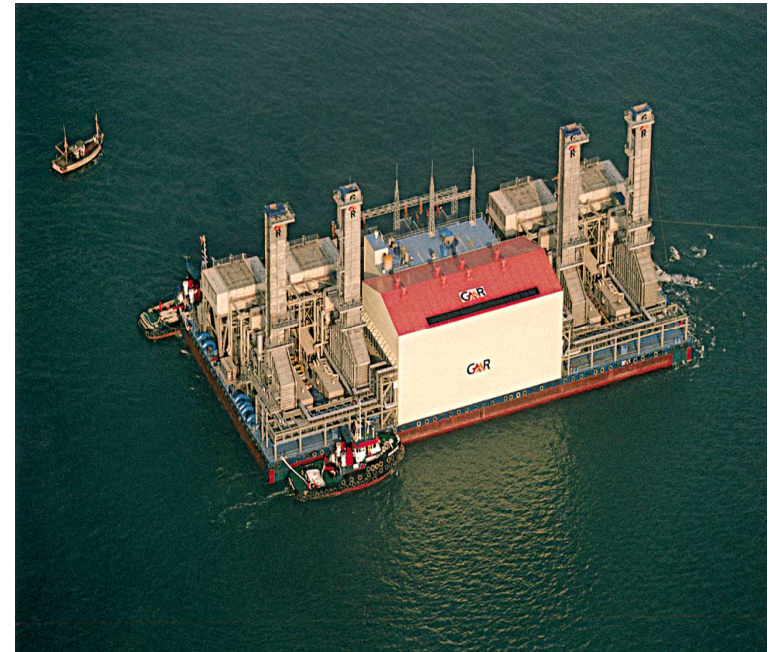

NATIONAL AWARD
for
"EXCELLENCE IN WATER MANAGEMENT 2007"

Presentation by:
GMR ENERGY LTD.
MANGALORE



GEL Profile:

- World's largest and India's first Barge mounted Power Plant.
- Barge size : 106m*55m*6m
- Plant Net Export 220MW
The plant mainly comprises of:
 - 4 X 46.64 MW LM6000PC Gas Turbines
 - 1 X 53.58 MW Steam Turbine
 - 4 Once Through Steam Generator
 - 8 X 1210 USRT chillers
 - Once thru' Sea Water Cooling System
- Total Plant Area : 13.4 Hectares
- Total Plant Green Belt : 4.5 Hectares



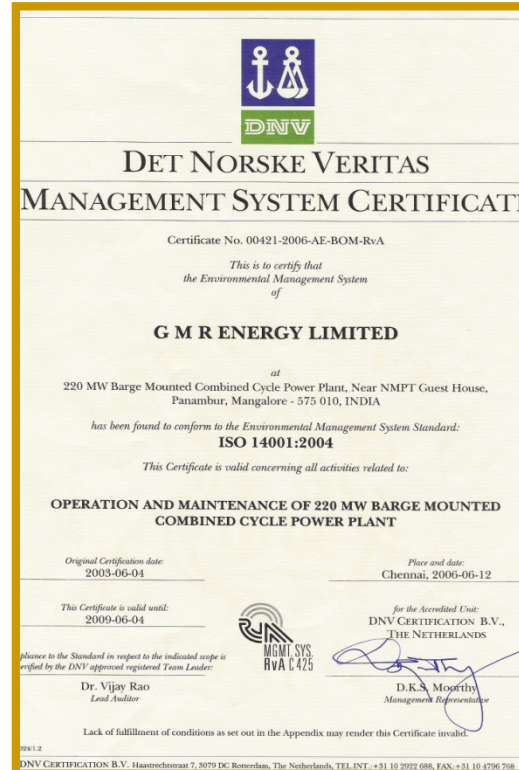


Humility

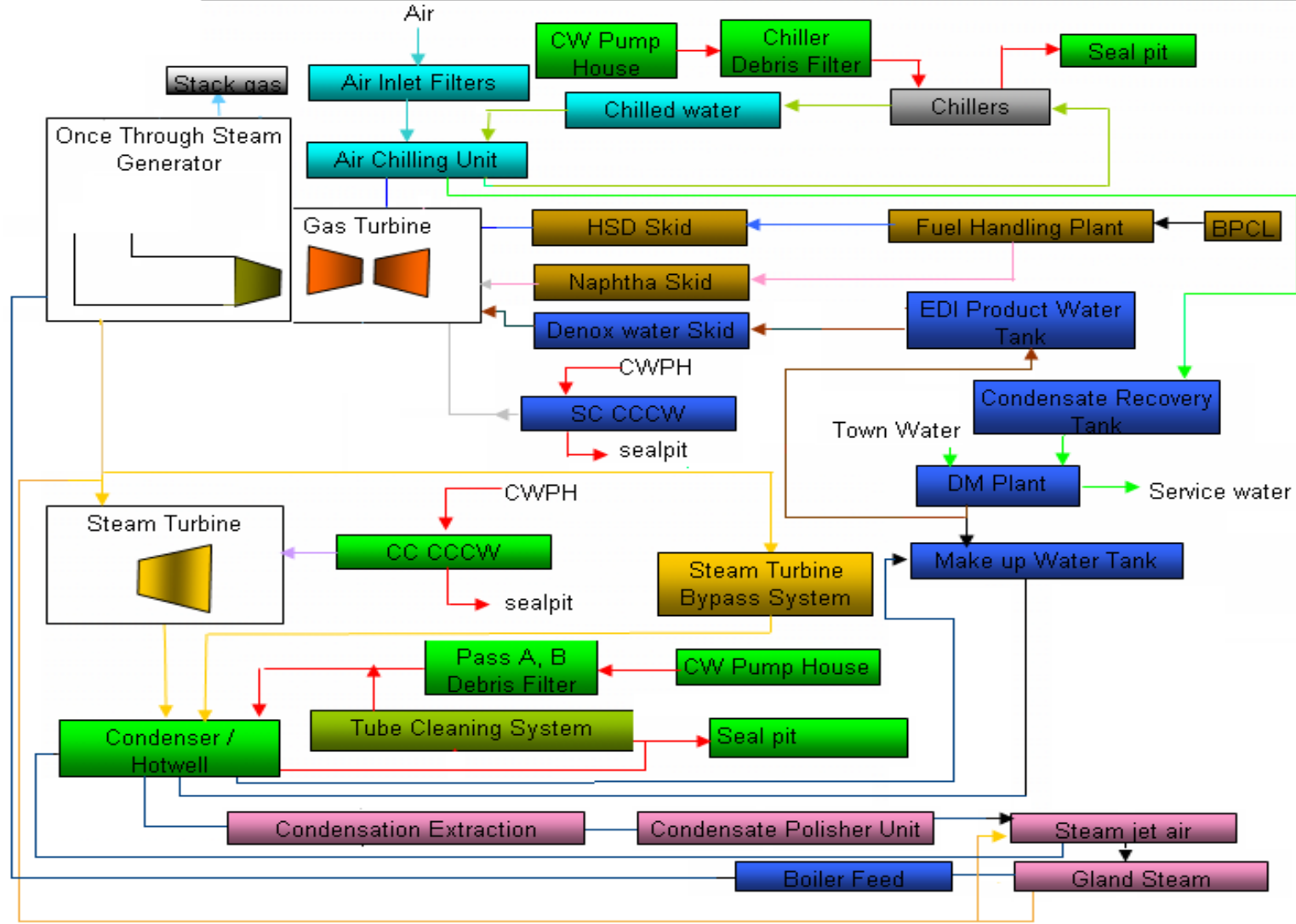
Entrepreneurship

Teamwork and Relationships

OHSAS 18001, ISO 14001 and ISO 9001



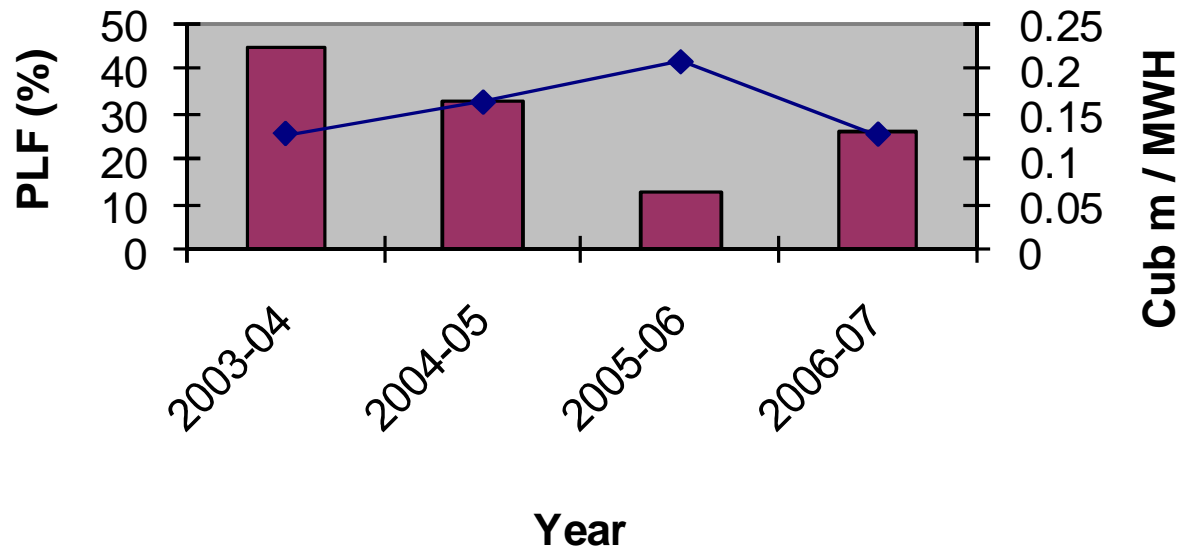
Plant Overall Flow Diagram



Awards & Recognitions:

- “Suraksha Puraskar-2005” Award for OHS performance 2002 -2004 by National Safety Council of India
- Received Best Safety Management & Performance – 2006 certificate from NSCI – Karnataka Chapter
- Commendation Certificate in Environment Management by CII in 2004
- Received 5S Excellence Award CII AOTS – CUMI, 5S Annual Award for excelling in 5S practices, 2006-07
- Received 5S Excellence Award – 2006 (3rd Prize) from CII
- Received 1st prize (jointly) CII AOTS – CUMI, 5S Annual Award for implementing 5S practices, 2005-06

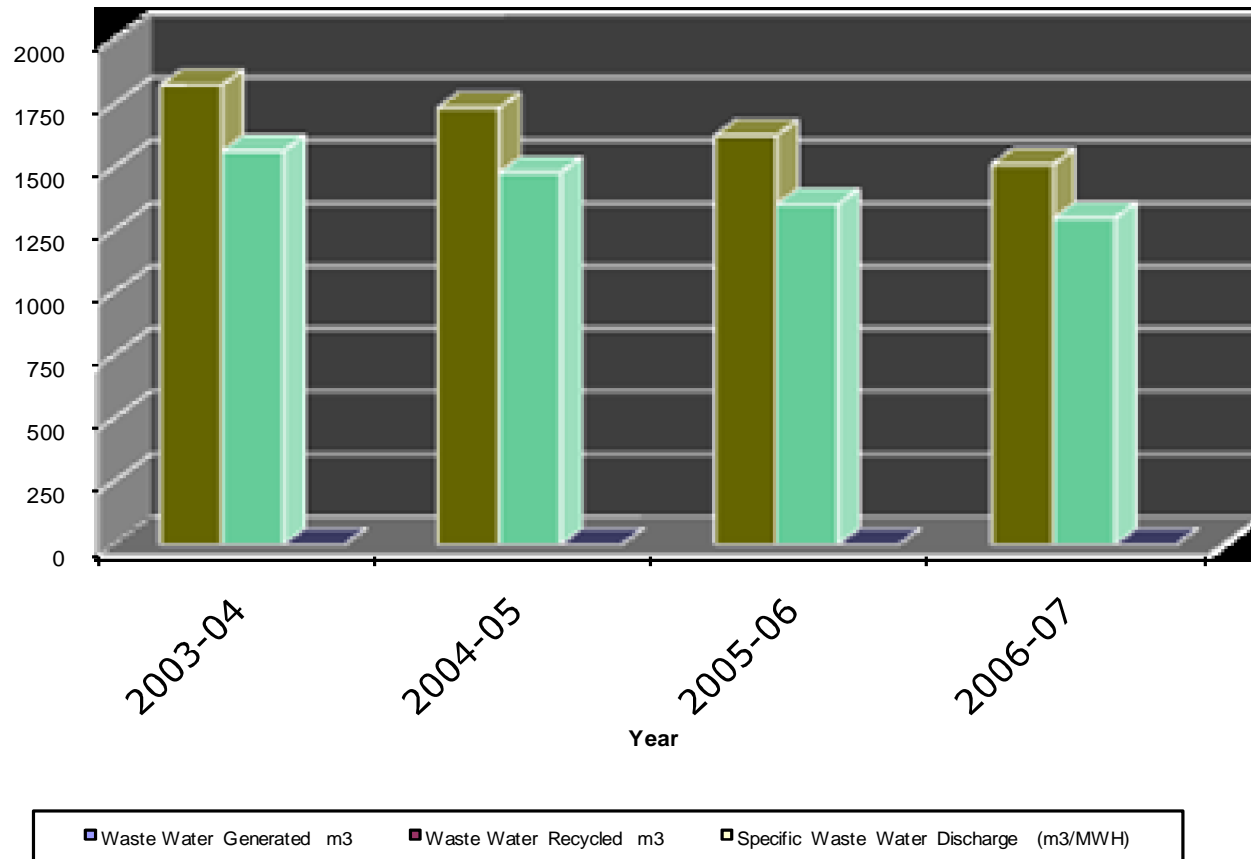
Specific Water Consumption 2003-07



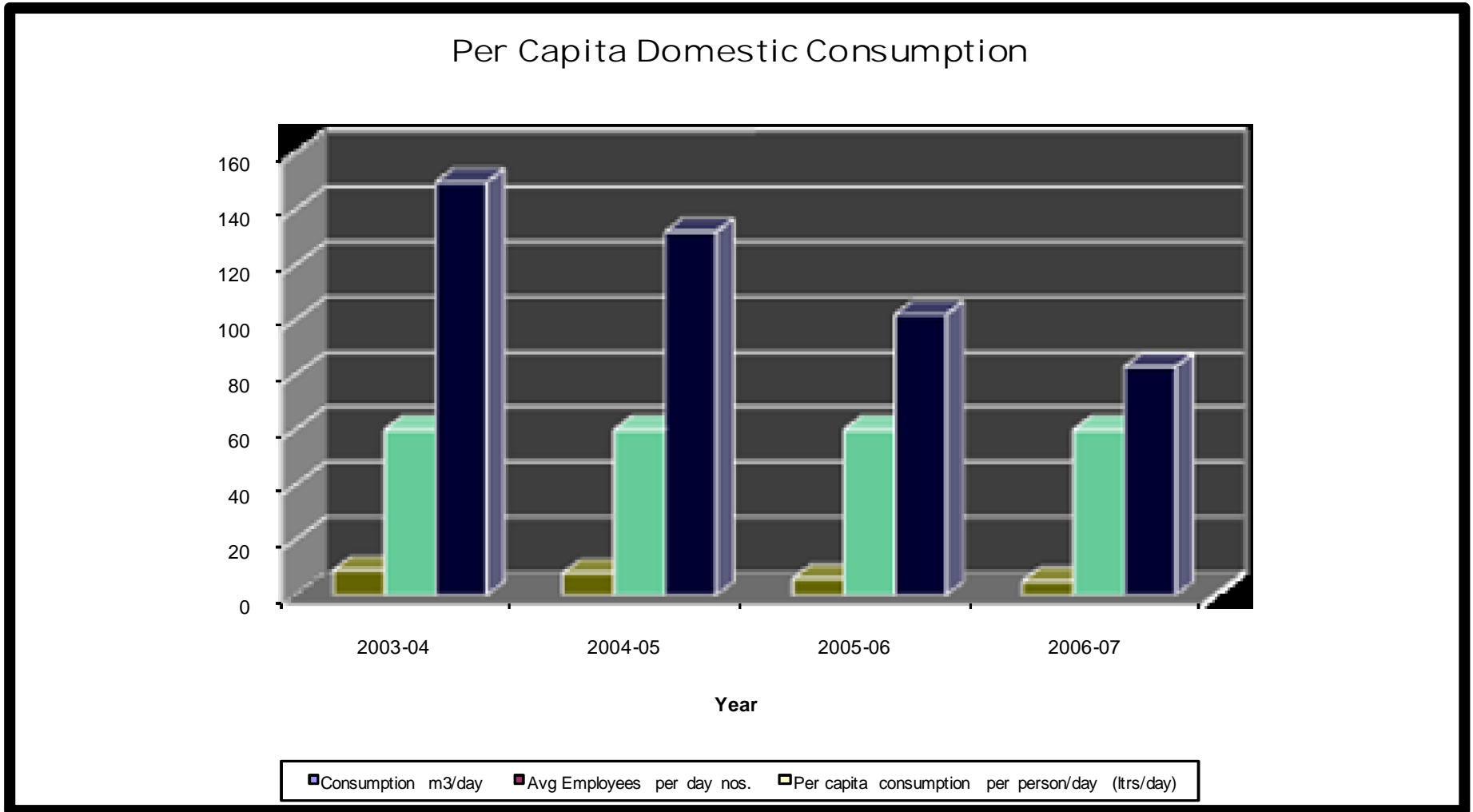
PLF %

Specific Water Consumption (m³/MWH)

Specific Waste Water Discharge



* Note: The remaining Waste Water recycled is lost by natural absorption in the soil, and so specific waste water discharge is zero.



National and International Benchmarks

	GEL	National Benchmark	International Benchmark
Specific Water Consumption (m ³ /MWH)	0.126*	0.276	NA
Waste Water Discharge (m ³ /MWH)	0	NA	NA

Data is from similar power plants in India.

* - Other Power Plants have normal SAC combustor whereas GEL has modified the SAC combustor in Gas Turbine to Ruggedized Combustor. In addition Zero Blow-down from Boilers in GEL. GEL plant can be considered for Benchmarking for Specific Water Consumption and also for being Zero Discharge Plant.

Water Management Projects:

SI No.	Water Saving Project	Annual Savings (in Rs. Lakhs)	Investment Made (in Rs. Lakhs)
1	NOx water injection reduction in GT	9.62	0
2	Vacuum pump seal water drain connected to CRT tank	0.68	0.23
3	Rain Water harvesting Enhancement	0.16	0.26
4	Coalescer provided for air filters	6.41	0.23
5	Natural Pond Expansion	2.16	0.41



Water Management Projects:

SI No.	Water Saving Project	Annual Savings (in Rs. Lakhs)	Investment Made (in Rs. Lakhs)
6	Alternate suction to debris filter flushing pump of condenser pass A, B from Simple cycle PHE outlet	18.6	0.2
7	Providing solenoid valves on Seal water system	1.34	0.2
8	Management Program on Water conservation	2.97	0.35
9	Cooling water Pump lube cooling (town) water changed to sea water	1.26	4
10	Bilge ballast system conversion to sea water	3.5	0.25

Project 1: NOx water injection reduction in 2003

- De-NOx water consumption in Gas Turbines is the major water consumption in the facility.
- The OEM specification for water to fuel ratio was 1.0 to 1.05 ie approx. 10 tons/hr/GT.
- Trials carried out on various ratios for Injection without compromising on NOx emission limits, Heat rate and Plant Performance.
- Best ratio : 0.6 conserving 24000 m³/year.
- Investment made : Zero
- Savings : Rs. 9.62 Lakh/year
Rs. 319 Lakh/year (in Heat Rate)

Project 2: Additional Coalescer Layer in Air Intake System (2004)

- TERI conducted an Energy Audit and recommended for an additional layer of Coalescer on the GT Air Intake Filter.
- This prevented the excess moisture entry to Gas Turbine along with the air.
- This Resulted in improved performance of the Gas Turbine
- The Condensate recovery was also enhanced to an extent of additional 16000 m³ /year.

- Investment made: Rs. 0.23 Lakh
- Savings : Rs. 6.41 Lakh/year (in water)

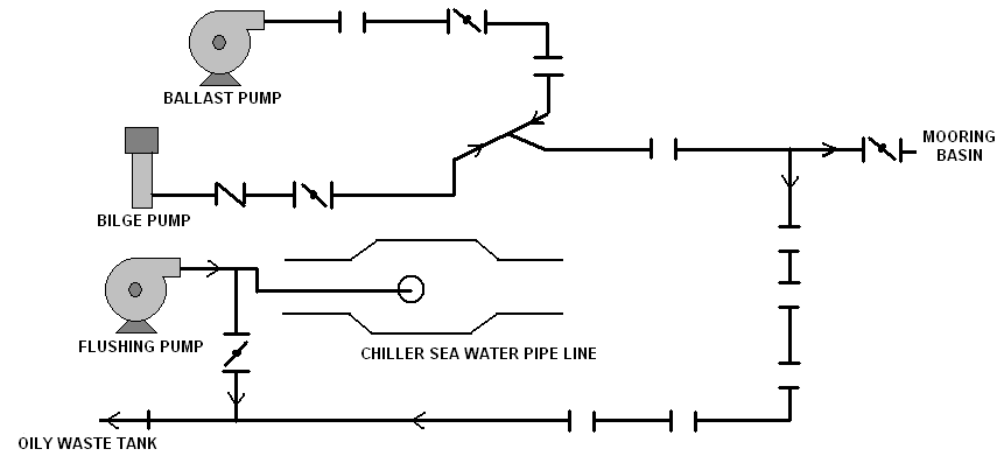
Project 3: Sea water in place of Raw water(2005)

- Sea water was used for flushing of the Debris Filters
- This water contained lot of silt and marine debris which itself was chocking the filter.
- To prevent plant stoppage raw water was used, the consumption of which was 124000 m³/year
- Brain storming was conducted to save water in this respect
- Sea water from Plate Heat Exchanger outlet is free from debris and silt which was suggested as an alternate flush water.

- Investment made : Rs. 0.2 Lakh
- Savings : Rs. 18.2 Lakh

Project 4: Clear sea water usage for flushing 2007

- Chiller debris flushing becomes ineffective due to dirty flushing water in monsoon season, hence raw water was used.
- Modification for using clear sea water for flushing directly reduced the raw water consumption.
- Discharge pressure improved from 1.2 bar to 3.5 bar.
- Cost of implementation
Rs 0.25 Lakh
- Savings per Year
Rs 3.4 Lakh





Monitoring and Reporting Systems:

WATER CONSUMPTION - February 2006							
Date	Service water Meter reading M3	Consumption M3	Town water M3	Sea water M3	DM Water M3	Effluent M3	Fire water M3
2/4/2006	21106	13	0	53024	325	35	0
2/5/2006	21124	18	180	106912	160	0	5
2/6/2006	21135	11	180	51672	317	30	0
...
2/27/2006	21358	7	280	275139	470	0	0
Total		327	5810	4283029	4800	225	30

Total water received as per main inlet line meter for Feb 2006 M ³	5810
Total service water consumed M ³	327
DM Water production M ³	4800
DM Plant Effluent M ³	225
Fire water consumption for the month of Feb M ³	30
Total water consumed	5382
* Total condensate received in Feb 2006, M ³	428
Average Per day, M ³ per hr	14

Monitoring and reporting systems:

- Installation of water meters in all consumption points
- Measurement and recording of the water consumption on daily basis
- Weekly data Analysis
- Maintenance and calibration of meters periodically
- Monthly Feed back on water consumption
- Monthly Reporting of overall Consumption data
- Implementation of the suggestions for water conservation
- Audits on Water management Program once in 4 months through ESHQ management system and discussion of the same during Management review meeting



Management program for water conservation:

Sl. No.	Activity	Responsibility	Proof of Completion	Date of Completion
1	To collect the base line data on the actual consumption of water	AGM-Operations/Chemistry	Water consumption data	31-01-06
2	Identifying possible alternate source of water	AGM - Operations	Report.	15-03-2006
3	Install and maintain the water meters	Manager - EHS	Maintenance schedule	15-03-2006
4	Ensure availability of Rain water harvest lines	Engineer - Civil	Report	10/4/2006
5	Monitor and submit reports on water consumption	Operations Team	Record	30-03-2006
6	Analysis of data	AGM-Operations/Chemistry	Report	On going
7	Adopting methods to reduce water consumption	AGM-Operations/Chemistry	Report	On going

Sustainability

- Regular monitoring- daily, weekly, monthly and yearly basis.
- Issues pertaining to Water conservation(repairs, leaks, modifications, procedural changes, suggestions, float valve condition etc.) taken up in Daily Works Management
- Ensure 100% usage of DM Plant Effluent for gardening
- Management Objective to Reduce Water Consumption
- Water Conservation Concepts carried to employee homes
- Visual Communication in identified places
- Periodic ISO Audit on water consumption

- Check on the water consumption for Fire water spray nozzle, mock drills.
- Implementation of the recommendations from the management program on water conservation.
- Periodic calibration of the water meters installed in 9 locations
- Rain water harvest arrangement maintenance – Quarterly
- Creating awareness to direct and contract employee, community members
- Monitoring water usage house keeping activities through check sheets.

Awareness (Employee and Community involvement)

- Creating Awareness to neighboring community through GMRVF (CSR arm)
- Quiz Competitions on water conservation to Contract Employees.
- Display Boards in Neighboring community Hall.



Future Preservation of Environment:

- Building an additional reservoir to collect rain water
- Arrange for Audits by External Water Conservation Experts
- Rain water collection enhancement by providing additional rain water collection facility to new ware house
- Extending Rain Water harvesting techniques to neighborhood community
- Tree plantation in areas identified by local MOEF officials
- Paperless office
- Jetropa plantation in the waste lands around plant premises
- Claiming Carbon Credits by converting to Gas fuel from

Naphtha



Humility

Entrepreneurship

Teamwork and Relationships

THANK YOU

Deliver The Promise

Learning

Social Responsibility

Respect for Individual