BSES Kerala Power Limited

Energy Efficiency
&
Energy Conservation

Introduction

- Promotion of energy efficiency & its conservation- the strategy to provide power to all by 2012
- Least cost option to augment the gap between the demand and supply
- Nearly 25,000 MW of capacity creation through energy efficiency in the electricity sector alone has been estimated in India
- One unit saved = two units generated.

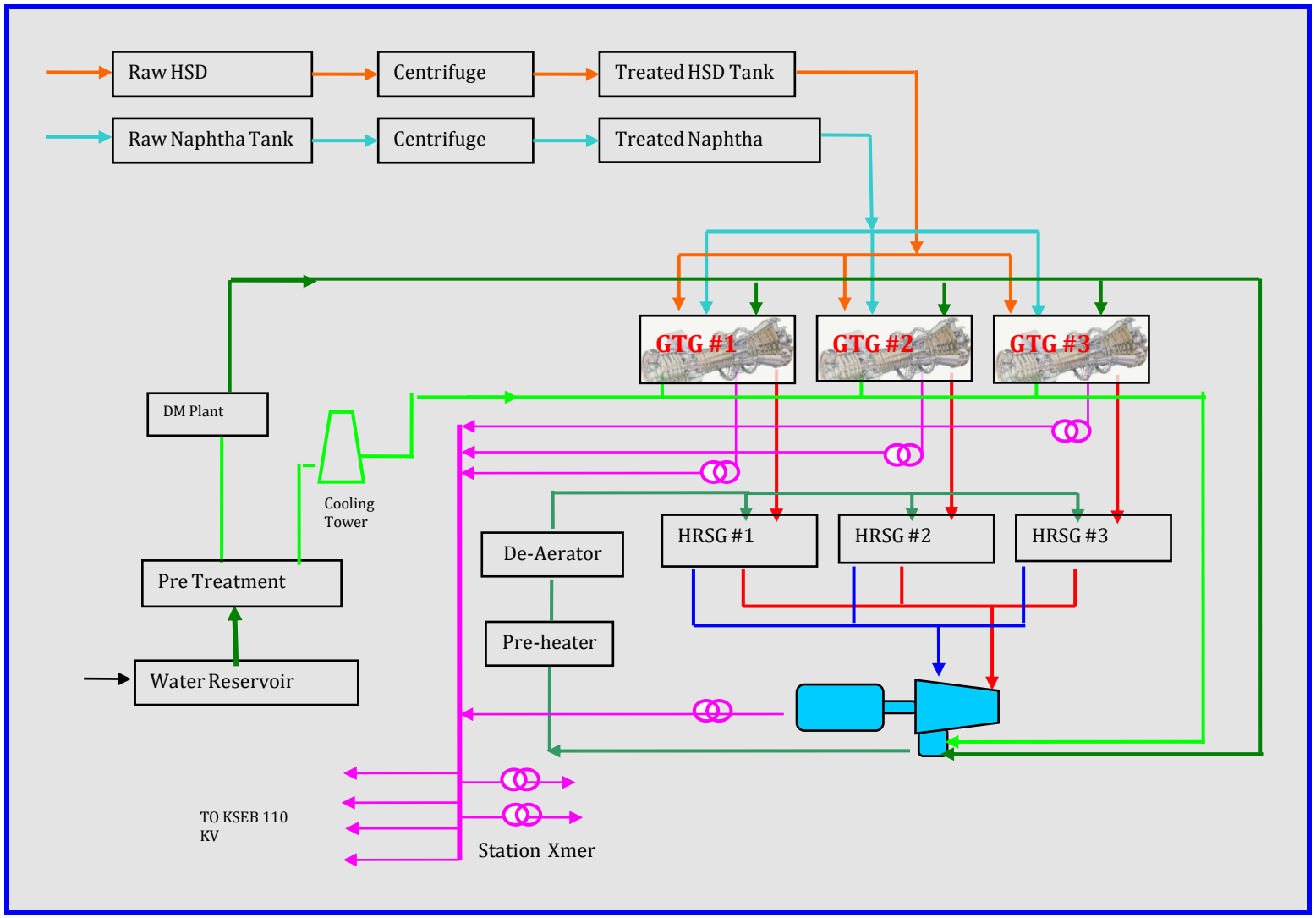
What is energy conservation ?

- Practice of decreasing the quantity of energy used without affecting the process

It's Advantage

- Cost cutting
  - Direct
  - Indirect
- Increased economic growth
- Reduces emission
- Most economic solution to energy shortage
- Preserve our natural resources
- Make money out of energy saving - CDM

Description of the Process at BKPL



Gas Turbine

- 3 X 45 MW GE LM6000 PC NLW
- Dual Shaft Aeroderivative Gas Turbine
- Startup fuel is HSD and main fuel is Naphtha
- Design conditions:
  - Ambient Temperature 28 ^{0}C
  - Relative Humidity 70 %
  - Inlet air Temp (after chilling) 8.88 ^{0} C

HRSG

- Three Nos. of Dual Pressure HRSG
  - Make – Thermax Babcock and Wilcox Ltd, Pune.

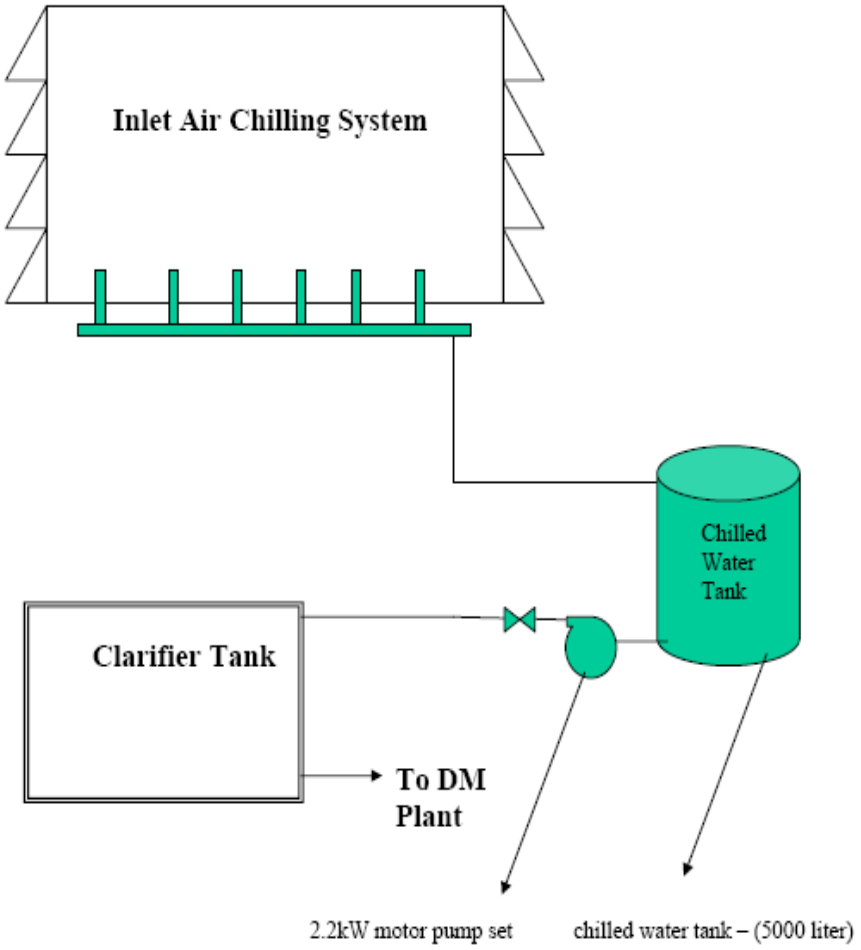
Steam Turbine

39 MW BHEL make

- Model – HNK 71/3.2- 4
- HP – 131.2 TPH, 44.5 Kg/Cm2
- LP – 35.85 TPH, 4.5 Kg/Cm2

Achievements of BKPL in Energy Conservation

Chiller condensate recovery



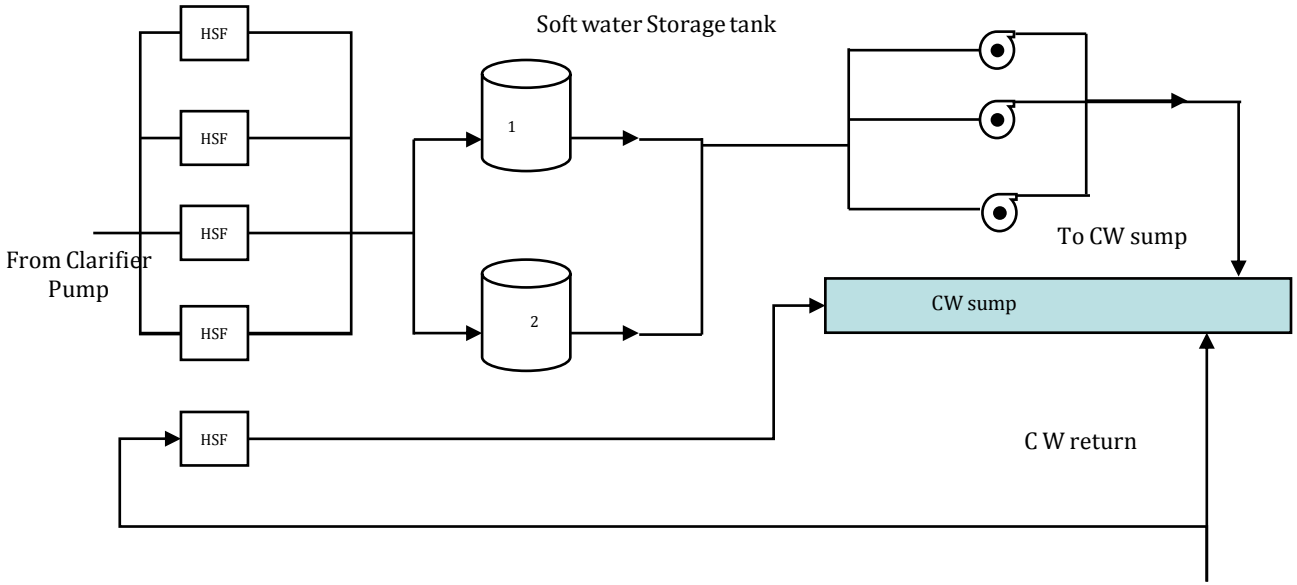
Source of Water- Condensate recovered form air chilling

Quantity – 15m3/ Hr. average

Power required to pump equivalent quantity form river – 4.5 KW.

Net saving 3.5 KW

Conversion of HSF to Side Stream Filter



Recirculation rate -11300 m3/Hr

Evaporation rate - 96 m3/Hr

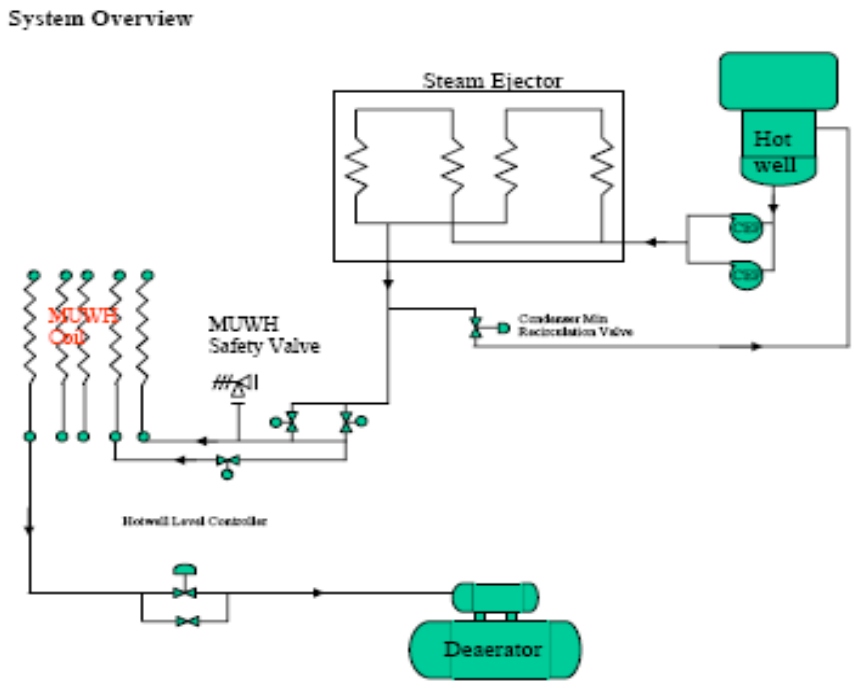
Makeup at 6 COC = 115.2 (96+19.2 (blow down)) m3/Hr

Makeup at 10 COC = 106.7 (96+10.7 (blow down)) m3/Hr

Net saving = 8.5 m3/Hr.

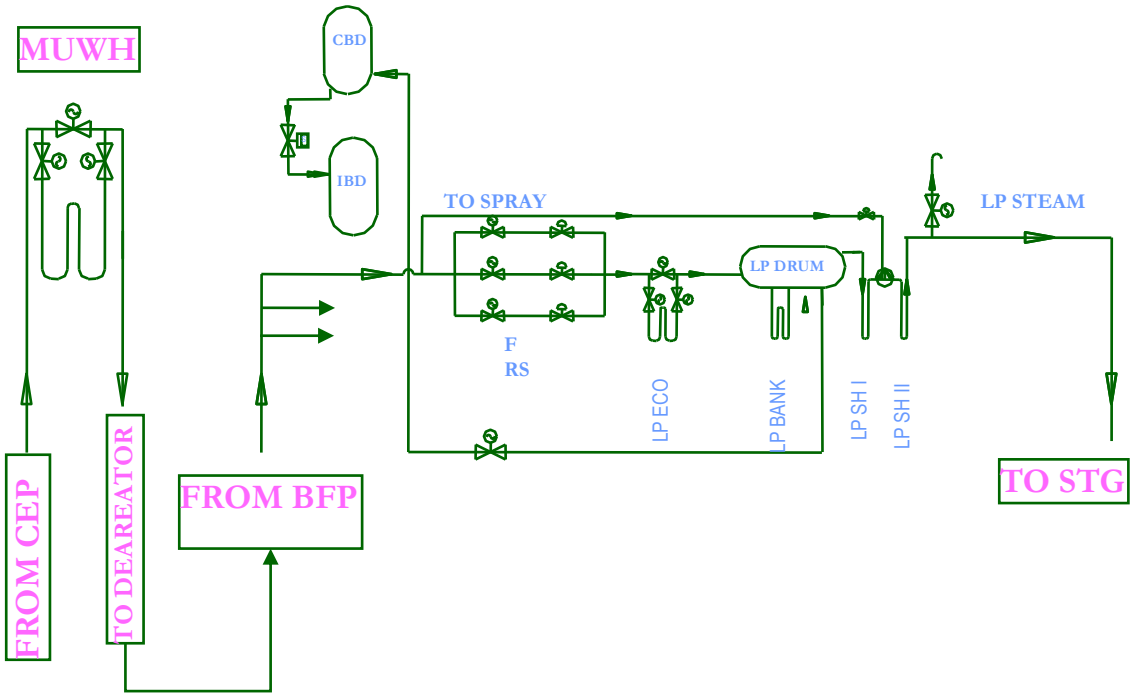
Pump De-staging- Condensate Extraction Pump (CEP)

	Pump Rating	Flow	Pump Head	Stages	Power consumption
	KW	m^3/Hr	Kg/Cm^2	Nos.	KW
Before De-staging	180	195	15.25	5	141.75
After De-staging	180	195	8.46	3	92.72
				Saving	**49.03**



Pump De-staging- LP Boiler Feed Pump (LPBFP)

	Pump Rating	Flow	Pump Head	Stages	Power consumption
	KW	m^3/Hr	Kg/Cm^2	Nos.	KW
Before De-staging	55	50.65	25	5	35.19
After De-staging	55	50.65	19.32	3	24.16
				Saving	**11.03**



Energy Efficient Hollow FRP (Epoxy Coated) CT Fan Blades

CT Cell No.	Before blade change			With Aerotech blade			Saving (KW)	% Saving	Air flow increase (%)
	Velocity (m /s)	Flow (m3/s)	Power (KW)	Velocity (m /s)	Flow (m3/s)	Power (KW)			
1	7.02	388.49	74.68	7.35	407.04	51.39	23.29	45.32	4.56
2	8.25	456.60	70.21	9.89	547.42	55.71	14.50	26.03	16.59
3	8.20	462.10	70.20	9.90	547.98	64.36	5.84	9.07	15.67
4	9.27	513.65	92.28	9.27	513.87	66.09	26.19	39.63	0.04
5	7.78	435.98	83.90	7.88	441.58	57.58	26.32	45.71	1.27
6	8.98	503.11	83.16	8.60	476.25	61.55	21.61	35.11	-5.64
7	7.50	416.70	71.00	9.50	526.40	65.20	5.80	8.90	20.84
						Total Saving	123.55		7.62

Efficiency improvement of Main Cooling Water Pump

- Original design of Cooling water pump was for 2X 60% capacity
- Single pump was operated at a off design condition
- Pump efficiency was reduced to 54%
- New pump installed in place of old pump with higher flow and efficiency (86%), maintaining the same motor.
- Net gain of 243 KW due to increase in the STG vacuum.

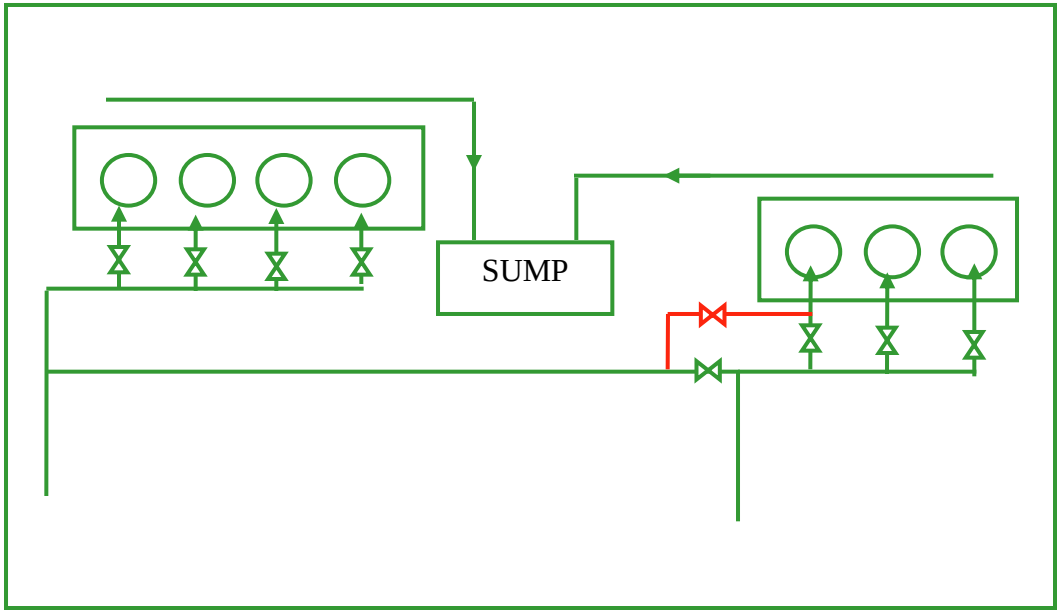
Installation of Vacuum pump

- Steam ejectors were used to maintain condenser vacuum.
- Direct saving of 90 KW due to the saving of the steam used by ejectors.
- 45 Minutes saving in plant cold startup time
- LP steam set point could be reduced to 3.9 KSC form 4.5, resulting in a saving of 220 KW in STG.

Cooling Tower Cell interconnection

- Two cooling towers with 3 cells and 4 cells
- Heat load distribution between the two CTs are not uniform.
- Hence we interconnected the cell No 3 of 3 cell CT with the inlet of the 4 cell CT.

Expect a drop of 1^0C in the cooling water inlet temperature to STG condenser, which in turn will increase the condenser vacuum and hence the STG output.



HPBFP Voith coupling cooler modification

- HPBFP discharge pressure maintained at 56 KSC to control the working oil temperature.
- Cooling water line of working oil cooler modified.
- With this the feed water pressure could be reduced to 52 KSC / 47KSC at full load and part load respectively.
- A saving of 27.5 KW at full load and 35 KW at part load could be achieved.

Other Energy Saving Measures

	Project	Saving	Unit
1	Rain water harvesting of STG-PCR Building	3171	m3/Year
2	Lighting Transformer (Coo lite) with energy saver option	4	KW
3	Reduction of set pressure of air compressor from 7.2 bar to6.7 bar and attending air leakages	17.51	KW

Other Energy Saving Measures Contd….

Sr. No	Activity	QTY	Saving (KW)
1	CRT monitor changed to LCD Monitor for all office / Process computers	59	3.11
2	Total 30 Nos. of 125W sodium vapor lamp replaced by 70W metal halide lamp	30	1.65
3	Various circuit modification done to avoid unnecessary lighting during day and night time		1.7
4	Total 150 Nos. of ordinary tube light ballast replaced by electronics ballast	150	2.85
5	Replaced 250W MV lamp by 150W metal halide lamps	3	1.05
6	Replaced 400W HPSV lamp by 400W MH lamp and done various circuit modifications.	10	5.6
7	Replaced 400W MV lamp by 250W metal halide lamp and done lighting circuit modification to avoid un necessary lighting	5	7.15
8	Replaced 600 filament indicating lamps by LED lamps.	600	1.14
9	150W SV Replaced with 150Watts MH & 125W MV Replaced with 70Watts MH	06	0.33
10	Lighting circuit modification and installation of energy efficient lights.(2 * 40W * 9 NOS fitting replaced by 2*36W * 7 NOS)	7	0.855
11	Lighting circuit modification and installation of energy efficient lights.(2 * 40W * 12 NOS fitting replaced by 2*36W * 8 NOS)	8	0.54
12	Lighting circuit modification and installation of energy efficient lights (250W * 4 MV High bay Fitting replaced by Street light fitting with 70W & 1 MH fittings)	1	0.93


THANK YOU