participation of House wives.

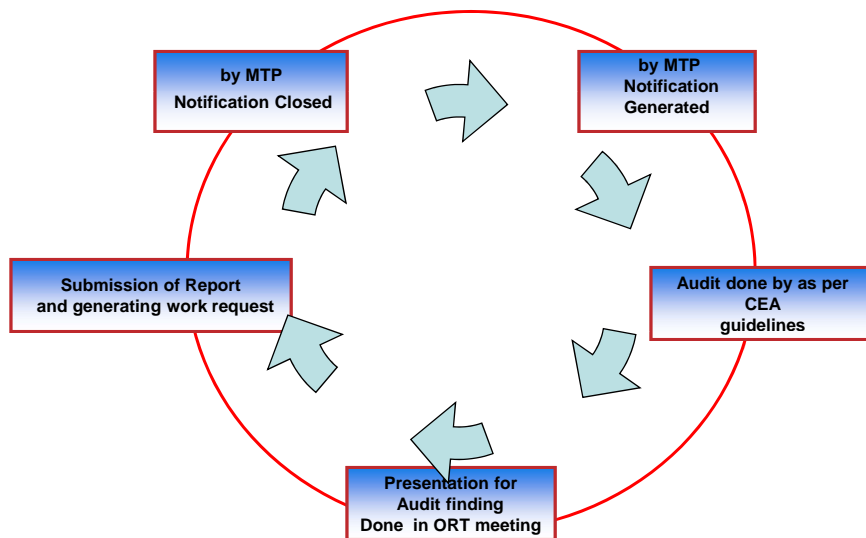
5& 6. Energy Conservation awareness to Dahanu city students.

6.0 Energy Audit as per CEA guidelines

Audit Team as Per CEA guidelines



Audit Procedure



Energy Audit Team As per CEA guidelines

Dahanu TPS, Reliance Infrastructure Ltd., Reliance Energy

Internal Energy Auditing Team

Sr.	Area to Be Audited	Audit Team	Audit Frequency	Audit Schedule	Equipments Required
1	Boiler U1	1. V. A. Dali-Asst EM 2. A. Shukla-Opn 3. Punnet Hate-Opn 4. Ravi Patil O&E 5. Hemant Bari- MTP 6. Pramaod Rege - Ele	Twice in year	Jul-09	1.Power analyzer 2.Temperature Indicator &Probe 3.Sling/ digital hygrometer 4.Anemometer 5.Digital manometer 6. Infrared Pyrometer 7.Stream trap tester/ ultra sonic leak detector. 8. Flue gas analyzer/Orsat apparatus 9.Pressure Gauges 10.Appropriate probe for measurement of Pressure Head & Velocity Head
		1. A. D. Patil-Asst EM 2. N. Pamale		Feb-10	
2	Boiler U2	1. V. A. Dali- Asst EM 2. S. Mestry- EA 3. Paresh Pahari-Opn 4. Hemant Bari - MTP 5. Bhupesh Raut-O&E 6. Pramod Rege - Ele	Twice in year	Jul-09	1.Power analyzer 2.Temperature Indicator &Probe 3.Sling/ digital hygrometer 4.Anemometer 5.Digital manometer 6. Infrared Pyrometer 7.Stream trap tester/ ultra sonic leak detector. 8. Flue gas analyzer/Orsat apparatus 9.Pressure Gauges 10.Appropriate probe for measurement of Pressure Head & Velocity Head
		1. A. D. Patil-Asst EM 2. 2. R. Sawant MECH		Feb-10	

Energy Audit Report

DTPS - Energy Audit Report of Condenser September 23, 2009

Name of the power plant and location
Dahanu Thermal Power station
Dahanu Road, Thane
Maharashtra-401608

Designated consumer ID Code and category given by BEE (Bureau of Energy Efficiency)
14. Thermal Power station, hydel power station, electricity transmission companies, & distribution companies

Auditor Name
DTPS Energy Management Cell

Mandatory Audit details:
BEE GUIDELINES FOR ENERGY AUDITING OF THERMAL POWER PLANTS

7.0 Replication arising out of Best Practiced implemented on energy front through associates

SPS, Samalkot

Project Description	Saving in mus	Saving in Lacs/Year
installation of variable frequency drive (VFD) in High Pressure Boiler Feed pump	2.27	72.8
installation of variable frequency drive (VFD) in Low Pressure Boiler Feed pump	0.1	3.36
installation of variable frequency drive (VFD) in Raw Water Pump	0.25	8.1
03 Nos Installation of Wind Turbo-Ventilator	0.1	3.36
03 Nos Installation of Wind Turbo-Ventilator	0.1	3.36
Corrocoating of CW Pumps	0.32	10.3
Total Saving	31.4	101.28

GPS, Goa

Project Description	Saving in mus	Saving in Lacs/Year
Corrocoating of CW Pumps	0.16	9.6
installation of variable frequency drive (VFD) in High Pressure Boiler Feed pump	0.69	41.62
Total Saving	0.85	52.22

BKPL, Kochi

Project Description	Saving in mus	Saving in Lacs/Year
installation of variable frequency drive (VFD) in Low Pressure Boiler Feed pump	0.42	25.38
Installation of efficient corrocoated impeller in CW Pump	0.73	44
Total Saving	1.15	67.38

Rosa Thermal Power Plant

Project Description	Saving in mus	Saving in Lacs/Year	Status
20 Nos Installation of Wind Turbo-Ventilator on TG roof	0.932	21.81	In - Progress

Kota Thermal Power Plant (NTPC)

Project Description	Status
Installation of variable frequency drive for CEP	Initial stage

Summary

Total Saving in mus	34.33 mus
Total Saving in Rs Lacs	245 Lacs

8.0 . Carbon Reduction Emission Reduction Projects

Title of Project implemented	Year of implementation	Total Co2 reduction in Tonne s	Total Annual savings in Rs Million	Investment in Rs in Million	Payback in Months
Variable Frequency Drive for Condensate Extraction Pump (CEP#1A)	Nov'2008	1520	0.72	7.0	10
Variable Frequency Drive for Colony Drinking water pump	Feb'2009	76	0.03	0.003	1
Installation of Wind Turbo Ventilator(6no.) at Turbine hall roof in place of motorized roof exhauster	May'2009	133.40	0.06	0.149	09
Installation of Wind Turbo Ventilator(6no.) at Turbine hall roof in place of motorized roof exhauster (In Progress)	Sept'2009	133.40	0.06	0.149	09

Title of Project implemented	Year of implementation	Total Co2 reduction in Tonnes	Total Annual savings in Rs Million	Investment in Rs in Million	Payback in Months
Replacement of existing purge air damper with modified purge air dampers	Dec-06	23704.53	36	8	03
Switching of fuel from HFO to LDO	Dec-06	6969.13	10.58	0.6	01
Condenser tube cleaning by bullet shot method during unit overhauls.	Dec-06	6321.21	9.6	0.65	8
Installation of modified debris filter to improve the heat rate of unit	Dec-06	12642.42	19.2	4.8	3
Modification of HP heaters parting plate of feed water inlet & outlet	Dec-06	6269.06	9.53	N/A	N/A

Title of Project implemented	Year of implementation	Total Co2 reduction in Tonnes	Total Annual savings in Rs Million	Investment in Rs in Million	Payback in Months
To change the procedure/strategy of CPU operation after unit shutdown.	May-06	1185.23	1.8	0	0
Six sigma project for reduction in generation cost by improving heat rate.	May-06	1444.40	2.19	0	0
HP module rotor replacement U#1	2006	30856.98	46.86		
Installation of BECK Actuators for SAD-& SAD-2 in Unit-01	Aug-06	721.97	1.09	0.8	9
Provision of HEA igniters for CD & EF Elevation in both units	Aug-06	1925.26	2.92	6.5	26

Title of Project implemented	Year of implementation	Total Co2 reduction in Tonnes	Total Annual savings in Rs Million	Investment in Rs in Million	Payback in Months
Fabric expansion joint installation in flue gas duct at APH inlet / outlet.	Nov-04	3160.60	4.8	1.3	4
Additional oxygen sensors in boiler	Dec-04	18963.62	28.8	32	13
Surface coating of Boiler Tubes by High Velocity Oxy Fuel Process	Dec-04	39507.55	60	0.23	1
To detect air in leakages in condenser of Unit –1 / 2 by use of Helium based air in leakage detector.	Aug-05	11062.11	16.8	0.27	3
Improvement due to Overhaul U #2	2004	28402.77	43.16	48.91	13

Title of Project implemented	Year of implementation	Total Co2 reduction in Tonnes	Total Annual savings in Rs Million	Investment in Rs in Million	Payback in Months
Improvement due to Overhaul U #1	2006	50759.30	77.08	87.44	14
Installation of modified debris filter to increase reliability of the system in U-1	Dec-06	12642.42	19.2	20	12

9. Energy Conservation Projects

9.1 Energy Saving Projects Implemented 2008-2009

Energy Saving Project	Savings (Rs. Lakhs)	Investments (Rs. Lakhs)
DTPS TG Roof Wind Ventilator Installation	2.21	1.49
Successfully commissioned the 6.6KV, 650KW Condensate water pumps VFD in Unit-1	25.20	70.00
Providing separate switches for MCC Room unit - 1 normal lighting and saving of energy.	1.12	0.03
Designing layout, erection testing and commissioning of 35 numbers solar lamp posts at railway dead end	0.12	4.90
Reduction in Debris Filter Flushing Pump Operation.	1.87	0.0
Installation of energy efficient pump for Unit 1 Generator Transformer oil cooling system	1.47	0.17

9.2 Energy Saving Projects Implemented 2008-2009

Energy Saving Project	Savings (Rs. Lakhs)	Investments (Rs. Lakhs)
Four locations selected for above illumination optimization. These areas are (1) Canteen (2) Library (3) Electrical maintenance office, C&I Office (4) Finance Dept. These areas were having conventional 2 x 40 w lighting fixtures. These fixtures replaced with new energy efficient fixtures	1.95	2.76
APH basket replacement in Unit-1	368.00	220.00
BFP 1A Cartridge replacement	146.27	100.00
VFD for colony drinking water Pump	1.26	0.00
Integrated Energy Management system procured and commissioned	0.00	27.00

9.2 Energy Saving Projects Implemented 2007-2008

Energy Saving Project	Savings (Rs. Million)	Investments (Rs. Million)
Unit Startup and Shutdown process	16	NIL
Running of double crusher with one unit drive	0.1	0.35
Replacement of boiler feed cartridge	2.56	2.0
Provision of water refractory cooling header from service water header result in reduction in running hrs of sea water pump.	0.057	0.2
VFD for condensate extraction pump.	4.52	6.00
To reduce 65% fire Hydrant consumption		0.01
Provision of make up line for HP/ LP sump from hydrant pump	0.06	0.15

9.3 Energy Saving Projects Implemented 2006-2007

Energy Saving Project	Savings (Rs. Million)	Investments (Rs. Million)
Fabric expansion joint installation in duct of wind-box & primary air, secondary air duct at APH outlet	25	1.6
Super cleaning of lubricating oil of ID, FD & PA Fan	3.9	0.3
Feed water temperature at HPH 5 & 6 outlet to be achieved near design value.	8.3	0
Additional oxygen Sensors in Boiler	25	1.6
To modify the existing procedure of coal mill changeover	5.4	0

9.4 Major Energy Saving Projects under implementation

- Installation of IFC air controller – GE60 for instrument air network to reduce demand side pressure consumption.
- Installation of refrigerant drier in place of Desiccant drier
- Installation of Solar water pump 2 HP for nursery and plantation
- Installation of solar water heating system in colony area in 2nd phase
- Installation of hybrid wind energy system for AAQM station at Ashagadh.
- 16 Nos of solar lighting system in plant area.
- 16 Nos LED lighting system in plant area.

9.4 Major Energy Saving Projects under implementation

- Replacement of BFA 2A cartige
- Replacement of APH gasket in Unit-2 .
- Replacement of HP Module in Unit-2.
- Procurement of new Ebslon Software package for finding out opportunities to improve heat rate, improve in boiler efficiency.

10. Use Of Renewable Energy Resources

Use of Renewable Energy Sources

- ▣ Solar street lighting for plant fencing and other areas - Additional 20 nos. installed this the year.
- ▣ 5 Nos 200 LPD (Liters Per Day) Capacity Solar Water Heating system installed in colony building,



Replacement of Electrical energy with RES

Type of RES	2006-07		2007-08		2008-09	
	Energy Generated (kWh)	Annual Savings (Rs. Million)	Energy Generated (kWh)	Annual Savings (Rs. Million)	Energy Generated (kWh)	Annual Savings (Rs. Million)
Wind ventilators	--	--	--	--	119136	0.416
Turbo wind ventilators					157986.6	0.552
Solar lamps					3477.3	0.0035
Solar photovoltaic	3942	0.013	3942	0.013	3942	0.013

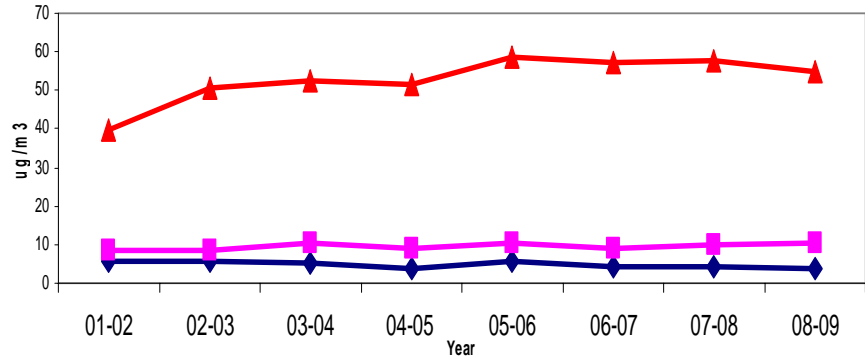
Replacement of Thermal Energy with RES

Type of RES	2006-07		2007-08		2008-09	
	Fuel Savings (kL or MT)	Annual Savings (Rs. Million)	Fuel Savings (kL or MT)	Annual Savings (Rs. Million)	Fuel Savings (kL or MT)	Annual Savings (Rs. Million)
Solar Thermal	22075	0.077	22075	0.077	26490	0.093
Biomass*	--	--	--	--	0.916 tones	0.0032

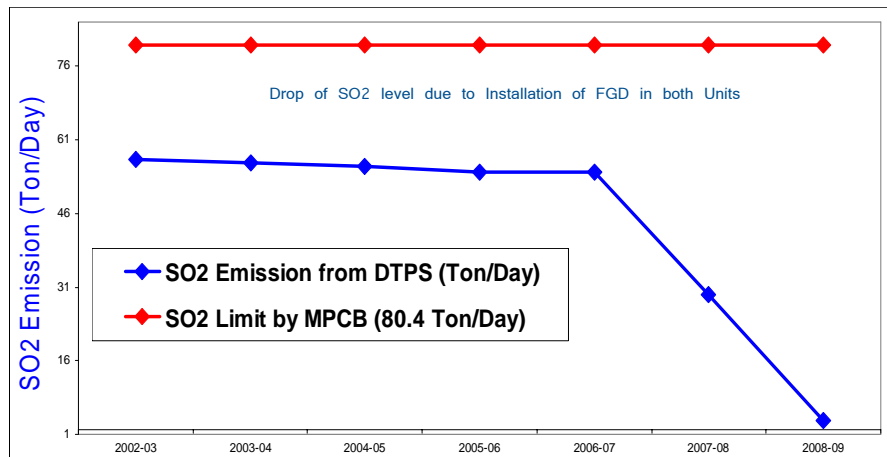
11. Environment Management

Ambient Air Quality Monitoring (AAQM) Stations

MPCB Limits : ◆ SO₂ = 30 ug/m³, □ NOx = 30 ug/m³, ▲ SPM = 100 ug/m³

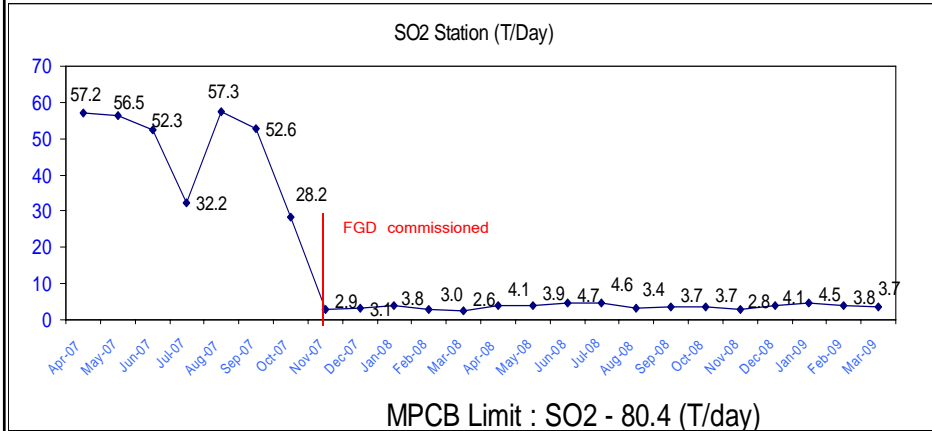


Environment Performance - SO₂ Emission

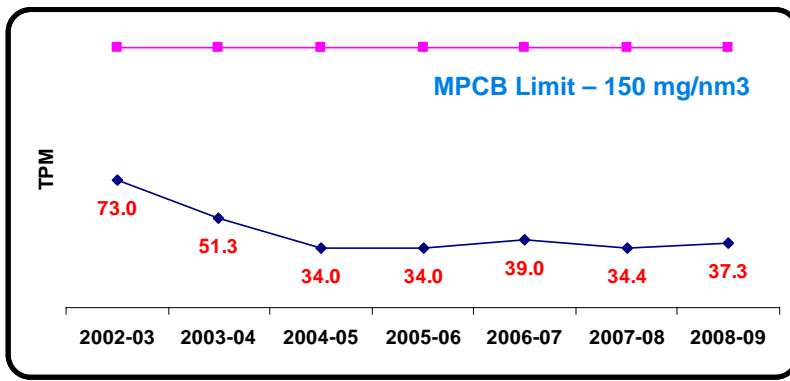


SO₂ Emission norms much lower than MPCB norms

SO₂ Emission



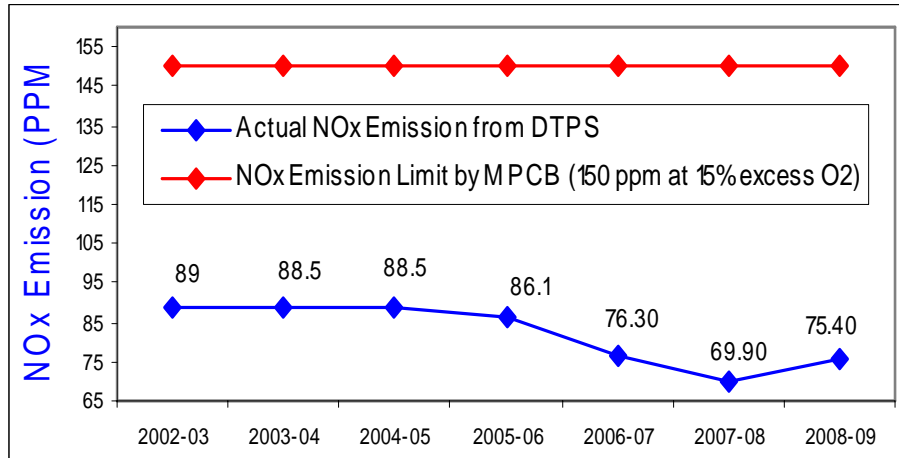
Environment Performance - TPM Emission



TPM – Total particles per million

Nox Emission norms much improved than MPCB norms

Environment Performance - NOx Emission

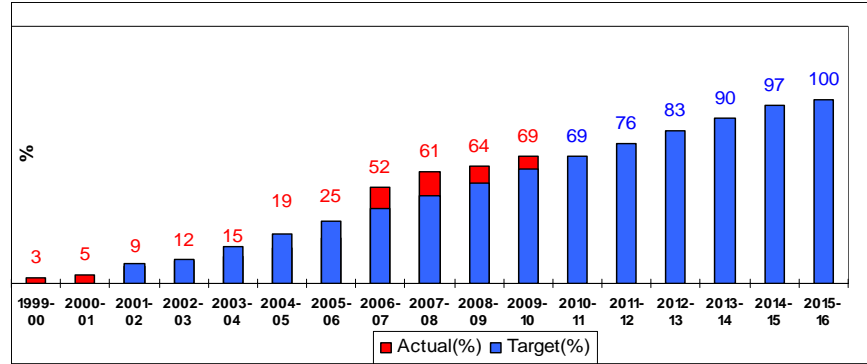


Nox Emission norms much improved than MPCB norms

Significant Points: Environmental Projects

Projects	Cap Cost	Benefit
Upgradation of sewage treatment plant	20 Lacs	Supplies treated water for drip irrigation in 260 acres of plantation and for fire extinguishing in coal yard. Save Rs 90,000/month. ROI within 4 years.
Flue Gas De-sulphurisation plant	250 Crore	Reduced emission by 90%. Support DTPS efforts for capacity expansion at Dahanu.
Land reclamation and mass plantation	150 Lacs	Reclaimed 260 acres of land that was highly saline up 10 pH. Planted different variety of trees on raised bund by in-situ soil + fly ash + ex-situ soil for positive impact on environment and biodiversity.
Fly ash classification	10 cores	ROI possible within 2 years as sale of fly ash is permitted. Fly ash utilization 64% achieved by using fine ash in cement admixture. As there is no cement plant near Dahanu, ash utilization was near impossible without the dry ash classification plant.

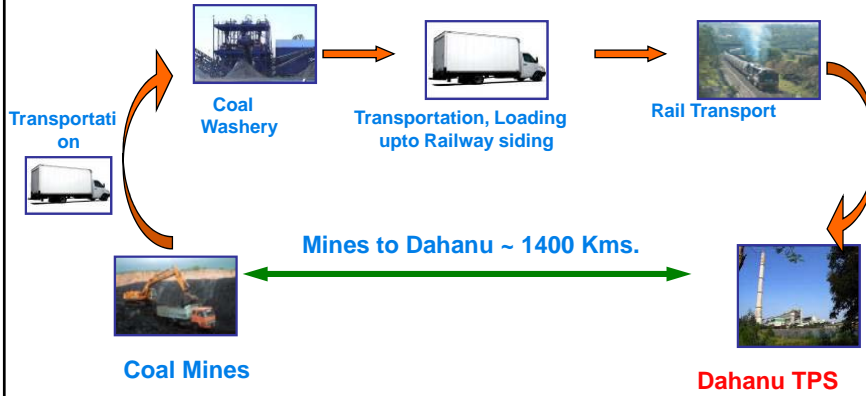
Ash Utilisation Plan V/S Actual



Presently Ash Utilization at DTPS is about 69% of the total Ash generated.

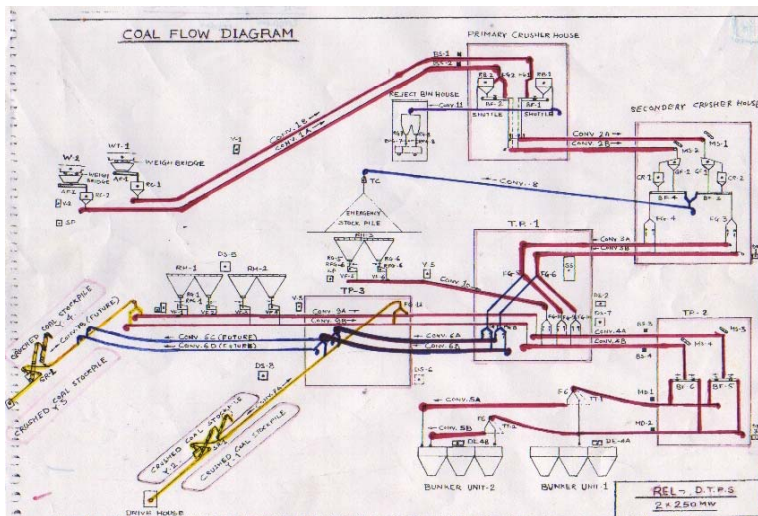
12. Innovative Project -1 Economics of ingress of foreign material in coal bunker

Coal Logistics: Indian Coal

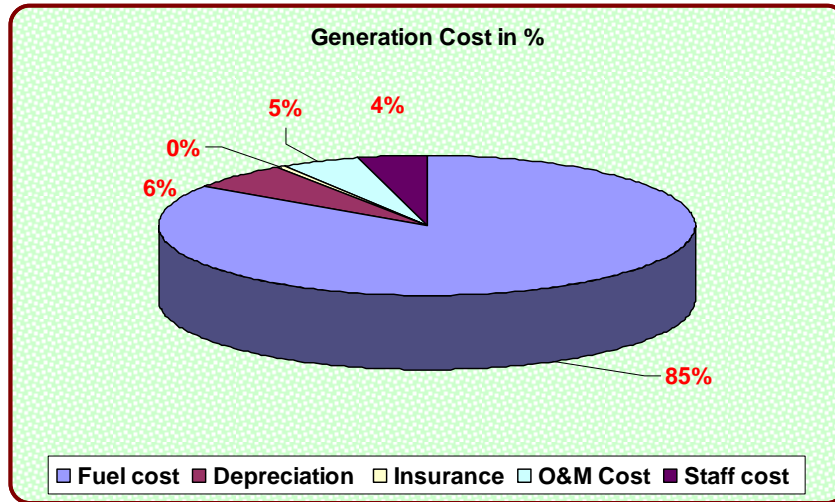


Average 45-50 rakes being received at DTPS in a month

Coal Flow Diagram at DTPS



Generations Cost



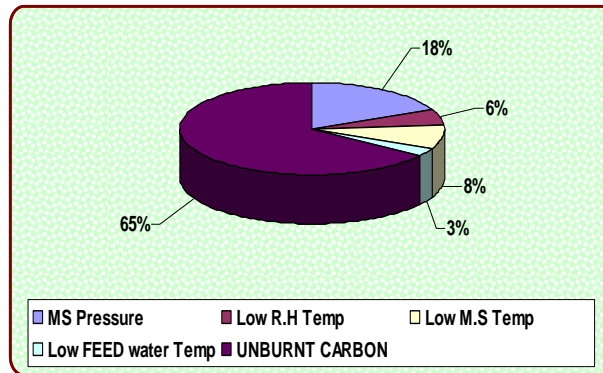
Economics of ingress of foreign material in coal bunker

Effect of ingress of foreign material

- Unburnt Carbon in ash.
- Generation loss
- Reduction in availability, reliability & performance of equipments such as Coal mills, Coal conveyors etc.
- Increase in maintenance expenses
- **Saving of 1Kcal/Kwh in Station heat rate, there will be saving of 3MT / Day of coal and Rs 30 Lacs/Year**

Heat Rate Loss due to various Reasons

Sr NO	Parameters	Change by	Heat rate Deviation
1	Unburnt due to bottom Ash	1%	2 Kcal/Kwh
2	Unburnt due to Fly Ash	1%	8 Kcal/Kwh



Aim of the Project

- ▣ The impact of the ingress of foreign material in coal bunker was analyzed by the management, and cross functional team was formed with object
- ▣ Reduction of ingress of Bags in coal Bunkers by 50% of last 6 years average.
- ▣ Elimination of Boulders and metals ingress in Coal Bunkers

Approach:

DMAIC Approach applied

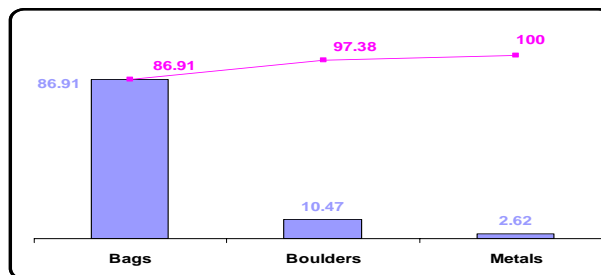
VOC Sheet is prepared to find out

- ▣ Customer perception
- ▣ To see the customer expectation
- ▣ The impact on business process

HIGH Level Process Mapping (SIPOC)

Supplier	Input	Process	Output	Customer
Jetty (Imported Coal)	Coal	Wagon Unloading	Coal feeding to Bunkers	Plant (O&M) CHP(O&M)
Coal Wagons (Indian Coal)	Handling/ Transportation Equipments	Loading and unloading of Dampers		
	Conveying Equipment	Direct Bunkering		
	Stacking Yard	Stacking		
	Contracts	Reclaiming House keeping Maintenance		

Identification of Problem



Brain storming

From the brain storming 42 possible causes were identified involving all the concerned sections.

Major Recommendations:

Following are the major counteractions suggested for improvement in existing process:

- ▣ 'Inline Bag trapping device', a breakthrough solution for arresting ingress of Bags in the system has been installed at Conveyor -4A & Conveyor - 4B.
- ▣ A permanent Magnet to be provided at Conveyor 7A/B.
- ▣ Provision of bins/area at designated locations for Bags, Boulders and Metals collection and disposal
- ▣ Refurbishment of Bunker Hopper wall to avoid further deterioration of existing gunniting thereby avoiding the ingress of re-enforcement steel.
- ▣ New SOG to be made for Belt Joint Vulcanizing. Belt joining process)

Innovative Idea Developed at DTPS through Brain Storming

1] Provision of bins at designated locations:



Bag trapping device

2] Inline bag trapping device:
"Bag trapping device" has been fabricated and installed at Conveyor as shown in picture.



Modification in Bag trapping device with counter weight

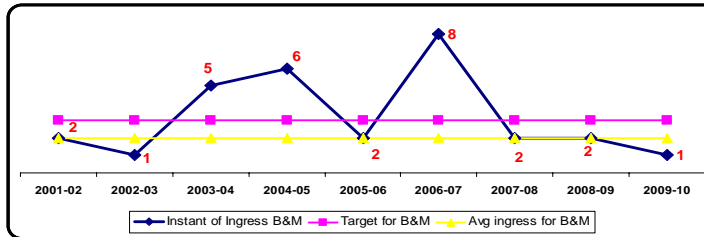
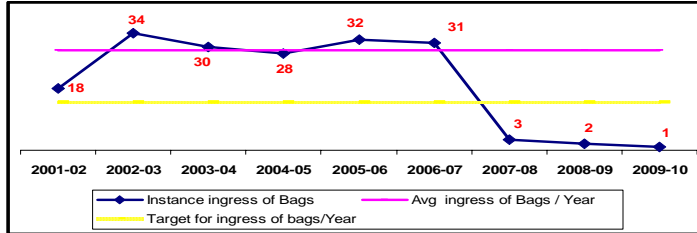
Cost involved

Sr	Description	Unit Cost (Rs.)	Total Cost (Rs.)
1	Permanent/Electro magnet Capacity – 20 kg metal	08 Lacs	16 Lacs
2	Refurbishment of bunker hopper (gunniting)	03 Lacs	18 Lacs
3	ARC for jetty/yard repair	03 Lacs	03 Lacs
4	Improvement in Inline bag trapping device	0.25 Lacs	01 Lacs
5	Provision of bins at designated location for collection of foreign material	0.10 Lacs	0.5 Lacs
Total			38.5 Lacs

Estimated Saving:

- :
- ▣ Generation loss (Over a period of 3years) = Rs 1.32 lacs
 - ▣ Loss due to Unburnt carbon (Over a period of 3 years) = Rs 90 Lacs
 - ▣ Maintenance cost (Over a period of 3 years) = Rs 10 lacs
Million
 - ▣ **Estimated total saving / annum (Approx.) = Rs 112 Lacs**
(For 50 % minimization in ingress of Bags & Elimination of Boulders & Metal ingress in coal bunkers)

Dashboards for the Bags after Six Sigma Initiative



12. Innovative Project -2 DTPS TG Roof Wind Ventilator Installation

DTPS TG Roof Wind Ventilator Installation

- “**Conservation of Energy**” by replacing the existing electric roof exhauster
- To promote Renewable Energy
- **On 16/12/2008 installation and commissioning done and testing carried out on 17/12/2008.**



Power Saving and Cost analysis

	Old Electric Exhauster	New-Hybrid Wind Ventilator (ecoPOWER600)
Power Required	3700 W	93 W
Net Saving		3607 W
Total 20 Nos New-Hybrid Wind Ventilator (ecoPOWER600 installed Net Saving in KW)		72140 W

Cost Of New-Hybrid Wind Ventilator (ecoPOWER600)	15 lacs
Financial saving	21.81 lacs
Pay Back Period	9 Months

12. Innovative Project -3

In House Project - DDC Pro-control Card Test Kit

Problem Description

- There are 6900 Nos. of Electronic cards in DDC system.
- Card failure lead to unreliable operation.

Problem Statement

- Since 1999-2000 till 2002-03
- Average 138 Nos. of Electronic card failures per year.
- Average 03 Nos. of unit tripping per year.
- This leads to unreliable operation of units

Problem Analysis

- Data collection:
- Data collection from O&E Dept. website.
- Event analysis & tripping analysis reports.

Year Wise Card Failures

Year	Qty.	Causes Unit tripping	Card failure Percentage
1999-00	138	4	2.00%
2000-01	128	4	1.86%
2001-02	78	1	1.13%
2002-03	71	2	1.03%

Problem Area

- No off line testing facility for electronic cards.
- On line card testing can not be done in running unit.
- Card failure lead to unreliable operation.

Actions Plan

- Monitoring of control room temp. through temp. trends.
- Monitoring of control room pressure through trends.
- Use of antistatic belts while handling the electronic cards.
- **In-house development of DDC card testing simulator kit.**

Development process of test kit

- Requirement Details finalized.
- Block diagram of test kit prepared.
- Material requirement assessed.
- Material procurement action initiated.
- Wiring diagram prepared.
- Test kit wiring done. Field inputs simulation provided.

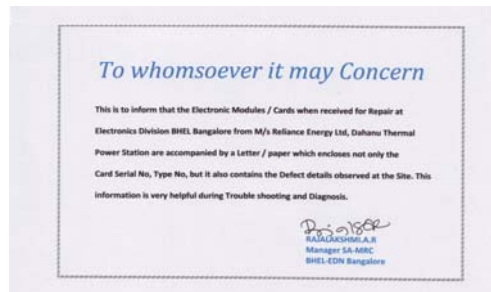


Test Kit Development work completed in 2002-03

Utilization of Test Kit

- Around 654 old cards / sensors of various type tested so far.
- Testing of 279 Nos. of cards received after repairs from BHEL & 193 Nos. of new cards purchased from BHEL.
- Average 14 Nos. of defective cards identified per year,

OEM - BHEL Appreciation Letter



Benefits of Test Kit

- No unit tripping on replacement of card since Test kit is functional.
- Integrated Card testing possible along with field sensors.
- Healthiness of cards, field sensors & devices independently which was not possible in running plant.
- Card testing can be carried out for long duration to find out passing faults.
- Defect details helped BHEL in diagnosis of fault.
- Reliability of units improved.
- Utilized for training to all executives, trainees, Vocational trainees.

Potential Savings

- 14 potential emergencies avoided per year.
- Average 01 unit tripping avoided per year.
- If we consider 02 Hrs. down time, we have saved around Rs. 40 lac's per year.

13.0 Awards & Recognitions

Awards & Recognition

More than 60 National & International awards received in the the category of

- ▣ Environment
- ▣ Performance
- ▣ Safety
- ▣ Corporate Social Responsibility

Operational Performance Awards

- **IMC Ramakrishna Bajaj National Quality Performance Trophy**
- IEEMA Power Awards 2009 – 1st Prize in the category of “Excellence in Thermal Power Generation”
- QCI – D. L. Shah Award on Economics of Quality commendation award under large scale manufacturing unit.
- CII – National Award for Excellence in Water Management – 2008, for “Innovative Case Study”
- CII - National Award for Excellence in Energy Management – 2005, 2006, 2007 & 2008.
- “International Star Award for Leadership in Quality in Diamond Category” in recognition of Commitment to Quality, Leadership, Technology and Innovations (21st April 2008).
- National Award for Meritorious Performance (SILVER SHIELD) for outstanding Performance during 2006-07 by Ministry of Power, Govt. of India.



Operational Performance Awards

- MEDA (Maharashtra Energy Development Agency) award for Excellence in Energy Conservation & Management in Thermal Power Station sector for the year 2006, 2007, & 2008.
- Infraline Energy Excellence Award 2007 for Generation Sector.
- CII - National Award for Innovative project for Energy Efficiency – 2007
- CII-National Award for Excellence in Energy Management – 2007
- “Beat the Best” award by Reliance Energy for overall performance during 2006-07.
- Viswakarma Rashtriya Puraskar (VRP) - 2006 (Two Employees) by Ministry of Labour & Employment, GOI.



Operational Performance Awards

- “CII National Water Management Award – 2006” for Most useful presentation.
- “CII National Water Management Award – 2006” for Excellence Water Efficient Unit
- International Quality Crown Award in the Gold category by BID (Business Initiative Directions, Spain)
- “CII National Award for Excellence in Energy Management” for 2006 by Confederation of Indian Society (C I I)
- Vishwakarma Rashtriya Puraskar - 2005 (Four Employees) by Ministry of Labour and Employment, Govt. of India,



Environmental Performance Awards

- IEEMA Power Awards 2009 - 1st Prize in the category of “Best Environment & Efficient Power Plant – Thermal”
- Golden Peacock Innovation Award – 2008 received at London on 18th September 2008.
- Greentech Environment Excellence Award 2007, in Gold Category.
- Golden Peacock Award-2008 for Environment Management.
- Srishti Good Green Governance Award 2007.
- Greentech Environment Excellence Award 2007, in Gold Category.
- 2007 Golden Peacock Award-2007 for Environment Management.
- Srishti G-Cube Awards – 2006 for Good Green Governance, by Srishti Publications (P). Ltd.



Environmental Performance Awards

- "FICCI Award" Federation of Indian Chambers of Commerce & Industry for Environmental Conservation and Pollution Control - 2005-06
- "Greentech Environmental Excellence Award (Silver Category)" for 2006
- "Greentech Environmental Excellence Award (Silver Category)" for 2004-05.



Environmental Performance Awards

- "Indo-German Environmental Management Award" by Greentech Foundation.
- Federation of Indian Chambers of Commerce & Industry (FICCI) Award.
- "Millennium Business Award for Environmental Achievement" by United Nations (UN) and International Chamber of Commerce (ICC) at BUDAPEST.
- "Environment Performance Award" by Council of Power Utilities (CPU) as a part of Thermal Centenary Celebration-1999.
- Dr. R. J . Rathi Environmental Award.
- The G-51 Millennium Award in the field of Mother Earth protection.
- International Greenland Society National Award.



Corporate Social Responsibility Awards

- CII – National Award for Excellence in Water Management – 2008, for “Excellent Water Efficient Unit – Beyond the fence”
- CII – National Award for Excellence in Water Management – 2008, for “Excellent Water Efficient Unit”
- Golden Peacock Award for Corporate Social Responsibility – 2007
- CII – National Award for Excellence in Water Management – 2007, for “Excellent Water Efficient Unit – Beyond the fence”
- “CII National Water Management Award – 2006” for Excellence Water Efficient Unit (Beyond the Fence)



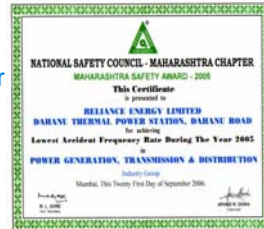
Safety Awards

- National safety award 2007
 - Lowest average frequency rate
 - Accident free year
- National Safety council of India “**Shreshta Suraksha Puraskar**” 2007.
- National Safety award – For the year 2006
- Safety Innovation award – 2008 from the Institution of Engineers, New Delhi Chapter.
- Safety Innovation Award – 2007 from “The Institution of Engineers (India) – Delhi State Centre”
- NSC - Maharashtra Chapter - Safety Awards-2006 for “Lowest Accident Frequency Rate”
- NSC - Maharashtra Chapter - Safety Awards-2006 for “Longest Accident Free Period”
- “Greentech Safety Award – 2007”



Safety Awards

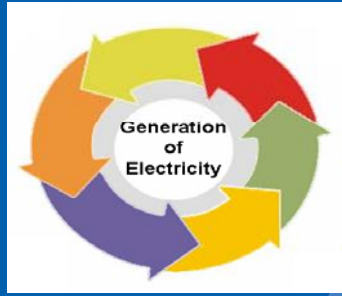
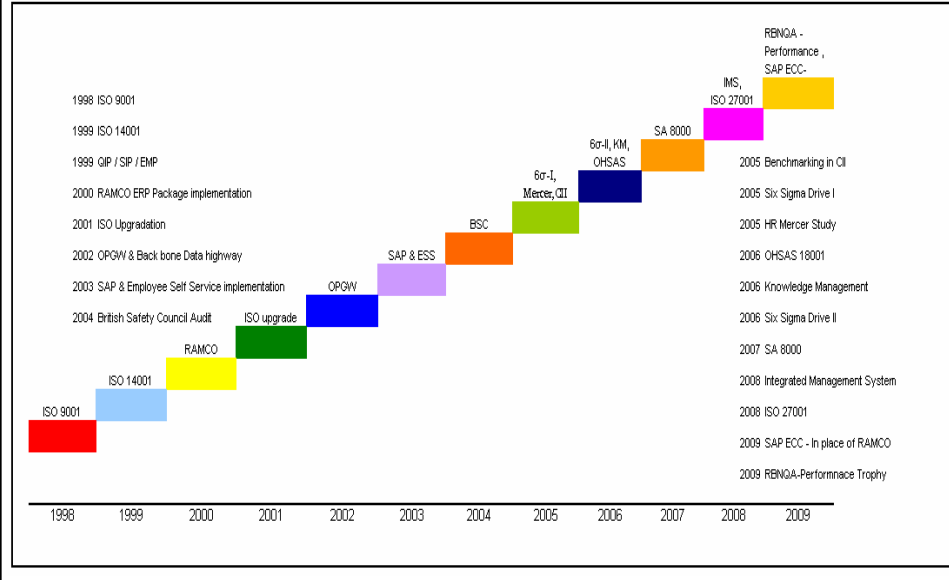
- NSC -Maharashtra Chapter- Safety Awards-2005 for “Lowest Accident Frequency Rate During the year 2005”
- NSC - Maharashtra Chapter - Safety Awards-2004
 - For longest accident free period and
 - For lowest accident frequency rate
- “Four Stars” Ranking by British Safety Council, UK for Occupational Health and Safety Management System.
- National Safety Council - Maharashtra Chapter.
- “National Safety Award-2003” Govt. of India.
- “Safety Award-2001” by “National Safety Council of India” for good performance in OSH for 1998 to 2000
- “National Safety Council- Maharashtra Chapter” for longest accident free period during 1999



DTPS “ Journey Towards Business excellence”

- System based approach and Continual improvement through QIP/ EMP/ SIP
- Adoption of best O&M practices. Cost control on dynamic basis by Day – to – day planning online
- Divisional objectives & KPI identified for every department
- Adoption of latest & best technologies.
- Use of “Six Sigma” methodology for break through improvements.
- Maintain a highly motivated workforce- Employee centric best HR practices
- Optimized operations by resource conservation, waste reduction along with Focused Energy conservation projects
- Benchmarking with other units & Internal benchmarking exercises.
- Participation in various Awards.
- Identification of COPQ.
- Advance Maintenance management by use of Equipment criticality analysis and Condition monitoring etc.

DTPS Milestones – “Journey towards Excellence”



Think Bigger Think Better
- Anil D. Ambani