

Welcome



Promoting Green Technology

**Energy conservation Activities at
GACL**



R . SUDHAKAR
ENERGY MANAGER
GACL – DAHEJ
CONTACT NO. 09909029665

ABOUT GACL

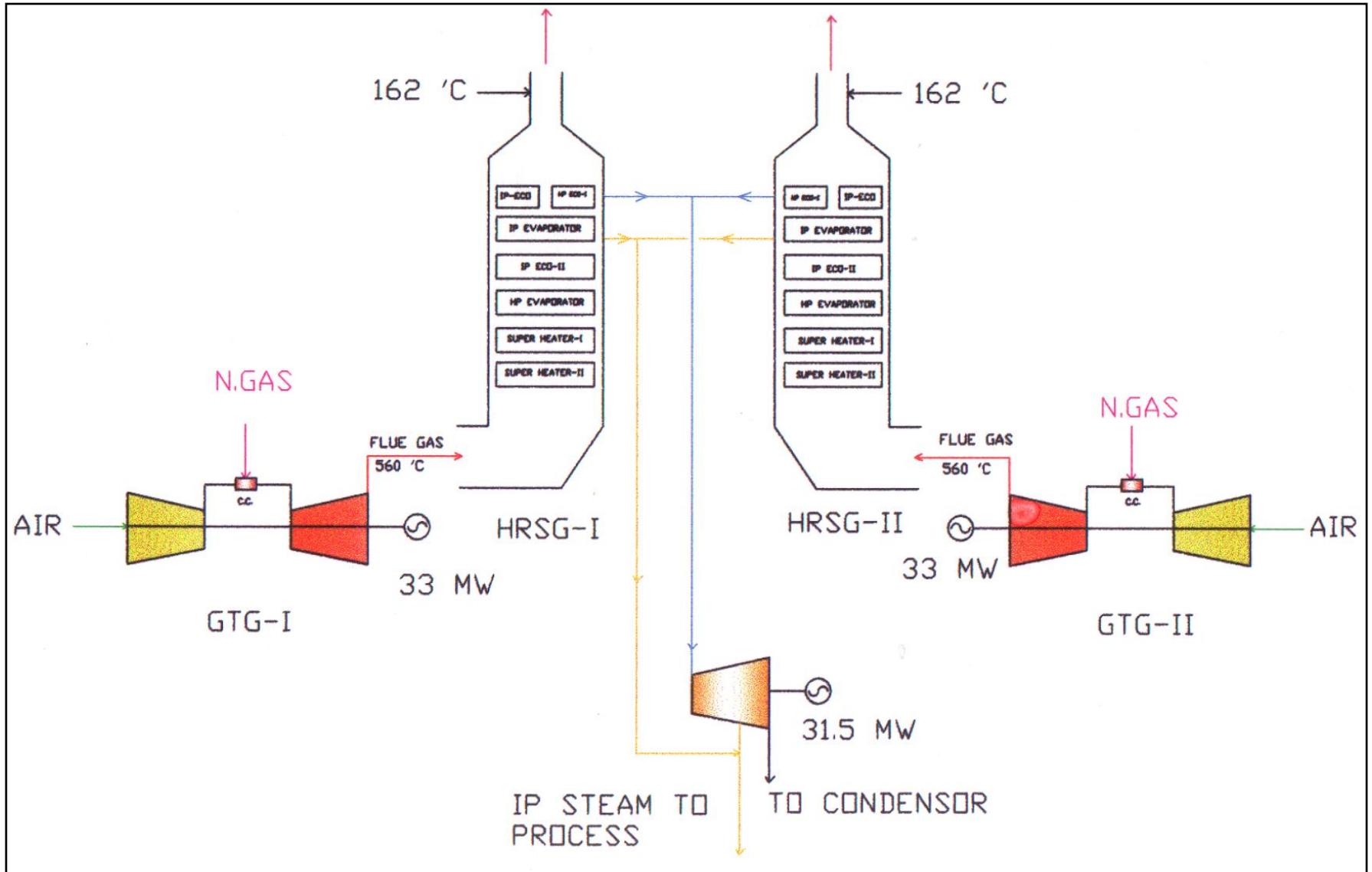
- 1. Gujarat Alkalies And Chemicals Limited is a Company promoted by Government of Gujarat in 1973.**
- 2. The company is the leading producer of Caustic Soda in the country with market share of around 16 %.**
- 3. The first Chlor-alkali Plant was commissioned in 1976 at Baroda with UHDE Mercury Cells and Chlor-Alkali unit at Dahej commenced in the year 1998**
- 4. The company is the first in the country to convert the Mercury Cells into UHDE Membrane Cells.**
- 5. Presently Company is producing Caustic Soda and Chlorine at two Complexes at Baroda and Dahej. Both the plants are operating on UHDE Membrane Cell Technology with a capacity of 1250 TPD**

90 MW POWER PLANT

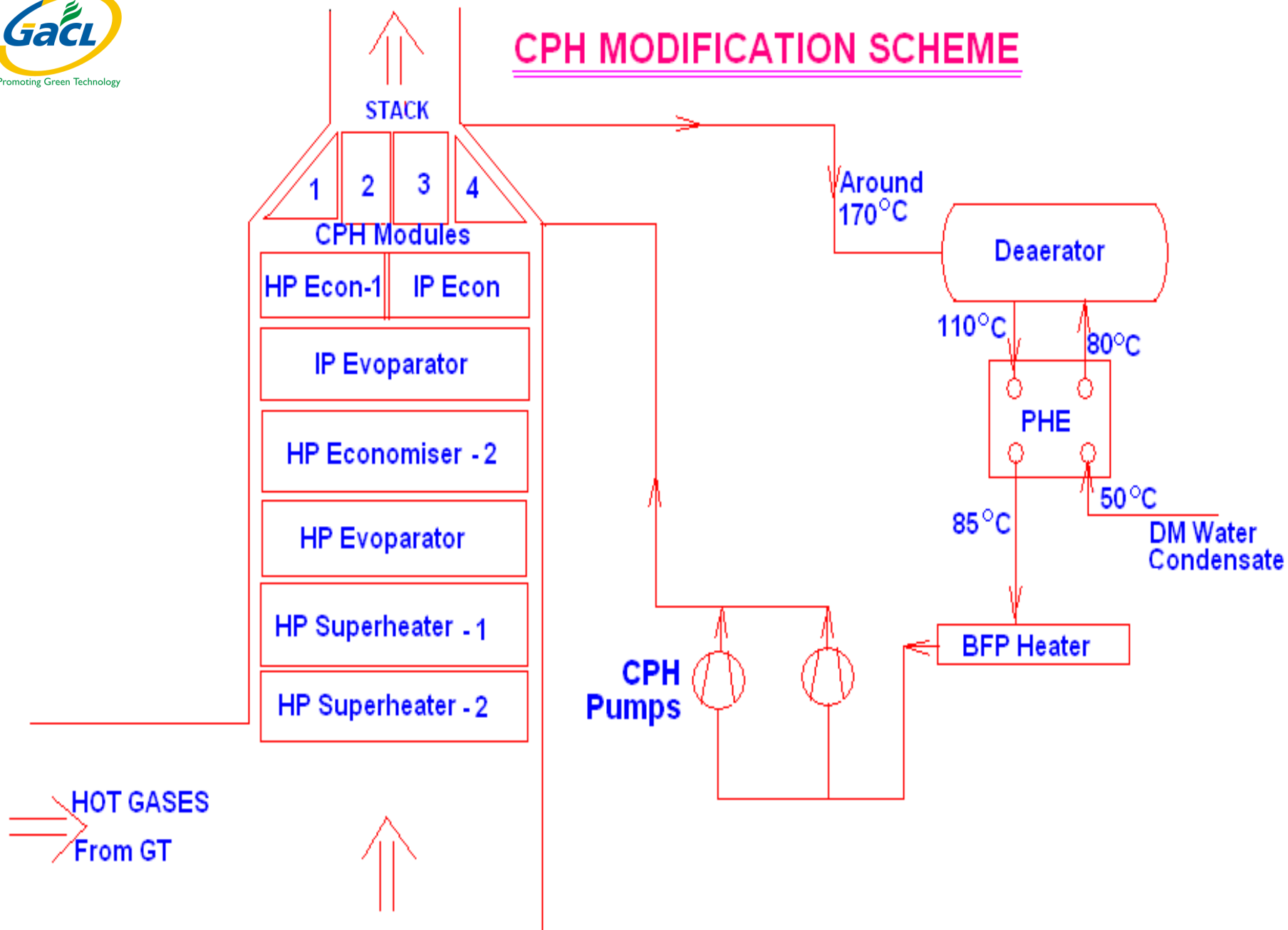


Welcome to GACL Power Plant

PERFORMANCE ENHANCEMENT OF WASTE HEAT RECOVERY UNIT – II BY ERECTING CPH



CPH MODIFICATION SCHEME



CPH ACHIEVEMENT

- Installed Condensate Pre Heater (CPH) modules above HP & IP Economizer modules in the flue gas path of HRSG-1.
- HRSG-1 present stack out let temp. is 180 °C, which has come down to 162 °C, after installation of CPH.
- After installation of CPH boiler feed water taken from De-aerator, circulated through CPH, which caused the feed water temperature raised from 84 °C to 170 °C. This increase of $\Delta T = 86$ °C has reduced the steam injection to De-aerator system for de-aeration purpose.

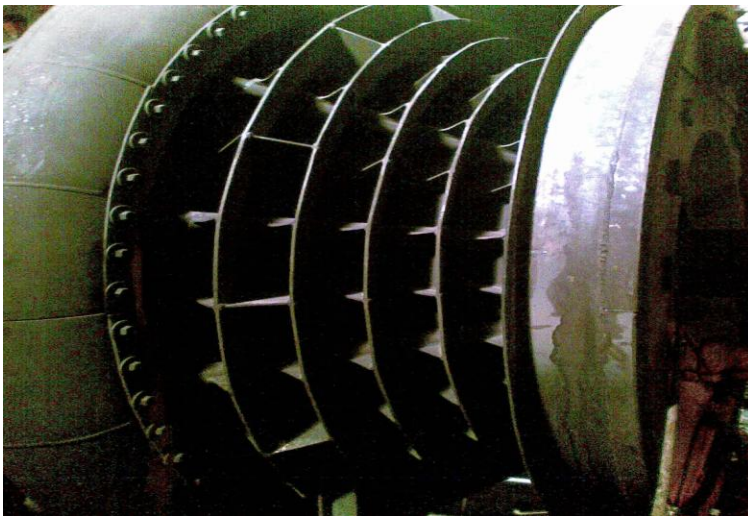
CPH ACHIEVEMENT

Description	Quantity	Unit
Flow of water	24	MT/hour
Water inlet temp	84	C
Water outlet temp	170	C
Heat gain	2.064	Mkcal/hour
Combined cycle heat rate	1840	kcal/kwh
Equivalent Kwh generation per hour	1121	kw
Equivalent saving per year considering 350 working days	94.22	Lakh kwh
Amount saved per year	401.4	Lakh Rs.

Details of saving due to up-rating of GT-1

Description	Quantity	Unit
Average opencycle Heat Rate before GT-1 Uprating	3112	Kcal/kwh
Average open cycle Heat Rate after GT-1 Uprating	2938	Kcal/kwh
Improvement in open cycle Heat Rate	174	Kcal/kwh
Total NG Saved per year basis (330 days)	96.15	Lakh SM3
Total saving per year	1442	Lakh Rs.
Total cost of Uprating	472	Lakh Rs.

Details of saving due to up-rating of GT-1



Energy saving STG due to steam path Over Hauling

Description	Quantity	Unit
STG Generation before overhauling	22.5	MW
STG Generation after overhauling	28	MW
Increase in Generation	5.5	MW
Additional Generation in a day	1.32	Lakh kwh
Additional Generation per year	462	Lakh kwh
Amount saving per year	1275	Lakh Rs.

140kw Energy Conservation Turbine Installation across PRDS at PA Plant

Description	Quantity	Unit
Steam Pressure before control Valve	10.5	kg/cm2
Steam Pressure after control Valve	6.5	kg/cm2
Consumption of Steam quantity	13	MT/hr
Installed Energy Conservation Turbine	140	kw
electrical Energy saved per year	11	Lakh kwh
Amount saved / year	28	Lakh Rs
Expenditure	40	Lakh Rs

SELECTION OF ENERGY CONSERVATION TURBINE

- Record average annual consumption of steam MT/hour.
- Pressure before control valve
- Pressure after control valve and any intermediate pressure to avoid complications after installation of ECT.
- The ECT out put drastically affects on small change in Steam flow, inlet pressure and outlet pressure of control valve.

ECT Performance

Steam TPH	Nozzles in Line	Nozzles Blocked	Out-put in KWH
13	34	11	140
11	29	16	87
9.5	26	19	66

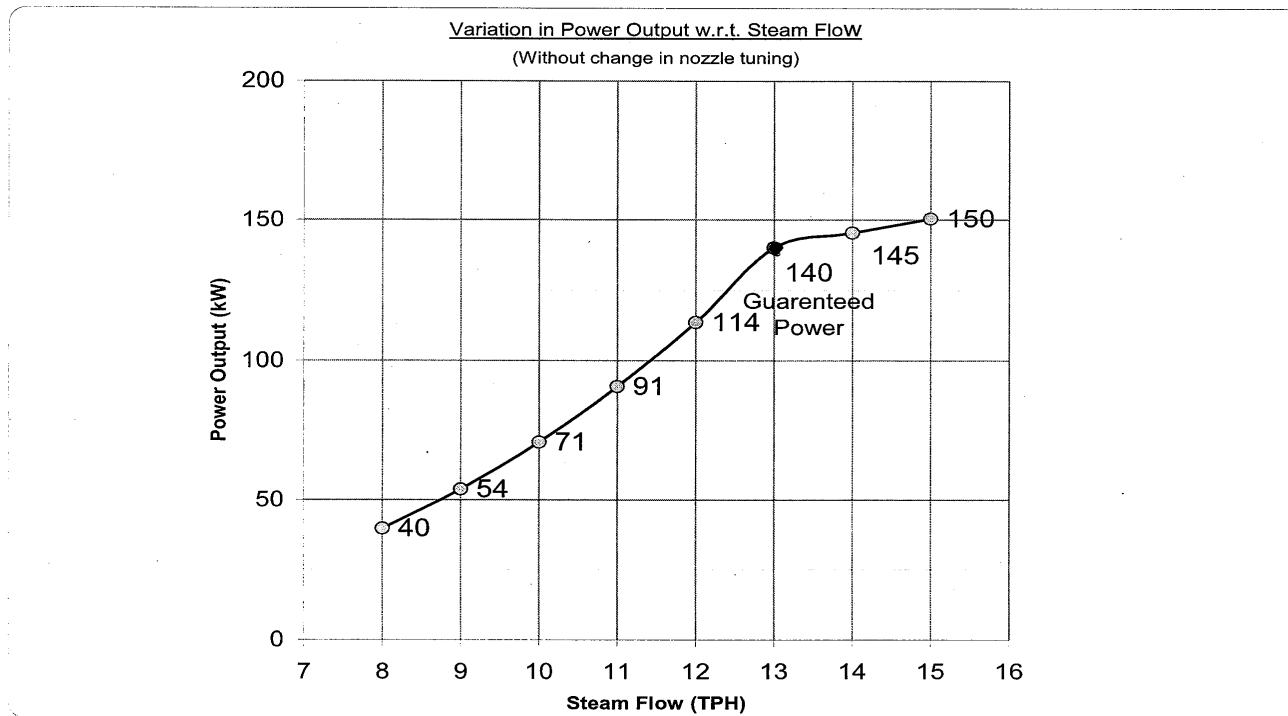
PERFORMANCE CURVE OF ECT

TURBOTECH PRECISION ENGINEERING PVT LTD.

0709-GACL

REV: 00
DATE:27-11-08

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Note: The guaranteed power is specified at design point. Remaining values are indicative only.

140 kW ENERGY CONSRVATION TURBINE (ECT)



Replacement of conventional magnetic chokes with energy saving Electronic Chokes



- Replacement of conventional magnetic chokes with energy saving Electronic Chokes (1500 nos.) for electrical energy savings and reduction of failure of tube rods. Slowly the magnetic chokes will be phased-out.
- Electrical energy saved
kwh-Lakhs : 0.84
- Invest . Rs.(Lakhs) : 3.00
- Saving Rs. (Lakhs) : 3.68

Solar Cooking system installed for main canteen for cooking 500 persons



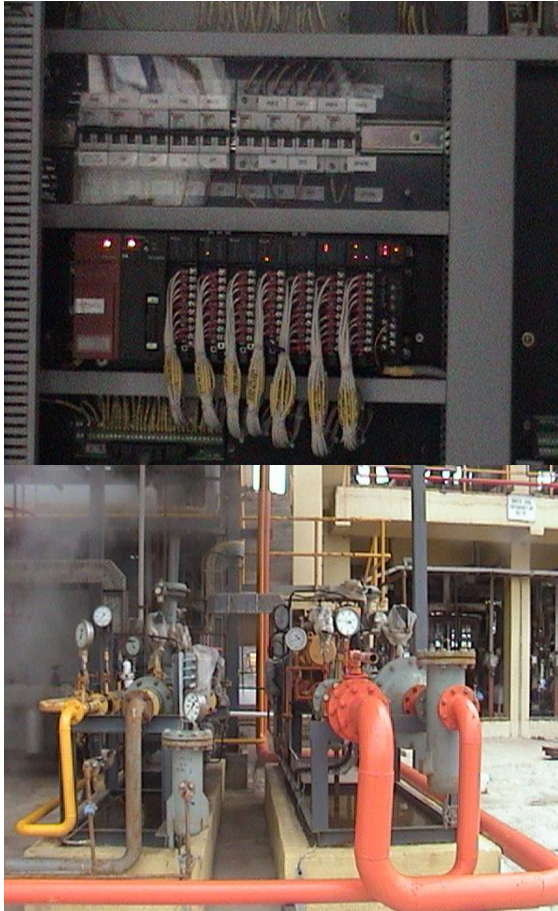
- Solar Cooking system installed for main canteen for cooking 500 persons. In place of Natural gas / LPG cylinders for cooking solar thermal system installed. Calculations per year basis is as given below :
- NG/LPG energy saved
MKcal : 705.60
- Investment Rs.(Lakhs) : 25.00
- Saving Rs. (Lakhs) : 8.25

Installation of variable frequency drives to suit process requirement



- Variable frequency drives installed to suit the process requirement to control the process variations on requirement basis. In CaCl₂ plant 132kw blower used to run on 3000 rpm and was running with damper closed at 60% and was consuming 115kw. After providing VFD at 60% speed power has come down to 40kw which saved 75kw and reduced maintenance problems too. (70 nos.of VFds were installed)
- Electrical energy saved
kwh-Lakhs : 2.78
- Investment Rs.(Lakhs) : 8.00
- Saving Rs. (Lakhs) : 12.06

Utilizing hydrogen in old CCU furnace as fuel instead of Natural Gas which saved the N.G. consumption.



- The CCU-1 (old) furnace was run with natural gas. By modifying the burner system to suit for hydrogen and natural gas dual firing system, which more or less the hydrogen gas only utilized instead of natural gas. After this modifications, the natural gas saved to the tune of 11963 Mkal/annum (17.55 lakhs NM³/Annum of Natural Gas)
- Investment : Rs. in lakhs 20 . 00
- Saving : Rs. in lakhs 169 . 62

TIMELY REPLACING ENERGY EFFICIENT MEMBRANES



- **Timely Replacement of energy efficient new membranes in place of old membranes and recoating of anode and cathode cell elements. Every four years old membranes used to be replaced by new latest energy efficient membranes to avoid the energy wastages.**
- **Electrical energy saved**
kwh-Lakhs : 99.85
- **Investment Rs.(Lakhs) : 405.00**
- **Saving Rs. (Lakhs) : 436.33**

INSTALLATION LIGHTING TRANSFORMERS



- **Lighting transformers were installed to maintain the normal 230 volts and reduced the electrical energy consumed by luminaries.**
- **Electrical energy saved**
kwh-Lakhs : 2.00
- **InvestmentRs.(Lakhs) : 2.00**
- **Saving Rs. (Lakhs) : 4.00**

Energy Efficient FRP blades replaced in place of existing FRP blades in CCP CT



- **Energy Efficient FRP blades replaced in place of existing FRP blades in CCP CTID Fans which saved Electrical Energy**
- **Electrical energy saved**
kwh-Lakhs : 2.00
- **InvestmentRs.(Lakhs) : 2.00**
- **Saving Rs. (Lakhs) : 4.00**

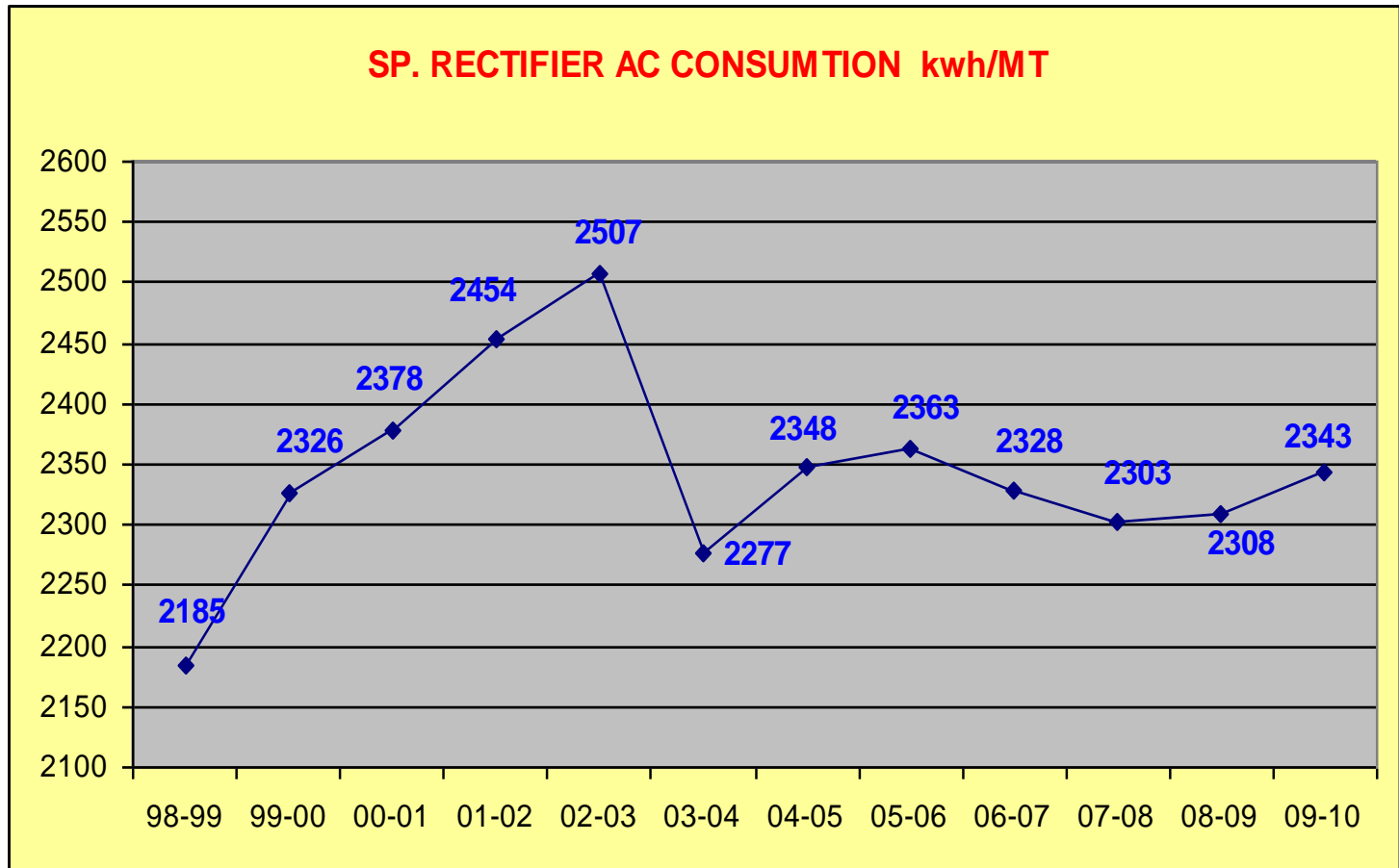
OTHER ENERGY SAVING MEASURES

- Overhauling of pumps and replenishing the defective parts.
- Replacement of high energy consuming lighting luminaries with energy efficient luminaries.
- Installation of power factor correction equipments.
- Cleaning and de-scaling of heat exchangers.
- Maintaining good quality of cooling Tower water.
- Stopping air leakages.
- Stopping steam leakages.
- Providing proper insulation over steam lines.
- Condensate heat recovery.
- Replacement of oversized equipments with suitable rated equipments.

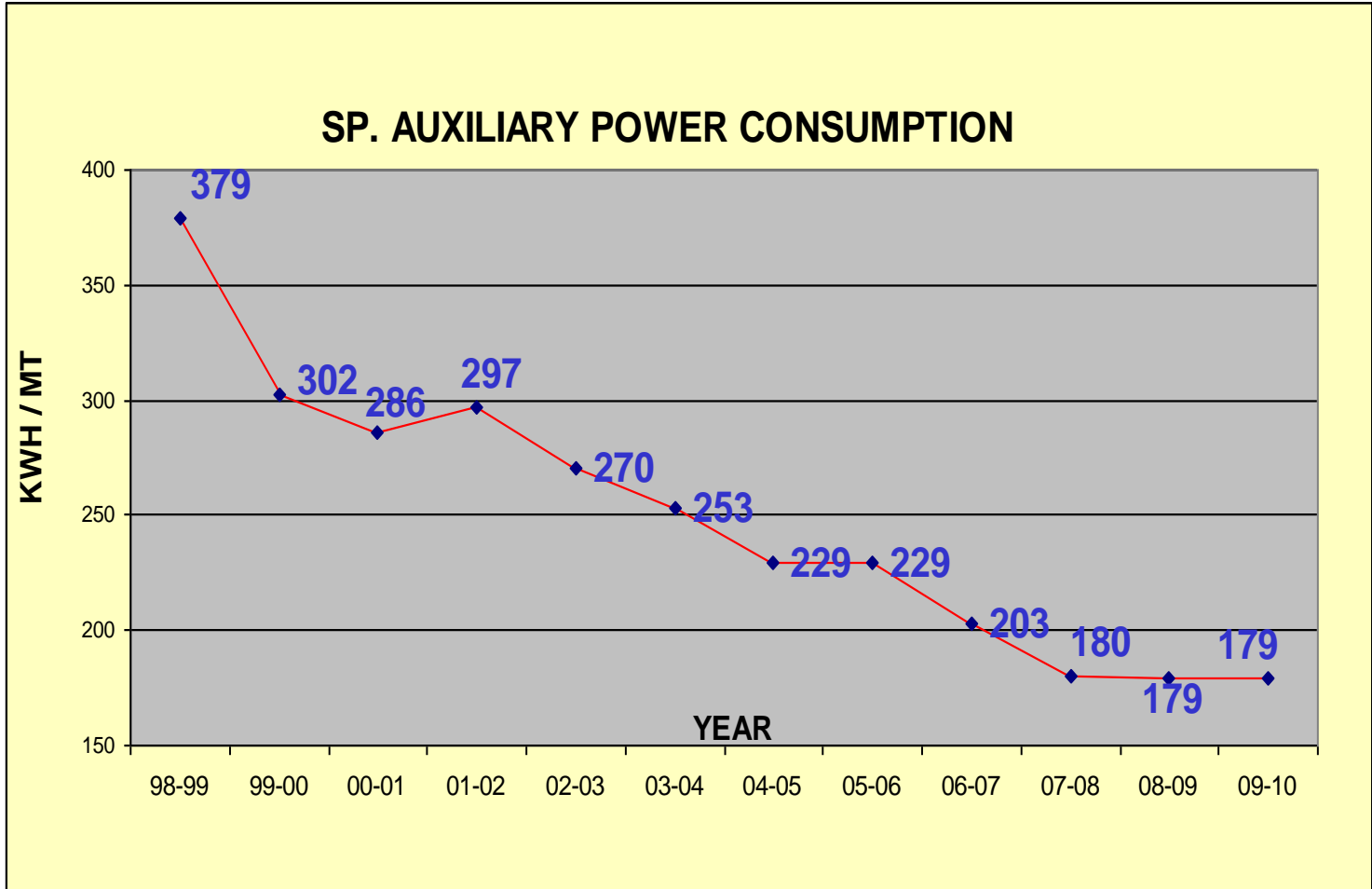
GACL – INITIATIVES BIG WAY

- **GACL has switched over from Naptha to N.G. to mitigate the Global warming and also enjoying the Carbon Credit benefit.**
- **GACL has installed 69 MW wind power plant at Kutch area in Gujarat to promote green energy as a part of mitigating global warming**

SP. RECTIFIER POWER CONSUMPTION



SP. AUXILIARY POWER CONSUMPTION



GACL : DAHEJ

ENERGY CONSERVATION MEASURES CARRIED OUT AT GACL – DAHEJ DURING PERIOD -2003-2010

SI N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expenditure in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
1	Steam Turbine installation across process steam throttling control valve at PAP to save 140 kw power.	3.60	15.48	40.00	31.01	Mini STG
2	By adding two stages in IP BFP, one pump out of two running was stopped by which electrical energy was saved.	1.60	3.04	3.00	325.66	Pump Modin.
3	By connecting drinking water line of CSP to existing over head drinking water tank 3.7KW pump has been stopped permanently which was running earlier continuously.	0.31	0.93	0.00	0.00	Pump Modin.
4	One no. 45 kw pump Switched off instead of running two nos. by incorporating bigger size impeller	1.07	2.14	0.20	30.84	Modin. Of pump.
5	One 18.5 kw ETP pump replaced with 9.3 kw pump to save the power and meet the same process requirement	0.79	1.58	0.00	0.00	Correct rated pump.
6	Out of three running pumps one pump was stopped to cater the flow requirement with two pumps only in CCP	1.94	3.88	1.00	85.05	Optimizing pump oprn.
7	By stoppage of drinking water pump energy is saved	0.19	0.38	0.00	0.00	Feeding from existing overhead tank.

Sl N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expenditure in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
8	Replacement of 2nos of overrated motors with suitable motors.	3.78	11.04	1.50	44.84	Correct rated motors.
9	Electrical Energy saving by reduction of receiving and transferring of effluent batches.	0.38	1.20	0.10	27.50	ETP pumping power cons. Saved.
10	By using CLW to PAP pump i.p.o. CLW to CT MAKE UP pump for Cooling Tower makeup.	0.18	0.61	0.10	44.00	Optimization of pumps.
11	By using New DM to CCP pump i.p.o.02 nos. old DM to CCP pump for De-aerator makeup. (2*25)	0.17	0.59	2.10	1229.00	Optimization of pumps.
12	Performance improvement of Low pressure cooling water Pump #B, Pure brine pump and CCU CT Pumps 3 nos. (Efficiency improved from 40 %, to 60% by checking pump, motor for poor efficiency and specially impeller Condition maintenance & overhauling)	8.09	36.40	0.30	3.01	Energy Audit Suggestion
13	Reducing the pressure in the line of process air to the plant with the help of PRV and reducing pressure set points in air compressor.	0.43	0.86	0.00	0.00	Air Pressure reduction.
14	Energy saved by stopping one number 75 KW, Bleach Lye Circulation Pump in place of two pumps running continuously.	3.48	6.92	0.00	0.00	Pumping linked with Redox meter

Sl N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expenditure in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
15	Saving of thermal energy by attending various steam leakages (21 places) and reducing steam pressure in the pipe line the safety valve frequent pop-up is stopped.	0.00	70.40	3.00	0.00	Attending steam leakages.
16	Thermal Energy Saving by Replacement of Heat Exchanger tube bundles with new ones	0.00	94.00	5.00	17.55	Replacement of HE tube bundles.
17	Switching off of 2.2 MVA idle charged transformer power saved	4.59	9.18	0.00	0.00	Saving of no load losses.
18	By maintaining the power factor above 0.95 lag amount saved	0.00	4.91	0.00	0.00	Power factor improvement
19	Switching off 5 nos air compr. and installing high capacity screw compr. 1no.	5.13	14.98	20.00	440.59	Energy Efficient Compressors.
20	CS Plant Chilled Water Spare capacity utilization at PAP Control Room	2.35	8.13	10.00	448.00	Optimization of Chilling water capacity.
21	Change over from Caustic regeneration system to Alumina regeneration system. By this one no. 11kw centrifuge system stopped.	0.87	3.92	10.00	842.91	Process modification.
22	New efficient membrane has been replaced for all old elements of Electrolizers by which considerable amount of power is saved.	395.33	1186.00	1500.00	417.37	Re-membraning.

SI N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expendi- ture in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
23	By replacing 405 Nos. of cell elements and recoating the old anode and cathodes elements, the electrical energy saved.	81.46	253.35	405.00	527.53	Re-membraning.
24	Electrical Energy saved by Re-membraning & Recoating of Cell Elements 405 Nos.	99.84	345.45	405.00	428.00	Re-membraning.
25	Flarable Low pressure NG utilized in place of HP NG by which cost reduction is achieved. With HP Gas cost is 110.33 lakhs. With LP Gas cost is 73.67 Lakhs.	0.00	36.66	0.00	385.00	LP NG Utilization.
26	Waste Hydrogen Gas used as fuel instead of Natural Gas in New CCU Furnace.		244.22	20.00	27.02	H2 Gas utilization instead of NG.
27	By utilizing hydrogen in old CCU furnace as fuel instead of Natural Gas after modification of burner system which saved the N.G. consumption.		169.62	20.00	38.91	H2 Gas utilization instead of NG in CCU
28	Solar Cooking system installed for main canteen for cooking 500 persons.	2.5 Gas Cylinder /Day	8.25	25.00	1106.00	Solar cooking system.
29	Mini Steam Turbine installed to recover the power from IP steam extraction goes to Deaerator.	31.68	60.19	129.00	707.26	Mini-STG.

SI N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expendi- ture in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
30	Improvement in Heat Rate of Power Plant by providing N.G. preheater	0.00	4.17	2.00	158.27	N.G. pre-heater provided in LNG Line
31	Modification of HRSG-1 to recover more heat from the hot gases to enhance generation of STG	130.20	380.18	5.00	4.34	HRSG-1 modification.
32	Cooling tower performance improvement by revamping of cooling towers 2 nos.	2.43	7.10	15.00	697.18	Revamping of CT.
33	Installation of PHE in Feed Water circuit & modifications in HRSG-2 duct to avoid the short-circuit of hot flue gases ,the stack temperature was brought down from 200 °C to 162 °C by which thermal energy saved.	0.00	768.37	40.00	17.18	HRSG-2 Modification.
34	GTG-1 overhauled and replaced the worn out turbine 2nd, 3rd path buckets and blades, which has given a better performance and reduced the heat rate from 3091kcal/kwh to 3040 kwh/kwh in open cycle.	9206526 SCM/YR NGSAVED	1381.00	473.00	113.03	GTG-1 Overhauling
35	STG Steam path cleaning and removal of mechanical restrictions for improvement in efficiency.	462.00	1275.12	13.98	0.13	STG steam path cleaning.

SI N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expendi- ture in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
36	HRSR - 1 modification (CPH installation) to recover further waste heat energy by reducing stack temperature from 205 deg cent. To 165 deg. cent.	94.23	401.42	125.00	3.74	CPH Installation.
37	Installations of 5nos variable frequency drives for different applications.	6.97	20.35	5.00	81.08	VFDs.
38	4nos. of variable frequency drives installed to suit the process requirement and enhancement of production levels.	8.41	26.15	4.00	50.48	VFDs.
39	Specific auxiliary electrical energy reduction by suitably designing the common equipments and installation of variable frequency drives to suit the enhancement of production levels:	34.59	107.57	21.00	64.42	VFDs.
40	VFDs INSTALALTION - 5 NOS.	2.76	9.55	8.00	276.44	VFDs
41	VFDs INSTALALTION - 2 NOS.	0.28	1.27	3.75	1389.00	VFDs
42	VFD Installation for De-OXO Blower for Electrical Power Saving	1.18	5.31	8.00	549.91	VFDs
43	VFD Installation for De-OXO Blower for Stopping Hydrogen Venting and using for CCU Plant in place of NG(200nm3 per hour H2 equivalent to 50Nm3/hr. NG saved).	396000 NM3 NG	59.40	considered in sr.no. 5	0.00	VFDs, due to which Stopping H2 Venting.

SI N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expenditure in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
44	By Installation of 2x75kw frequency drives for Rectifier cooling pumps the cooling water pumping requirement met with the same pump by which electrical energy saved.	0.69	2.97	3.00	12.11	VFDs
45	Installation of Lighting Transformer, electronic chokes and CFL Lamps	0.23	0.67	1.50	738.81	Lighting Transformer
46	Replacement of 150 watts HPSV lamps in place of 250 watts HPMV lamps and Transparent sheet installation for saving Electrical energy.	0.65	2.01	2.00	328.36	Energy Efficient Lamps.
47	Replacement of conventional magnetic chokes with energy saving Electronic Chokes (1500 nos.)	0.82	2.84	3.00	385.00	Energy Efficient Chokes.
48	20 Nos. 125 W lamps removed by location changing in street lighting & plant lighting	0.21	0.97	0.20	75.26	Energy Efficient Lamps
49	Replacement of old AC system with new generation efficient AC system for DM plant control room which saved electrical energy.	0.63	2.84	0.75	3.17	Energy Efficient AC.
50	Specific Thermal Energy reduction by replacing defective steam traps with new steam traps.	0.00	21.60	2.00	30.56	Defective steam traps replacement.

SI N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expendi- ture in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
51	Reduction of specific steam consumption in Caustic Soda Plant by attending steam leakages, replacing defective steam traps,	0.8314 (mkcal)	91.45	2.00	7.00	Attending steam leakages
52	Replacement of CCP cooling tower fan blades by energy efficient FRP blades (in 4 cooling towers)	11.04	49.68	10.40	2.51	FRP Blades
53	Energy Efficient FRP blades replaced in place of old FRP blades in CCP CTID-2 Fan	1.82	8.19	1.60	65.00	FRP Blades.
54	Replacing metallic blades with FRP blades in 3nos. CT Fans	3.63	7.76	1.50	63.79	FRP Blades
55	Recommended suggestion of Energy auditor is implemented for CW Pump # 1, for improved efficiency which saved electrical energy.	3.05	7.63	5.83	9.18	Energy Audit Suggestion

SI N	Energy Conservation Measures	Energy Saved in Lakh kwh	Amount Saved Rs. In Lakhs	Expendi- ture in Rs. Lakhs	Pay-back period in Days	Energy Conservation Measure.
56	Recommended suggestion of Energy auditor is implemented for, compressor cooling water Pumps 22P01A & B for improved efficiency which saved electrical energy.	0.37	0.92	0.10	1.30	Energy Audit Suggestion
57	Recommended suggestion of Energy auditor is implemented for Cooling water Pump 3101- A/B (PAP),&81P012A for improved efficiency which saved electrical energy.	0.46	1.15	0.25	2.61	Energy Audit Suggestion
58	Improvement in performance in HP CW Pumps by over hauling and attending passing of recirculation valve.	2.52	7.36	0.20	8.97	Overhauling.
	TOTAL SAVINGS 2003-2010	1416.43	7249.29	3358.36	169.09	



Energy Management Policy

GACL is committed to Energy Conservation by :

Minimizing Specific Energy Consumption,
Maximizing Capacity Utilization,
Continuous fine-tuning and maintenance of operations,
Upgrading of process and equipment for better
energy efficiency,
Motivating employees to achieve a minimum 1%
reduction per annum in specific energy consumption,
Monitoring and Reviewing energy conservation.



MANAGING DIRECTOR

Gujarat Alkalies and Chemicals Limited



THANK YOU