

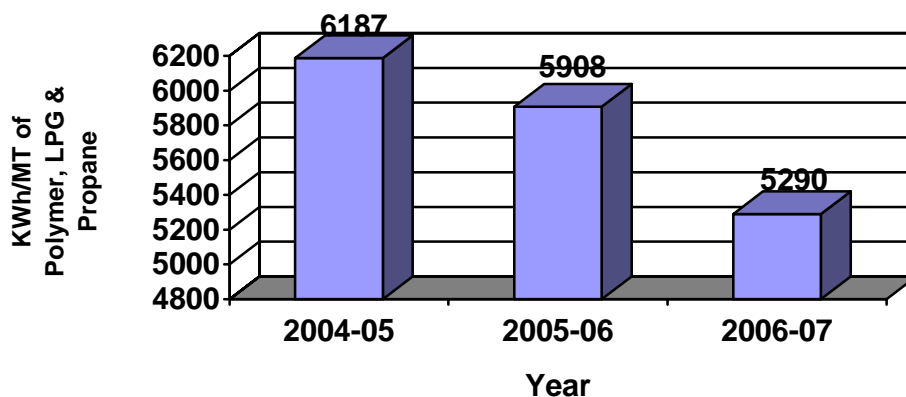
## Unit Profile

GAIL (India) Ltd., Pata Petrochemical Complex is located at Distt. Auraiya in Uttar Pradesh. It is based on Natural Gas as feedstock from GAIL's HBJ pipeline, which has been set up in accordance with GAIL's mission to maximize the value addition from each fraction of Natural Gas.

The Plant consists of Gas Processing Unit (GPU), LPG Unit, Gas Cracker Unit (GCU), LLDPE/HDPE swing unit, Butene-1 & HDPE units. Current capacity of the cracker plant is 400,000 tonnes per annum of Ethylene. This acts as a feedstock for the two downstream units with an annual production capacity of 100,000 TPA HDPE and 2, 10,000 TPA of LLDPE/HDPE respectively. New HDPE unit of 100,000 TPA is to commence production shortly. GAIL's product range comprises of a wide range of Polyethylene Products named as **G-Lex** and **G-Lene** (HDPE & LLDPE) grades, which are used by plastic processors to manufacture a large variety of products for industrial, agricultural & domestic uses.

### Energy consumption

With the regular monitoring of energy consumption, implementation of energy saving measures, increasing plant throughput, reducing off grade production and carrying out grade transition online, the overall specific energy consumption has declined over last three years.



### Energy consumption details

Year	Prod. MT	Energy Consumption		Specific Energy Consumption	
		Lakhs kWh	MKCal	kWh/ Tonne	MkCal/ Tonne
2004-2005	594,266	2702	4103518	455	6.91
2005-2006	577,358	2735	3983561	474	6.90
2006-2007	647,662	2866	4373402	443	6.75

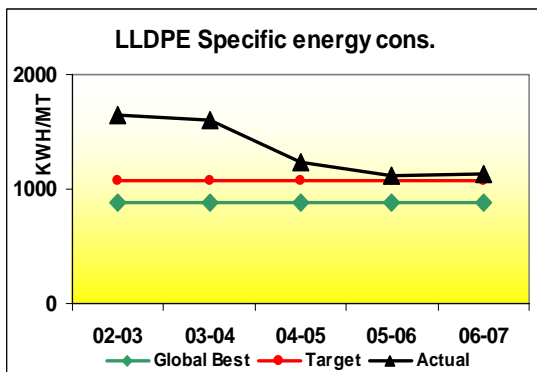
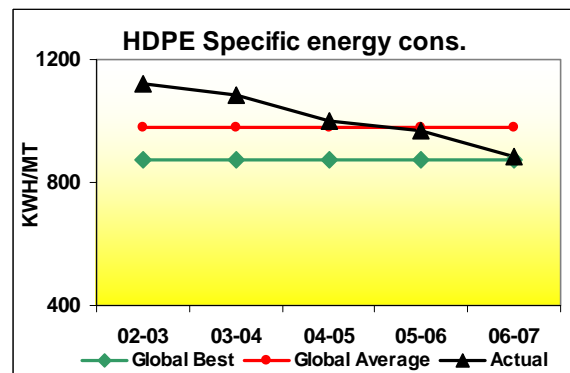
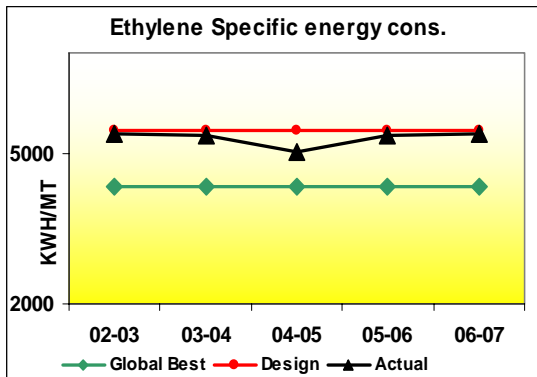
**Reduction in energy consumption**

Year	Product	kWh/Tonne	% reduction over 2002-2003	MkCal/Tonne	% Reduction over 2002-2003
2004-2005	Polymer+ LPG+ Propane	455	8.5	6.91	-0.29
2005-2006		474	-4.24	6.90	0.14
2005-2006		443	6.54	6.75	2.17

**Specific Energy Consumption of Energy Intensive Products**

Specific energy consumptions of energy intensive products and intermediate ethylene forms part of benchmarking performance parameters since 2002-03 and are monitored regularly by top management. Specific energy consumption of ethylene has come down from 5403 KWh/MT (2002-03) to 5395 KWh/MT (2006-07). LLDPE specific energy consumption came down from 1650 KWh/MT (2002-03) to 1136 KWh (2006-07).

HDPE specific energy consumption reduced from 1120 KWh/MT (2002-03) to 884 KWh/MT (2006-07), which is better than global average given by M/s A T Kearney.



The above improvement in specific energy consumption was achieved through improving furnace operations in GCU by monitoring regular health of furnaces, improving throughput in downstream units by implementing process modifications and minimizing grade changeover transition.

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

GAIL, Pata is a major player in petrochemical sector. Natural gas being used as feedstock also serves the purpose of fuel. With the increasing price of fuel gas, energy conservation has become urgent need for competitiveness. Specific energy consumption targets are set every year, which are monitored at the top management level in the organization. Benchmarking parameters with respect to specific energy consumption of intermediate product like ethylene and final products HDPE & LLDPE are set, which are monitored by corporate office on monthly basis.

Process optimizations as well as plant modifications are encouraged by the management in order to reduce energy consumption. We have suggestions scheme at corporate level for encouraging innovative ideas.

Energy policy is available and an energy management cell functions for process improvements and energy conservation.

GAIL Pata is carrying out energy audits every year. M/s PCRA has conducted energy audit in 2006-07. Recommendations of PCRA are being implemented in the plants. GAIL, Pata has nominated several of its engineers to undertake energy audit exams conducted by Bureau of Energy Efficiency every year. We have more than two dozens certified energy auditors. Encon studies are conducted by plant employees. Employees are encouraged to take part in energy conservation activities.

Mass awareness campaign about energy conservation is conducted every year involving employees, their families, school children and adjacent community.



## गेल (इंडिया लिमिटेड)

पाता

### ऊर्जा नीति

गेल, पाता प्रभावी ऊर्जा प्रबंधन के साथ उत्पादकता, लागत प्रभावकारिता, पर्यावरण और बेहतर भविष्य पर ध्यान केंद्रित करते हुए अपने सभी अनुप्रयोगों और सेवाओं के लिए ऊर्जा संसाधनों के दक्ष और सर्वोत्तम उपयोग हेतु प्रतिबद्ध है।

(सी०एन० त्रिवेदी)

कार्यकारी निदेशक एवं प्रभारी अधिकारी



## GAIL (India) Limited

PATA

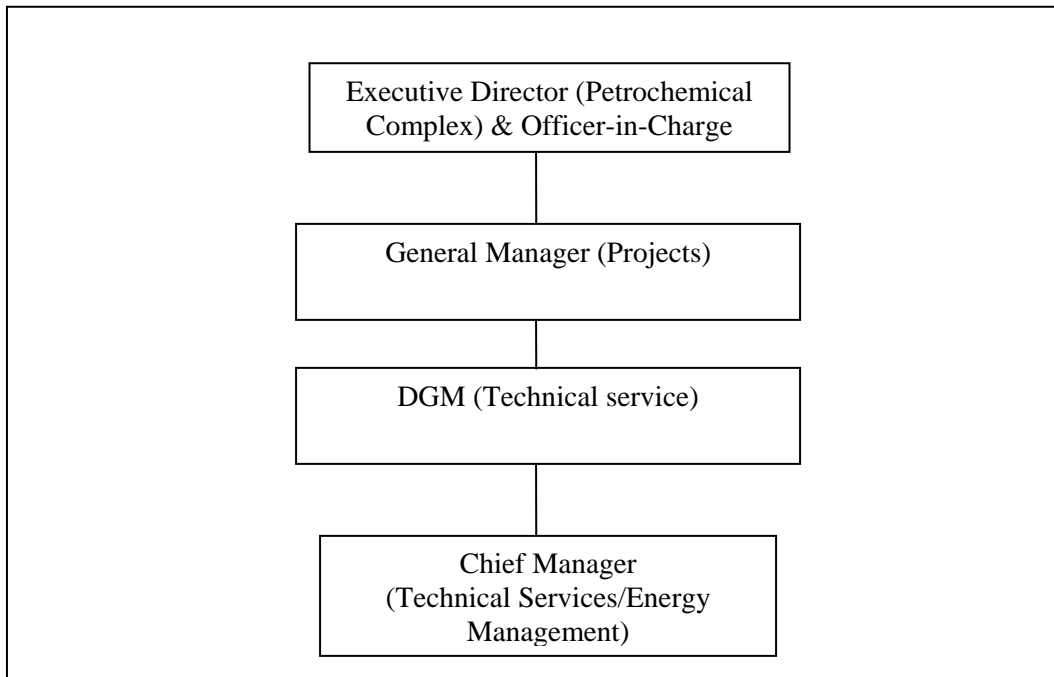
### ENERGY POLICY

**GAIL, Pata is committed to efficient and optimal use of energy resources in all its applications and services through effective energy management with focus on productivity, cost effectiveness, environment and a better tomorrow.**

(C. N. Trivedi)

Executive Director & OIC

## Energy Cell Structure



### Energy Conservation Measures Implemented in 2006-07

#### 1. ENERGY COST REDUCTION BY REDUCING OWN POWER GENERATION

GAIL, Pata has two nos. turbines, 15.5 MW back pressure extraction and 25.5 MW condensing turbine. With the increasing energy cost due to exorbitant rise in fuel gas prices, a study was carried out to reduce energy cost by reducing load on condensing turbine and substituting equivalent amount of power from cheaper alternate source i.e. grid.

Subsequently, load on condensing turbine was reduced by around 10 MW in Oct '07, which generates power at higher cost compared to backpressure turbine. This power optimization scheme has resulted into savings of **Rs. 16.18 Crores** during 2006-07 and expected benefit per year will be around Rs. 38 Crores.

#### 2. SWITCHING OVER FROM FUEL GAS TO NITROGEN FOR FLARE END PURGING

Flare end purge is provided in GPU, LPG & GCU Plant, for continuous purging of the flare header to maintain sufficient positive pressure and to prevent ingress of oxygen into flare stack.

A separate fuel gas line for pilot burners in the flare stack is also provided to keep the flare lit at all time, ensuring burning of hydrocarbons discharged into the flare header.

As the fuel gas is scarce and its price is increasing, it was proposed to switch over from fuel gas to nitrogen for end purging of flare header.

The positive pressure in the flare header will be maintained by continuous purging with Nitrogen. Flare tip pilots shall remain always lit by fuel gas supplied through separate line, ensuring burning of any hydrocarbons discharged to flare header.

The implementation of the scheme in Aug '06 has resulted into fuel gas saving and the benefit as a result of implementation are Rs. 14.7 Crores/year (equivalent saving of 9.4 MMSCM fuel gas per year). Moreover, no extra facilities were required for implementation of the new operating philosophy hence no capital financial implication was involved.

### **3. STOPPING OF COOLING WATER PUMP IN LPG PLANT**

In LPG Plant cooling tower, there are five pumps, out of which four pumps used to run. One pump of 480 KW was stopped in Oct '06. Now only three pumps remain in operation. This has resulted into savings of 38.4 lakh KWh/year of electrical energy corresponding to a benefit of Rs. 1.13 crores/year.

### **4. STOPPING OF PROPYLENE TRANSFER PUMP IN LPG PLANT**

Propylene liquid was being supplied to 08-EE15/19 exchanger in GPU from 3<sup>rd</sup> stage KOD in LPG plant via running propylene transfer pump (09-PA-013 A/B). During the energy saving campaign conducted in Jan '07, plant people optimized the operation and subsequently, the pump was stopped. Since then there is no requirement of operation of this pump. This has resulted into saving of 1.48 lakh KWh/year and equivalent monetary benefit of Rs. 5.2 lakhs/year.

### **5. RESIZING OF SR-8 (CPU) CONDENSATE INLET RO**



Due to high friction loss in the common condensate line to Condensate polishing unit, both the hot-well pumps of CG and C3R were running continuously. This was reviewed and the restricted orifice (RO) provided in the common condensate line was resized to minimize the friction losses. The resized RO was replaced during Aug '06 shutdown.

After replacement of the RO, only single pumps were running for both the above turbo machinery. This not only resulted into savings of Rs. 17 lakhs/year on account of stoppage of 60 KW pump, but also improved the reliability of operation.

## 6.REMOVAL OF TEMPORARY STRAINER IN C3R COMPRESSOR SUCTION



After analyzing the high delta pressure (to the tune of 0.1 to 0.2 kg/cm<sup>2</sup>) on the first stage suction strainer during the year 2005, it was reviewed whether to keep the temporary suction strainer of C3R compressor. After thorough inspection of the temporary strainer during Aug '06 shutdown, the same was removed.

This has given a steam (VHP) savings of 5 MT/hr on regular basis equivalent to money saving of Rs. 2.9 Crores/year.

## 7. REDUCTION IN DM WATER CONSUMPTION IN LLDPE PLANT

The consumption of DM water during financial year 2006-07 was reduced by average 400 MT/month compared to 2005-06. The consumption has been reduced by continuous monitoring and process optimization carried out by plant people.

The consumption of DM water was brought down by 400 MT/month. Equivalent energy saved per year is 40,400 KWh/year amounting to Rs. 1.2 lacs/year.

## 8. REDUCTION IN NITROGEN CONSUMPTION IN LLDPE PLANT

In the pursuit of cost reduction, a quality circle project on nitrogen consumption reduction was taken up by LLDPE plant on 18<sup>th</sup> of April 2006.

The areas of nitrogen consumptions were identified; actual consumptions were compared with design consumptions at all the consumption centers. The timings of adsorber changeovers, cyclo-hexane purifiers changeovers were monitored round the clock in all shift groups.

Through the quality circle initiative N<sub>2</sub> consumption was reduced by 550 MT/month resulting into saving of Rs. 1.2 Crores/year. The equivalent energy saved is 2700 MWh/year.

## 9. REDUCTION IN HP STEAM CONSUMPTION BY REDUCING DOWNTIME DURING GRADECHANGE OVER IN LLDPE/HDPE SWING PLANT

LLDPE/HDPE plant produces polyethylene of various grades. Transition from one grade to another grade is as per market requirement. While some transitions are online while others require shutdown. During shutdown, the consumption of steam is very high. Therefore, through in-house discussions and process improvements, the downtime period between grade transitions were reduced.

This resulted into reduction of HP steam consumption by 640 MT /month and equivalent money saving of Rs. 56 lacs/year.

## **Energy Saving Measures already implemented in current year (2007-08)**

### **1. DIVERSION OF ETHYLENE SPHERE VAPORS TO HDPE UNITS**



Ethylene produced from Gas Cracker Unit is stored in Double Wall ethylene tanks and ethylene sphere. Ethylene sphere is an insulated vessel designed to operate at 17 bars pressure and at a temperature of -30 degC. Ethylene vapors generated from sphere to the tune of 1.5 MT/hr, as a result of heat loss from insulation, were being recycled to cracked gas compressor in Gas Cracker Unit, where it was undergoing through several stages like compression, cooling and cryogenic distillation and finally leaving with main product ethylene.

Therefore, it was decided to divert sphere ethylene recycle generated at 17 bar pressure to HDPE unit instead of recycling it back to GCU. This has resulted in increased ethylene production by around 10-15 MT/day and subsequently resulting into extra polymer production benefit of Rs. 9 Crores/year. The reduction in energy intensity by means of avoiding recirculation is around 9000 MWh/year.

### **2. USE OF ASTRONOMICAL TIMERS IN PLANT BOUNDARY AND PERIPHERIAL LIGHTING (Use of latest technology)**

Astronomical timers have been provided in plant boundary and peripheral lighting circuit. This was implemented in Apr '07 and it has started saving 100 KW electricity per day, which will give benefit of Rs. 1.2 lacs in a year.

### **3. INTERCONNECTION OF DM WATER AND DRINKING WATER PUMPS**

Interconnection between DM water feed pump and drinking water make up pump scheme was implemented and one pump of 39 KWh was stopped in Sep '07. This will result into savings of Rs 10.92 lakh/year.

## Energy Conservation Measures Planned

Energy Conservation Measures (Planned)	Anticipated savings in		Approx. investment (Rs.lakhs)	Project Commencement & Completion year
	<u>Energy Value</u> (specify units)	<u>Rs. Lakhs</u>		
Insulation and refractory replacement for furnaces in ethylene plant	7,247 MMKcal/year	114	88	Oct '07
Reduction in steam consumption by overhauling of C2R & C3R turbines in ethylene plant	1,28,800 MMKcal/year	1300	120	Oct '07
Cooling tower pumps internal coating	1800 MWh/year	63	50	2007-08
Replacement of tube lights with energy efficient tube lights	31,530 KWh/year	1.1	0.3	2007-08
Replacement of solvent pump motors with proper rating motors in LLDPE	769,000 KWh/year	24.2	5	2008-09
Flare gas recovery	63,700 MMKcal/year	700	4	2008-09
Ethylene Boil off Gas diversion to HDPE units	19328 MWh/year	670	985	2008-09
Advanced Process Control Implementation	3% energy reduction expected	**	750	2008-09
<b>Total</b>		<b>3184</b>	<b>2038</b>	

*\*\*3% energy reduction in GCU, GPU & LPG is expected after implementation.*

## Environment and Safety

GAIL is committed to the cause of, Safety Health & Environment. At GAIL, PATA a well defined Safety, Health & Environment Policy has been formulated, distributed and displayed. GAIL, Pata has been accredited with the Quality Management Systems (ISO 9001), Environmental Management Systems (ISO 14001) & Occupational Health & Safety Management Systems (OHSAS 18001).

### ***Environment***

GAIL, Pata is committed towards Sustainable Development. In line with its commitment GAIL has given topmost priority to environment protection throughout the project including the phases of Technology selection, process design and project execution.

Elaborate Waste Water Treatment Plant (WWTP) facilities have been set up to treat effluents from all the processing plants and utilities at the Complex and to meet MINAS (Minimal National Standards).

Apart from this, more than 5 lacks trees have been planted in the area of about 225 hectares in and around the plant. Secured landfill & Incinerator have been initiated towards solid waste management. We have implemented creative schemes enabling us to recycle almost 55% of our treated wastewaters. Development of surroundings is taken up every year under our corporate social responsibility projects. Rain Water harvesting measures have been implemented in two main official buildings of GAIL Pata complex spread over 585 Ha, in which most of the land is open, which helps rain water to directly seep into the soil.

GAIL, Pata has bagged Greentech Gold Environmental Excellence award for 2001-02, 2003-04, 2004-05, 2005-2006 and 2006-07. GAIL, Pata received Golden Peacock Environmental Management award for two consecutive years i.e. 2006 and 2007.

## **Safety**

Safety is ensured through proper designed, layout, construction and best operation and maintenance practices. National & international standards are followed in all above areas.

External and Internal safety audits are conducted on regular intervals. Risk Assessment analysis for GAIL, Pata was carried out by M/s Tebodin, Netherland in 2005. OISD audits are conducted regularly for plant.

GAIL Pata Bagged International Safety Award in 2007 from British Safety Council for 8th Consecutive year. We have also been honored with Green Tech. Gold Award for industrial safety. In addition to this we have also received platinum safety award from Greentech foundation.