

GUJARAT ALKALIES AND CHEMICALS LIMITED, VADODARA

20(i). Unit Profile

Gujarat Alkalies and Chemicals Limited (GACL) is the **single largest flag bearer company** in chlor-alkali industry having installed capacity of **3,79,550 tons per annum (TPA)** of Caustic Soda/Potash with state-of-the-art technology at locations of Vadodara and Dahej. This unit of Vadodara commenced Caustic Soda production in 1976 with production of **37,425 TPA** and expanded it to current capacity of **1,85,657 TPA** of Caustic Soda and Caustic Potash with unique product integration manufacturing **27 chemicals** at Vadodara & Dahej complexes. This is a **pioneer unit** in the country to introduce **energy-efficient and eco-friendly Membrane Cell Technology** converting its mercury cell plant in 1989 and completely changed over in 1994. This unit has always been **proactive in adapting modern-technologies of the time in process equipments required to be deployed in a large scale chlor-alkali plant of world class.**

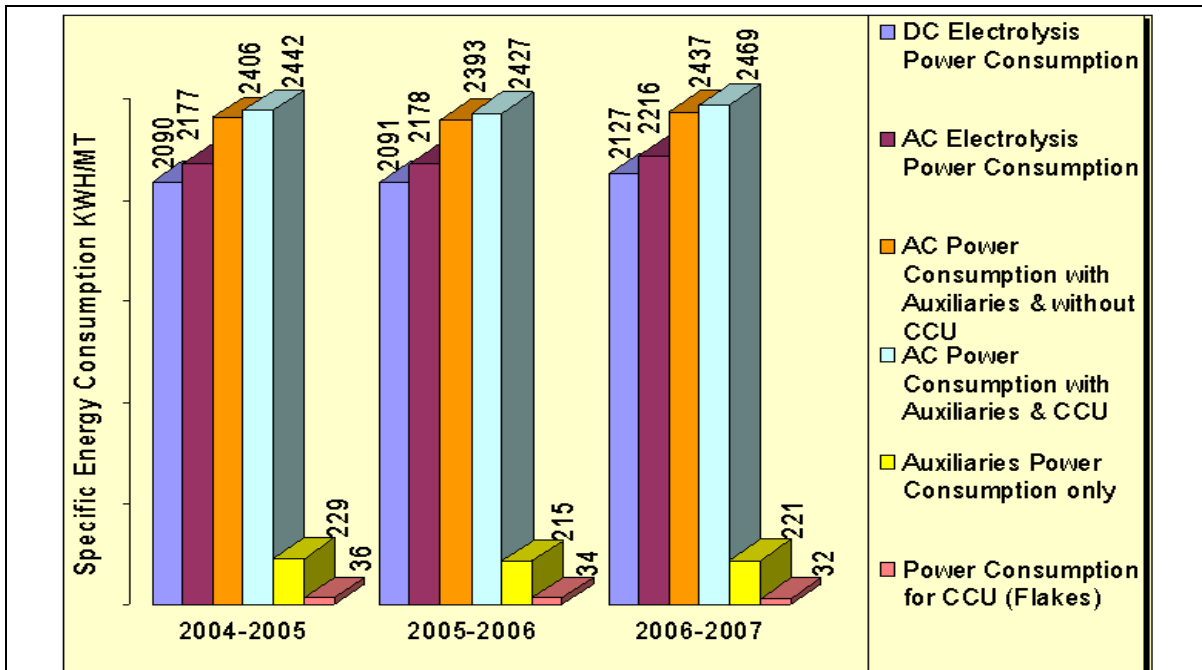
Company has following distinctions to differentiate it from its others in the industry for maintaining its leadership with market share of **16.19%** and **109.21%** capacity utilization. (AMAI Report) during 2006-07.

- **GACL has a distinction of first PSU** for laying foundation of **23.75MW Windmill Power Generation** - a renewable energy resource recently in **Kutch** area committing investment of about **Rs. 122 crores.**
- **90%** utilization of **Hydrogen** – which is a co-product in chlor-alkali process. It is used to produce eco-friendly chemical of Hydrogen Peroxide and also it is used as fuel in concentrating Caustic Soda/Potash.
- Complete changeover to clean energy source of NG from Furnace Oil reducing CO₂ generation alongwith cost and improving energy efficiency since 2006.
- Capacity utilization at Vadodara unit is **109.21%** against industry average of **84.2%**.
- We introduced **DCS** (Distributed Control System) in **Chlor-Alkali Industry in 1994 first-time** in the country converting its mercury plant to membrane plant in second phase. The “trend” continued for all other UHDE – plants thereafter. **In the year 2006-07 we have changed over to DCS System from panel based instrumentation system** in our pioneer caustic plant commissioned in 1976. This has improved our operating efficiency and reduced energy consumption evident in the data.
- Company is ISO 9001:2000, ISO 14001:2004 and IS 18001:2000 certified for its commitment to Safety, Environment and Health of its associates in particular and community in general.
- GACL Vadodara unit has a unique Potassium Carbonate Plant using Carbon Dioxide from flue-gas of its boiler/furnace reducing Green House Gases (GHG).
- GACL Vadodara changed over to Natural Gas from Furnace-oil completely for its boiler at Vadodara adopting a Clean Technology Philosophy as committed in its “**Energy Management Policy**” since 2006.

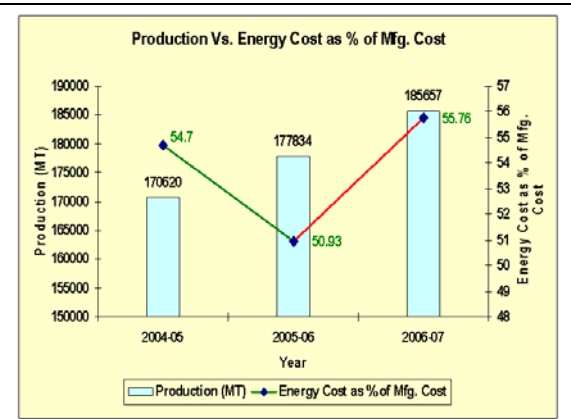
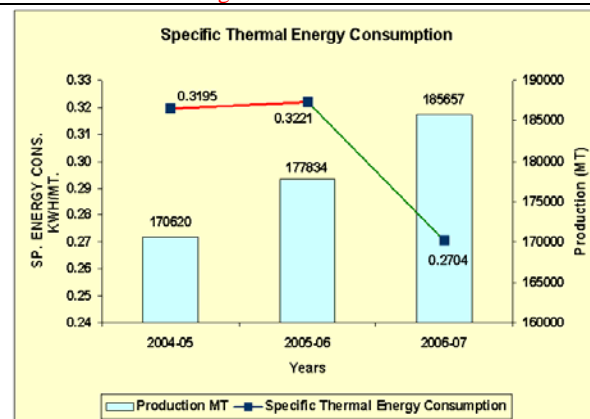
Energy Consumption

Specific Power Consumption Details	Unit	2004-2005	2005-2006	2006-2007
Annual Production (Caustic Soda & Potash)	MT	170620	177834	185657
Total energy consumption per annum	Lacs KWH	4105.12	4255.7	4524.37
Total thermal energy consumption	MKacI	54513.09	57293.71	50207.8
Total Manufacturing Cost	Rs. Lacs	21420.69	22925.42	28539.95
Total Energy Cost	Rs. Lacs	11719.92	11676.19	15913.89
Energy Cost as % of Manufacturing Cost	%	54.7	50.93	55.76
DC Electrolysis Power Consumption	KWH/MT	2090	2091	2127
AC Electrolysis Power Consumption	KWH/MT	2177	2178	2216
AC Power Consumption with Auxiliaries & without CCU	KWH/MT	2406	2393	2437
AC Power Consumption with Auxiliaries & CCU	KWH/MT	2442	2427	2469
Auxiliaries Power Consumption only	KWH/MT	229	215	221
Power Consumption for CCU (Flakes)	KWH/MT	36	34	32
Thermal Energy Consumption	Mkcal/MT	0.3195	0.3221	0.2704

20(ii). Graphical Representation of Specific Energy Consumption:

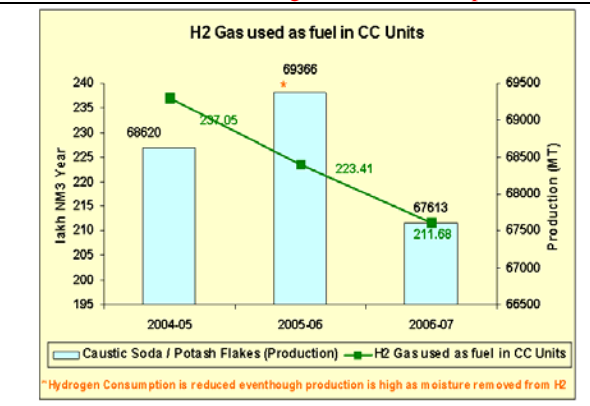


*The production rate improvement has been contributing for high electrical consumption due to typical process characteristics of design. ↑

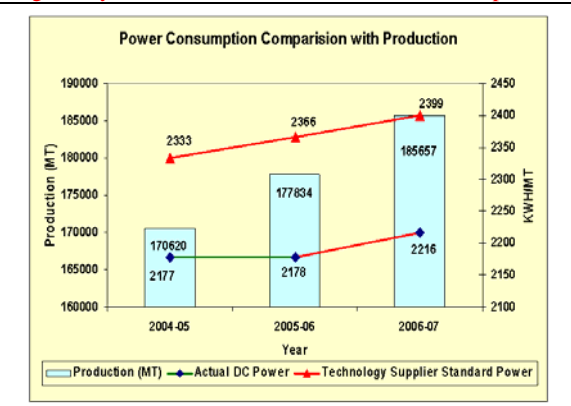


*H₂ Gas is used as fuel only when its current market value is reduced, rather than venting in air unlike competitors. ↓

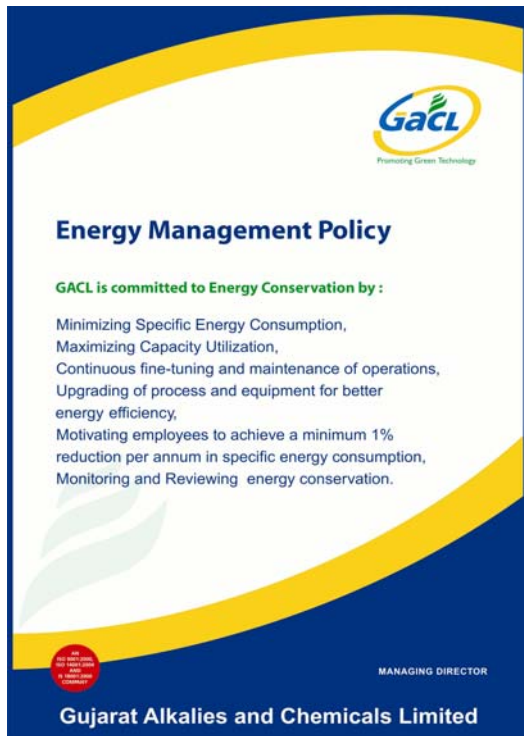
*Cost of energy has increased due to new imposed regulatory tariff on electrical transmission & Gas price ↑



*Hydrogen Consumption is reduced even though production is high as moisture removed from H₂

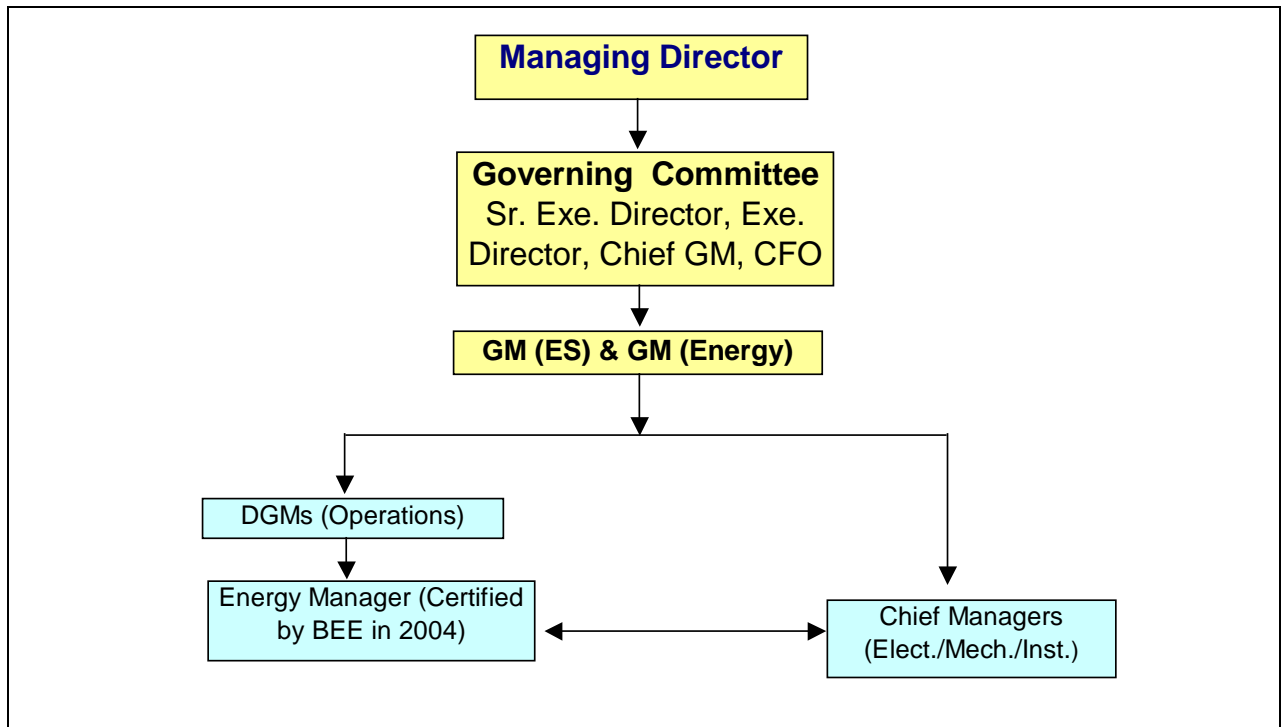


20(iii). Energy Conservation Commitment, Policy & Organisational Set-up:



GACL has a Energy Conservation Cell at Vadodara Complex, headed by Managing Director assisted by Sr. Executives and BEE certified Energy Manager, who is supported by Managers from each department forming a team. This team finds various energy saving potential in their working areas, brings the proposals to Energy Cell for elaborated discussions and brain storming sessions to finalize and implement the projects. Regular audits are conducted by external certified auditors. Annual budgetary provisions are made for energy conservation activities. As top management is committed to implement the energy saving measures, GACL always fine-tunes operations & maintenance continuously to achieve the continual improvement, technology up-gradations with energy efficient processes and equipments. Company's top management is motivating & giving training & encouraging our employees to achieve a target of reducing specific energy consumption by minimizing 1% every year evident in the results reported in this application.

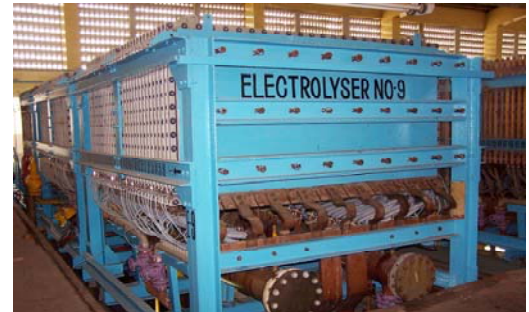
ENERGY CONSERVATION CELL STRUCTURE:



20(iv). Achievements: 2006-2007

Unit has implemented **21 nos.** of major EC projects during the year 2006-2007 at total investment of **Rs. 516.49 lacs** saving worth **Rs464.38 lacs**. Major projects are mentioned here below:

We have procured 98 nos. of 4th generation elements so existing elements became spare. We have installed all spare elements in electrolyzers and reduced operating current density, which saves electricity. During this activity of remembraning and recoating, we have installed high performance membranes to reduce further power consumption.



Saving in Cost during 2006-07.....**122.69 Rs.lakhs**
Total Investment**73.43 Rs.lakhs**

Power factor was improved from 0.972 to 0.983 resulted into additional rebate of Rs. 5.24 Lacs / month from MGVCL. Also net power saving of 1.63 Lacs units per month achieved. Earlier one of the capacitor bank was not having series reactor. Subsequently, series reactor was connected in the circuit and 6 nos. of capacitors were added at 33KV bus. Also capacitors in LT network was added to reduce voltage drop in the cable.



Saving in Cost.....**159.36 Rs. lakhs**
Total Investment.....**35.0 Rs.lakhs**

Revamping of Cooling Tower hardwares inclusive of using **Aero Dynamic** blades in place of normal metallic blades as a result of reduction in **Drift losses & improvement in Air circulations**. The following data shows the energy saving and investment during the year 2006-07.



Saving in cost.....**10.58 Rs.lakhs**
Total Investment.....**22.5 Rs.lakhs**

Our existing refrigeration system having very old reciprocating machine which consumed more power & more maintenance also. So, these old machines were replaced by energy efficient screw compressors.



Saving in cost.....**47.14 Rs.lakhs**
Total Investment.....**162 Rs.lakhs**

The unit being 30 years old, We plan regular replacement of Hot & Cold Insulations of Pipe lines and Equipments and we have a planned budget provision and annual maintenance contract for replacement of Hot & Cold Insulation as required. The following data shows the energy saving and investment during the year 2006-07.

Steam Header from Boiler to Plants →

Saving in cost.....10.85 Rs.lakhs
Total Investment.....80 Rs. lakhs



Process parameters like cell temperature, brine gpl, Caustic Concentration, Pressure across membrane are controlled by DCS instead of conventional panel based instrumentation system. This resulted into saving in power consumption due to continuous monitoring of key parameters contributing to energy consumption. It is very easy to analyse all these data on DCS and process parameters are optimized on regular basis.

DCS Replaced Panel Instruments →

Saving in cost.....49.84 Rs.lakhs
Total Investment.....80 Rs. lakhs



Alkaline water generated by cooling of H₂ gas was earlier going to drain, which has been now used for HCl fume neutralization in HCl absorption tower of HCl plant. Thus, process water was used in tower is saved and performance of tower is improved because of alkalinity.

Recycling Water →

Saving in cost.....3.78 Rs.lakhs
Total Investment.....5 Rs. lakhs



Last year we have installed Solar Panels for our Instrumentation Power Load, this year we have installed Solar Panels for lighting in plant wherever there is no electrical light connection and light is required in emergency. We are planning to add more nos. of Solar lights in the plant.

Solar Street Light →

Saving in cost.....0.06 Rs.lakhs
Total Investment.....0.60 Rs. lakhs



Other Energy Conservation Projects implemented during 2006-07.

- 1) Replacement of conventional chokes by electronics chokes (1000 nos.)
- 2) **Hot Caustic Potash Pumping to Caustic Concentration** by using existing pump.
- 3) Replaced old Motors by **high efficiency motors** of 7 nos. of equipments.
- 4) Replaced 250 ordinary tube lights by energy efficient tube lights.
- 5) Installation of **KOH Evaporator** in place of old one.
- 6) Installation of high performance membranes F8020 & N2030.
- 7) Minimization of steam leakages by pipe replacement and online leak protection.
- 8) Installation of ejector to recover heat from heat gases of concentration unit.
- 9) Optimized operation of chilled water pumps system to save power by stopping one pump.
- 10) Ensured discipline among all for Switching off lights, fans, ACs, whenever offices are not occupied.

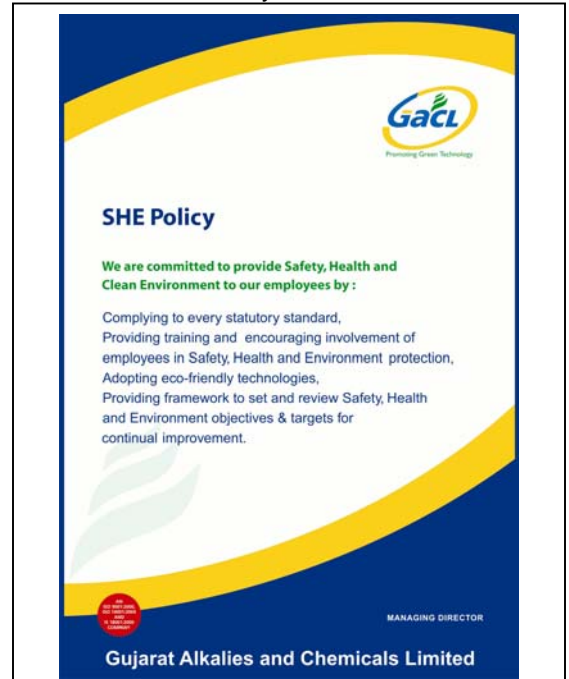
20 (v). Energy Conservation Plans and Targets:

Energy Conservation Measures (Planned)	Anticipated savings in		Approx. investment (Rs.lakhs)	Project Commencement & Completion year
	Energy Value (specify units)	Rs. Lakhs		
Replacement of 18 yr old elements by energy efficient latest version-5 of UHDE electrolyzers	37.44	196.56	1344	2007-08
Installation of Hydrogen gas line to concentration unit to replace NG as fuel by Hydrogen Gas	29.6	148	18	2007-08
Replacement of existing chilled water compressor by energy efficient screw compressors	7.548	37.14	162	2007-08
Replacing old rectifier transformer by high efficient transformer	47.69	174	1200	2007-08 & 2008-09
Replacing two reciprocating air compressor by one centrifugal air compressor	5.04	25	30	2007-08
Re-membraning and re-coating of electrolyser of Cell House No.1 (Activity started 2006-07)	158.75	731.14	1967.14	2007-08
Installation of waste heat recovery boilers	0	112	135	2007-08
Renewable Energy Projects: PV Solar power for lighting & heating	1.5	4.5	20	2007-08
Renewable Energy Projects: Power Generation by Wind Mill (available 6 MW against 23.75 MW installed)	420.48	1219.39	12263	2007-08
Other small projects like replacement of chokes, reflectors, energy efficient motors etc.	23.5	115.62	200	2007-08
Sub Total:	731.548	2763.35	17339.14	

20 (vi). Environment and Safety :

Our unit has been accredited for ISO 14001:2004 and IS 18001 by Bureau of Indian Standards (BIS) valid till 2007 indicating managements commitments of environment and health of its employees and community as per 'SHE' policy as under : This unit has completed **1540 Accident Free Days** as on 12-10-2007. With about 1500 employees and associates working at site breaking the previous best record of **234** days.

GACL's Vadodara unit has been winner of Safety **GOLD Award of Greentech Foundation** for the year 2007 for outstanding achievement in Safety Management.



Vermicomposting - a



Vermicomposting - b



Green House Activity

This unit also has implemented **Vermi-Composting** plant from canteen and garden wastes since 4 years.

Company has also made recharging bore-well for the **harvested rain water** at its secured land filled site with about **29,000 green trees** planted since last **12 years**. And every year we plant about **3,500 trees** at our **Green belt area** & thus justifying **Promoting Green Technology** shown in our logo shown here:

