

**RELIANCE INDUSTRIES LTD.**  
**DAHEJ MANUFACTURING DIVISION**

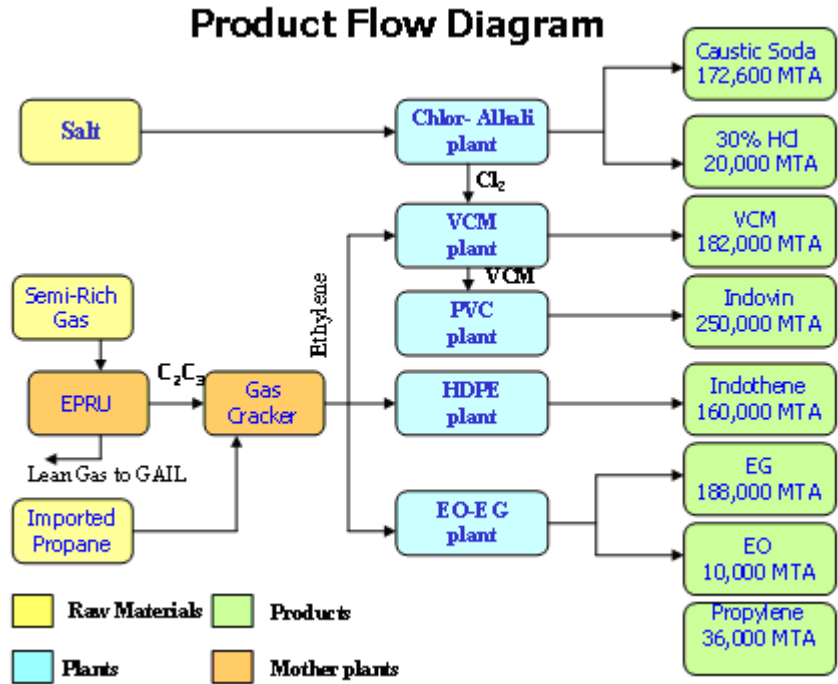
**RELIANCE INDUSTRIES LIMITED**  
**DAHEJ MANUFACTURING DIVISION**  
**PO: DAHEJ, TAL: VAGRA, DIST: BHARUCH,**  
**GUJARAT, INDIA**  
**PIN: 392130**

## Unit Profile

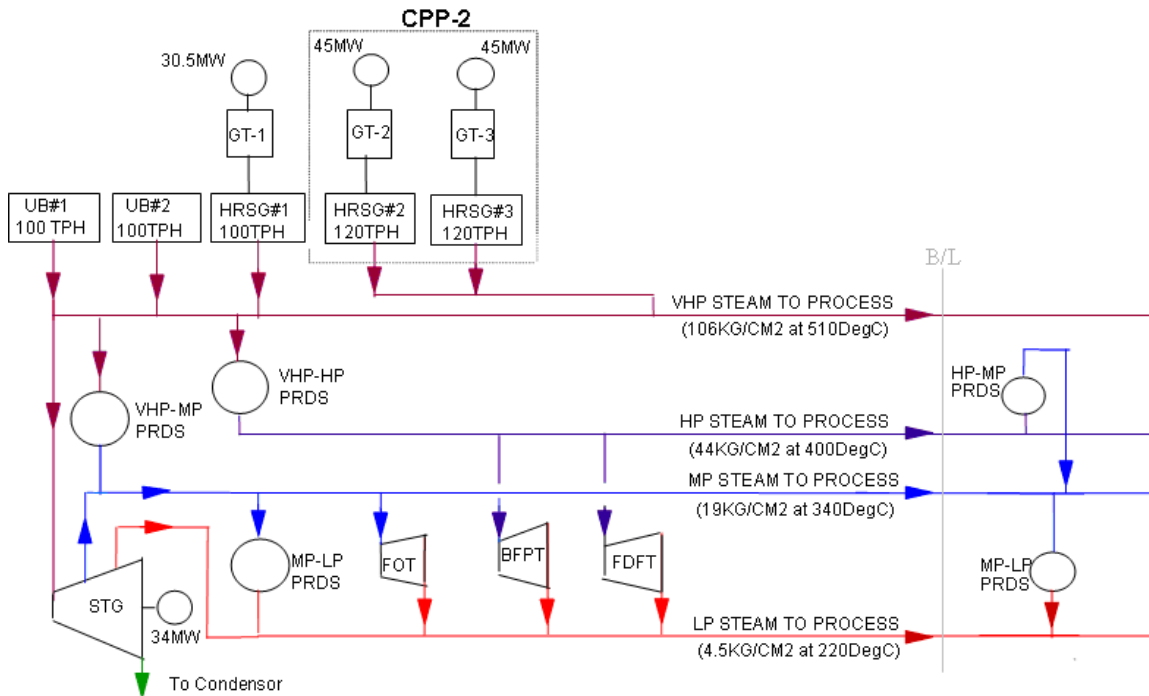
Reliance Industries limited - Dahej Manufacturing Division (RIL-DMD), earlier known as Indian Petrochemical Corporation Limited - Gandhar Complex (IPCL-GC) is one of the “Navratna Company” established by Government of India. IPCL (with three manufacturing plants two in state of Gujarat located at Vadodara & Dahej and third in Maharashtra located at Nagothane) was the pioneering petrochemical manufacturer in India established in 1969, now it is a part of India’s largest private sector Reliance Industries limited. The Petrochemicals Complex at Dahej, 45 Km from Bharuch, is based on raw material derived from Gandhar oil & gas fields, hence was called Gandhar Complex. Dahej Manufacturing division is the youngest complex of RIL (1996) spread over 800 hectares of land at estuary of Narmada, have own captive jetty and well connected with GCPTCL. The complex houses the country only chlorine integrated PVC manufacturing facility backed by captive power plant and Gas Cracker unit. Present power & steam generation capacity is 154.5 MW & 540 MT/hr and going for a major CAPEX in the present financial year. *The Product flow diagram & schematic of CPP are shown below in fig. 1 & 2 respectively.* The product slate includes

- Caustic Soda
- Polyvinyl Chloride
- High Density Polyethylene
- Mono Ethylene Glycol
- Ethylene Oxide

Organizationally shared values at RIL-DMD are: integrity, respect for people, and unity of purpose, outside-in focus, agility and innovation. The company has a shared vision of being the preferred business associate with concern for ecology, society and stakeholders’ value. This vision is the fountainhead of integrating business with social responsibility including Energy & resources conservation. RIL has excelled in business along with nurturing social responsibility.



**Fig. 1: Product Flow diagram of the complex**



**Fig.2: Schematic of Captive Power Plant**

## Energy Consumption

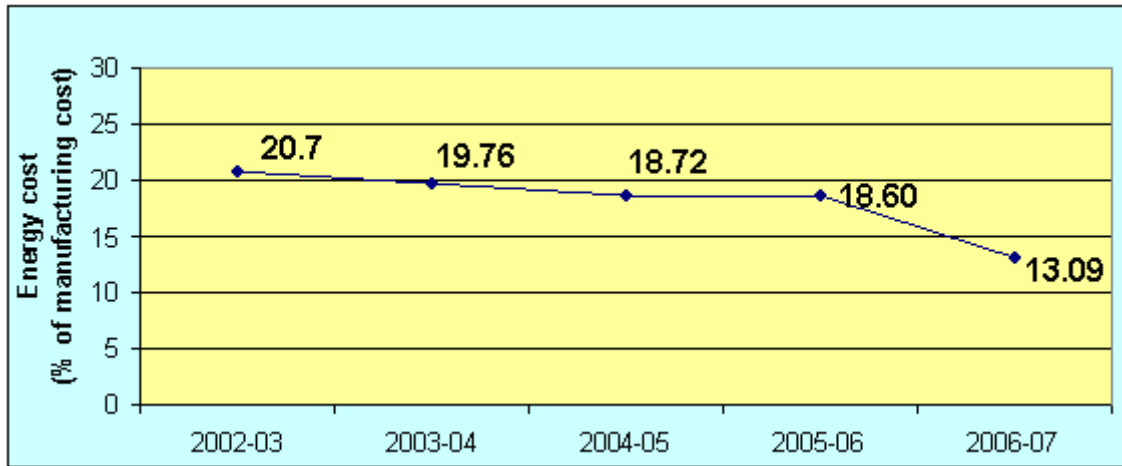
**Data for the past three years is shown below:**

Description	Unit	Year		
		2004-05	2005-06	2006-07
Annual Production	MT	1,776,126	1,993,682	1,816,223
Electrical Energy Consumption	Lakh kWh	9,897	10,198	9,301
Thermal Energy Consumption	MMkcal	1,546,490	1,718,852	2,137,569
Specific Electrical Energy Consumption	kWh/ MT	557.21	511.52	512.10
Specific Thermal Energy Consumption	MMkcal/MT	0.87	0.86	1.18
Overall Energy Index of the complex**	MMkcal/MT**	2.65	2.50	2.65
Energy cost as % of manufacturing cost	%	18.72	18.60	13.09

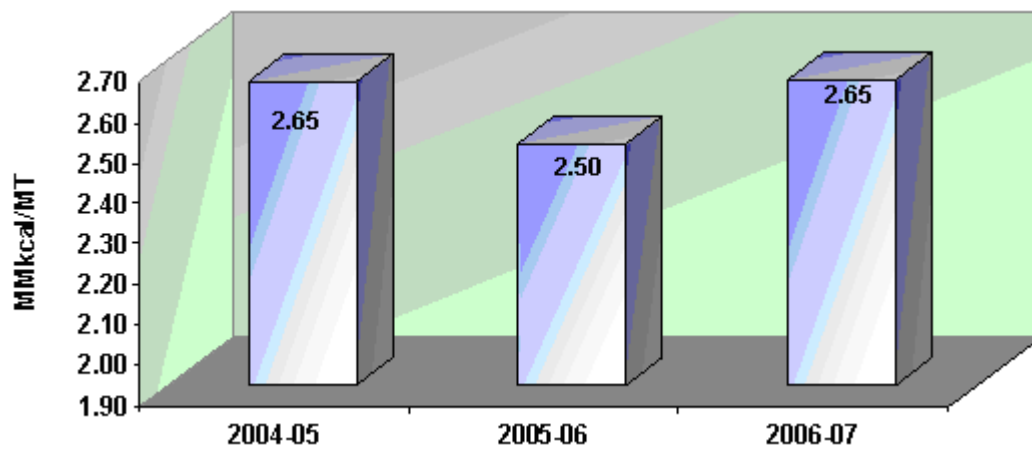
\*\* NOTE: The methodology for the calculation of Overall Energy Index of the Complex has been modified based on the recommendations from the Group Manufacturing Services (GMS), RIL, Mumbai. Following two modifications have been done (1) The production of ethane & propane from EPRU Plant and EDC from VCM Plant is also added to the total production of the complex. (2) Internal fuel consumption other than CPP in the process plants of GCU, VCM and PVC has been added to the total fuel consumption of the complex.

The methodology has been revised since financial year 2007-08 and the same has been recalculated for the last three years (2004-05, 2005-06 and 2006-07) also so as to have a uniform platform for comparison in future as well.

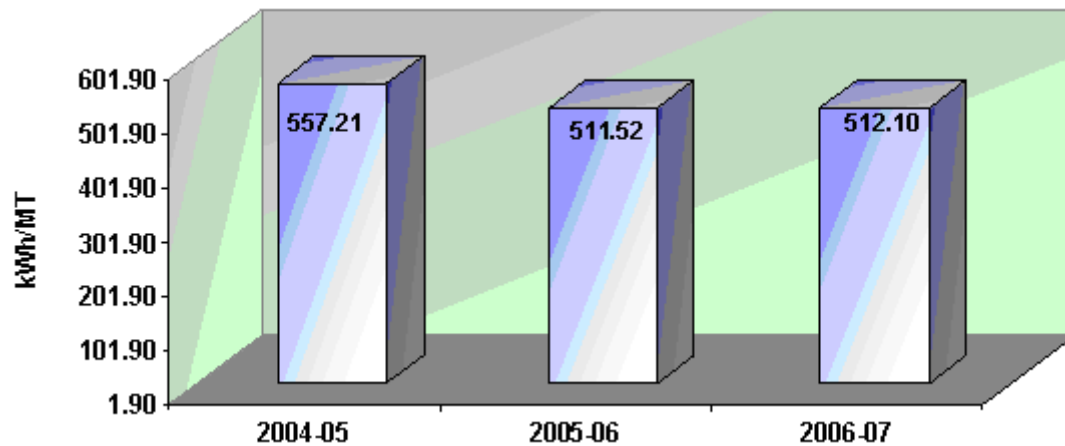
## Reduction in Energy Cost as percentage of manufacturing cost



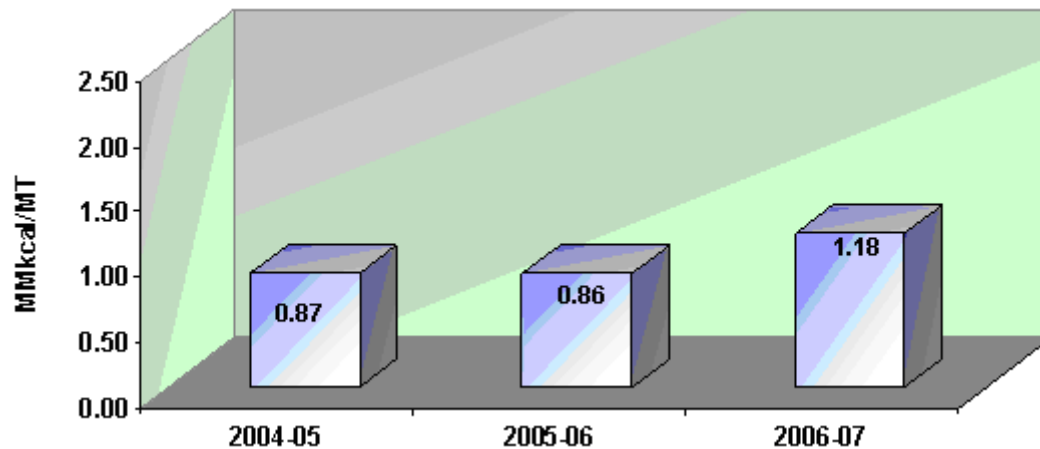
## Energy Index



## Specific Electrical Energy Consumption



## Specific Thermal Energy Consumption



The Energy index for the year 2006-07 is higher as compared to the previous year due the following reasons:

- (1.) We could source Natural gas from JV-PMT company from April-.2006. The equipment of CPP-1 and HRSG-2& 3 were ready to utilise gas and GT-2 and GT-3 CAPEX for gas conversion was under implementation. GT-2 and 3 was running on naphtha as fuel. To take the advantage of low cost fuel we have made a operation philospohy to load the equipment running on gas at full load so accordingly GT-1 and STG was loaded which are less efficient in terms of energy but due to low cost fuel it's production cost was lower than production cost of GT-2 ad GT-3. By this way we could reduce energy cost from 18.6 % to13.09 % of manufacturing cost and reduced the energy bill by 15 % as compared to previous year.
- (2.) Due to the trials conducted in CPP-2 because of the fuel changeover scheme being implemented.
- (3.) Lower production during the year.

The fuel bill was reduced by about 15% in 2006-07and energy cost reduced from 18.60 to 13.09 % of the manufacturing cost as compared to the previous year, thereby saving on Fuel bill in terms of money during 2006-07, although the energy index was higher as indicated in the graph above. After the complete gas conversion of CPP equipments is completed in Apr-07, this result into lower energy consumption and reduces energy bill further.

## **Energy Conservation Commitment, Policy and Organizational Set up**

IPCL, Gandhar Unit, is committed to energy conservation in every stage of its operations. The energy conservation features are incorporated in every dimension, starting from the design stage of the plant itself and then, maintaining and improving it in the normal plant operations. Our strategy is to reduce energy consumption/cost at every stage from:

- Technology selection.
- Equipment selection.
- Selection of fuel mix.
- Strategy of make or buy power.
- Explore renewable resources (Windmill).
- Optimal use of energy through operational control and management reviews.
- Heat integration and retrofitting

Energy conservation is a part of our corporate vision of being a preferred business associate with concern for stakeholders, ecology and society.

We have a system stretch target to beat the internal benchmark year after year. There is a system of internal benchmarking practice within Reliance group of plants and hence, a system of close monitoring, analysis, management, and appropriate course corrections as per requirement.

Our promotional measures include: Energy conservation Awareness programme like Poster, Slogan competition etc.

Training on energy conservation at grass root level.

Encouraging employees to become Energy Auditor & Energy Managers.

The process parameters and flow of different utilities are continuously monitored through intranet net work IP-21 which works as a tool for optimisation of Utilities.

To intensify the internal efforts for improving energy efficiency, Energy management is integrated within technical services department and Energy Cell was created and it is operational since 1999 under the guidance of Sr. Vice President (Technology). Qualified energy manager, energy auditor, mans the cell. The cell has horizontal linkages with energy consuming plants having eight qualified energy auditors as energy co-ordinators.

*A copy of our Energy Management Policy is attached herewith.*



## **Reliance Industries Limited Energy Management Policy**

Reliance Industries Limited plays a leading role in the national and global economy by providing quality goods and services in the materials and energy value chain.

Our Mission is:

- ❖ To become the lowest specific energy consumer in the industry.
- ❖ To widen our options for energy sources and
- ❖ To minimize the adverse impact of our operations on the environment.

We plan to achieve the above within the framework of sustaining the business by:

- ❖ Integrating energy management with the business management and establishing performance driven goals.
- ❖ Upgrading hardware, employing new technologies and improving our practices to increase energy efficiency, reduce greenhouse gas emissions and minimize environmental impacts.
- ❖ Supporting scientific research and technological efforts to deliver new sources of energy including renewable and alternate fuels.
- ❖ Carrying out regular audits and training employees to promote energy conservation as a culture across the entire business functions.
- ❖ Continuously benchmarking our energy efficiency and energy productivity against others.
- ❖ Promoting awareness on energy conservation among all members of the Reliance family and the community at large.

A handwritten signature in blue ink, appearing to read 'M. D. Ambani'.

Mukesh D. Ambani  
March 2007

## **Energy Conservation Achievements**

### **1. Fuel substitution from Naptha to Gas**

Fuel changeover from Naptha to Gas of GT-2, GT-3 for power generation and HRSG-2 & HRSG-3 for steam generation in CPP-II was completed. To reduce the dependency on highly price sensitive fuel and to reduce fuel bill of the site, the facilities for the gas utilization is installed. The project has two salient features:(1) Installation of fuel gas supply line (2) Equipment modifications to utilize gas. The utilization of Lean as fuel in GTs also reduces maintenance cost and improves the reliability of the power and steam generating system.The project is being applied as a Clean development Mechanism (CDM) project under United Nations Framework Convention on Climate Change (UNFCCC) and also as a Voluntary Carbon Markets (VCM) project due to reduction in CO2 emission by using gas in place of naphtha contributing to better environment.

Total saving Rs lacs / annum :	33544
Investment Made Rs lacs :	5500
payback period :	2 months

### **2. Replacement of faulty steam traps with new steam trap assemblies**

Detailed survey of steam traps all over the complex was carried out and 109 no.s of faulty steam traps identified. The faulty steam traps in VHP header & GCU LP line was replaced with new thermodynamic type of steam traps after taking VHP header shutdown during the GCU, HDPE & EPRU Plants planned S/D.

Total saving Rs lacs / annum :	562.4
Investment Made Rs lacs :	88.8
payback period :	2 months

### **3. Replacement of solution for CO2 removal in amine stripper at EPRU plant**

GAS SPEC CS Plus, MDEA based formulation solvent was being used for absorption of CO2 from feed gas. Solvent is being reused after regeneration. In regeneration of solvent CO2 stripping is carried out from rich amine

solution in amine stripper. Heating and cooling cycle of solvent generates degraded components and Heat Stable Salts (HSS), Bicine etc, which are corrosive in nature and keep accumulating in the system restricting the flow to the absorber resulting in frequent load reduction for Exchanger suction strainer / exchanger offsite cleaning. The different vendor offers were evaluated for solvent change based on operating condition of the plant and aMEDA solvent of BASF was selected due to its better loading efficiency and better flashing property due to presence of stable activator. More capacity of solvent loading reduces the solvent circulation rate and in turn energy efficient process.

Total saving Rs lacs / annum :	1577.5
Investment Made Rs lacs :	193.3
payback period :	2 months

#### **4. Replacement of old window Air conditioners & conventional florescent lights with new energy efficient ones**

Based on the detailed internal audit carried out for electrical equipments & fittings in the buildings, 80 No.s of old 1.5 TR window Air Conditioners consuming higher power was replaced with the new energy efficient ones of 2\* Rating. Also, 179 No.s of conventional 55 W Florescent lights were replaced with new 28 W T5 Florescent lights.

Total saving Rs lacs / annum :	13.3
Investment Made Rs lacs :	14.7
payback period :	13 months

#### **5. MP steam condensate recovery from HCl column in VCM Plant**

A scheme was developed to collect the condensate by installing on line pH and conductivity analyser to recover condensate of HCl column reboiler, which was earlier drained.

Total saving Rs lacs / annum :	5.2
Investment Made Rs lacs :	2.5
payback period :	6 months

## Energy Conservation Plans and Targets

<b>Energy Conservation Measures (Planned)</b>	<b>Anticipated savings (Rs. Lakhs)</b>	<b>Approx. investment (Rs.lakhs)</b>	<b>Project Commencement &amp; Completion year</b>
Replacement of existing GRP fans with Energy efficient FRP fans.	32	49	2007-08
GT-1 inlet air chilling package installation.	250	500	2007-08
Heat recovery from HRSG-1 flue gas.	400	100	2008-09
New compressor for balance hydrogen recovery.	490	230	2007-08
Study of optimised steam/ power integration between different plants using Pinch Technology.	—	—	2007-08
Energy Audit of individual plants by the respective working groups & external agency.	—	—	2007-08
Training of supervisor & non supervisor cadre.	culture building	Negligible	2007-08

## **Environment & Safety**

We had generated 10620 MWH wind power from the windmill sites in 2006-07 which saves Rs. 376 lakhs for the year and 1445 KWH from Solar Photovoltaic panel in 2006-07.

Biogas Plant is installed in 2006-07 for Canteen waste resulting in thermal energy production of about 4.3 MMKcal during the year.

CO2 emission reduction by approx. 2 Lakhs ton by conversion of CPP-2 Equipments on gaseous fuel.

Depleted green belt replacement with Jatropha plantation of 1.8 lakh seedlings with drip irrigation facility initiated within the complex covering 155 Acres of land with an investment of Rs. 2.87 Crores for biodiesel production.

Rainwater Collection in Overhead tanks of ESD Building (500 m2 area) and Learning center (185 m2 area) and used in Toilets.

We have a seamlessly integrated management system (IMS) encompassing QMS-ISO 9001:2000; EMS-ISO 14001:2004 and OHS -OSHAS 18001:1999 certified by DNV.

British Safety council, UK conferred prestigious 5-star safety rating to the complex in Health & Safety Management System Audit conducted in July, 2007.

RIL has entered into strategic agreement with DuPont for implementation of Process Safety Management (PSM) across all the sites.

National Award for Excellence in Energy Management, 2006 by CII.

National Award for Excellence in Water Management, 2006 by CII.

National energy conservation Award (Certificate of Merit in Petrochemical Sector) Instituted by BEE for the year 2005-06.

GAIL Gas conservation award in petrochemical sector for 2003-04.