Organization:

GAIL (India) Limited
Gas Processing Unit, Vijaipur
Dist - Guna (M.P.), Pin – 473112

GAIL (India) Limited

Gas Processing Unit
Vijaipur

PROFILE:

GAIL (India) Ltd (Erstwhile Gas Authority of India Ltd), India's principal gas transmission and marketing company, was set up by the Government of India in August 1984 to create gas sector infrastructure for sustained development of gas market in the country. The organization has attained a leading status in the Indian business through its all-round contribution to the nation's gas-based economy with a countrywide presence of Pipelines, Gas Processing Plants, and Marketing network, including 60 work centers, which is efficiently operated by a young team of less than 3,500 employees, whose average age is 36 years.

GAIL is writing a new genetic code to achieve all-round excellence in our services towards the people and nature. Today GAIL has expanded into Gas Processing, Petrochemicals, Liquefied Petroleum Gas Transmission and Telecommunications. The company has also extended its presence in Power, Liquefied Natural Gas re-gasification, City Gas Distribution and Exploration & Production through equity stakes and joint venture participations. GAIL (India) Ltd is having it's one of the gas processing complex at Vijaipur, Distt. - Guna, MP.

The Gas Processing Unit (GPU) at Vijaipur is designed for processing 15 MMSCMD (Million Standard Cubic Meter / day) of Natural gas in two trains of 7.5 MMSCMD each. The total plant capacity is 6 Lakh MT of Liquid Hydro-carbon (LHC). The production capacity of different products is given in table.

Sr. No	Products	Capacity (MT/Annum)
1	LPG	406000
2	Propane	130000
3	Pentane	42000
4	SBP Solvent	24000
	Total Capacity	602000

ENERGY MANAGEMENT POLICY:

GAIL (India) Ltd. Vijaipur is committed to explore new horizons in Energy conservation & to minimize the specific energy consumptions for our products to benchmark against International standards through

- **Adoption & up gradation of technology with main concern on energy efficiency & eco friendliness**
- **Benchmarking against the best practices of energy consumption & resource generation**
- **Nurturing a culture of participation & innovation amongst stakeholders & customers for continual improvement in Energy Conservation**
- **Imbibe practices of in house Energy saving with waste elimination & recycling mind-set**
- **Promote awareness among society to adopt renewable energy resources in a more user friendly manner, by cultivating responsive attitude among individuals, with spirit "Enough is not enough for Energy Conservation", through motivation, training & encouragement to our employees.**

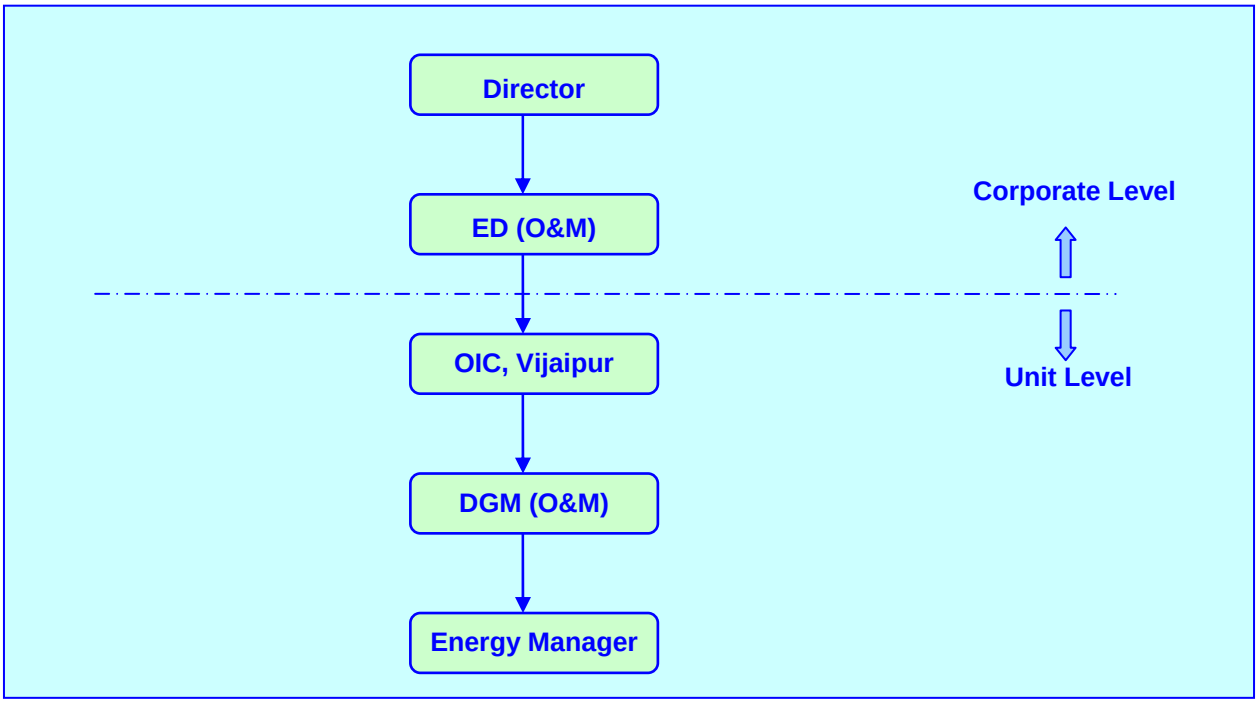
ENERGY CONSUMPTION DETAILS:

Year	Production (Lakh MT)	Capacity Utilisation (%)	Consumption of Energy Per Unit of Production MKcal / MT (FUEL GAS)	Consumption of Energy Per Unit of Production kWh/ MT (Electricity)	Energy Cost In Rs. (Cr)	Energy Cost as percentage of Cost of Production (%)
2005-06	606598	100.76	1.51	44.00	82.23	13.20
2006-07	569417	94.59	1.48	44.46	100.12	13.22
2007-08	588516	97.76	1.39	44.63	104.36	13.99

ENERGY CONSERVATION COMMITMENT POLICY AND SET-UP

The Energy conservation activities in the organization is being monitored by top management headed by Executive Director (O&M) assisted by his Team at corporate level for disseminating information related to energy conservation not only within GAIL but also to our valued customers.

ENERGY CONSERVATION CELL STRUCTURE



ENERGY CONSERVATION PLANS & TARGETS

Energy Conservation Measures (Planned)	Anticipated savings in Energy per annum	Approx. investment (Rs.lakhs)	Project Commencement & Completion year
Installation of solar water heater in new bachelor hostel	0.25 Lac KWH	8	2008-09
Fixing of non-metallic wearing rings in rail / road loading pumps	1 Lac KWH	2	2008-09
Replacement of V-belts with energy efficient flat belt	0.25 Lac KWH	2	2008-09
Arrest of compressed air leaks in distribution	3.62 Lac KWH	1	2008-09
Installation of dry gas seals in PRU compressor		1.5	2009-10
Use of energy efficient lighting	0.41 Lac KWH	7.5	2009-10
Uprate of Fr-3 Gas turbine BHEL make		350	2010-11

SAFETY & ENVIRONMENT

GAIL attaches great importance to Safety, Health and Environment in its plants, pipeline systems and work centres as also in the community and its work environment. The Company follows the guidelines and stipulations issued by the concerned Indian Statutory Agencies and Regulatory Bodies. For enforcing the safety of international standards, the internationally reputed organizations are being called for safety audits e.g

- Germinscher Lloyd, U.K.
- British Safety Council, U.K.

Major environmental initiatives taken up in last three years are:

Halon Replacement: Halon 1301 is now known to be environmentally damaging, particularly toward the earth's protective ozone layer, which shields the planet from damaging UV-B radiation. As a result, production of this gas has, or will be, ceased within the next couple of years, in accord of Montreal protocol.

The Montreal Protocol stipulates that the production and consumption of compounds that deplete ozone in the stratosphere thru Chlorofluorocarbons (CFCs), Halons, Carbon Tetrachloride, and Methyl Chloroform are to be phased out. The phasing out schedule for different countries is mentioned in the table ahead. Current status of Halon replacement is shown in table attached.

Location	Qty of Halon (Kg.)		
	Installed	Replaced	Action in Progress
HVJ Compressor Station	556 KG	556 KG	
LPG Plant	2309 KG	2309 KG	
LPG Substation	712 KG	NIL	To be completed in 2009-10
LPG Control Room	3204 KG	NIL	

In LPG plant turbines, Control room, Substations, Fire station & HVJ compressor station Turbines total 6617 Kg of Halon is used. 3465 kg of Halon has been replaced in LPG plant & HVJ compressor stations Gas Turbines, remaining will be replaced in coming future by 2009-10.

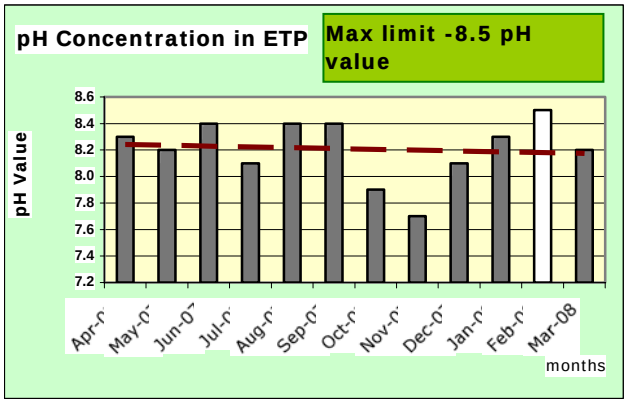
HALON REPLACEMENT WITH CO_2

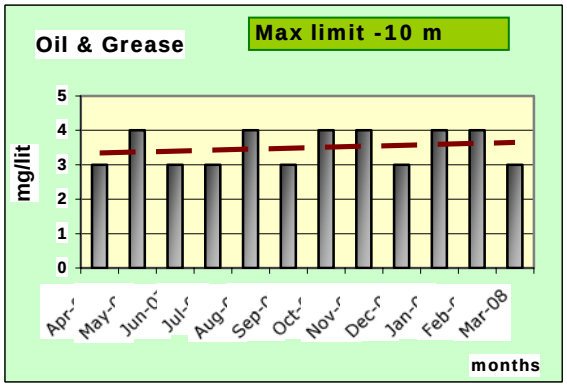
Water Effluent treatment plant: The Effluent from various section of plant is fed to the Common Effluent treatment plant, which is kept on line round the clock. The design of the effluent treatment plant provides for standby for all the running equipments, as well as for aerators. The LPG plant has integrated process waste train through which any hydrocarbon required to drain in case of emergency, is routed to effluent treatment plant and collected in PW (process waste) sump.

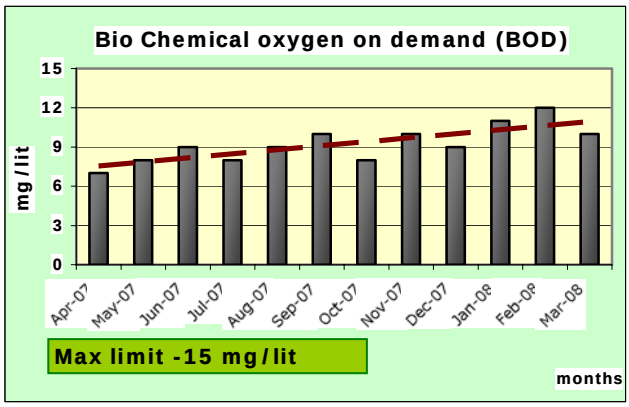
Urea and DAP are dosed before Aeration for microbiological growth which in turn controls the BOD and COD. The pH of water remains same and there is no requirement of acid or alkali dosing in the system.

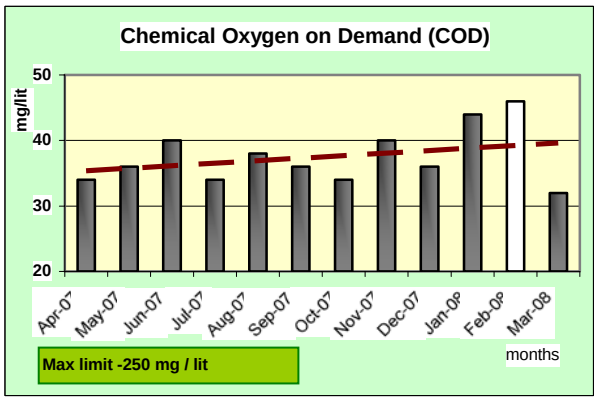
The rate of effluent generation and the intensity of pollutants is well below the design limits of MPPCB.

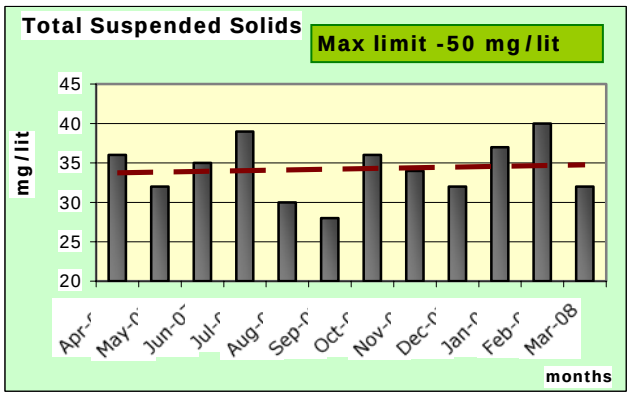
Main water pollutants from LPG plant	The indicators to monitor
• Oil and grease • Total suspended solids (TSS)	• Biochemical oxygen Demand • Chemical oxygen demand • pH value

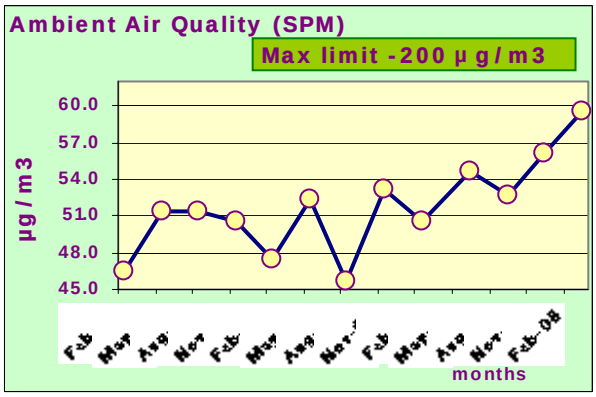












Air: Since natural gas is used as fuel in Gas turbines and RG Heaters, the flue gases have insignificant quantity of pollutants. State of the art technological designs of gas turbines and rigorous predictive and preventive maintenance schedules ensure that the complete combustion takes place inside combustion zone, and pollutants emitted in flue gases are well below the standard pollution norms. Hence no treatment for the pollutants is required. The tables given below indicate the average values of pollutants emitted from our plant.

The pollutants, which are emitted from our Plant, are listed below

- Suspended particulate matter (SPM)
- Sulphur dioxide (SOX)
- Oxides of nitrogen (NO_X)
- Noise

AMBIENT AIR QUALITY RESULTS Average values for 2007-08		
Parameters	PCB Limit	Results
SO_X	120 ug/M^3	3.3 ug/M^3
NOx	120 ug/M^3	5.0 ug/M^3
SPM	500 ug/M^3	56.1 ug/M^3
CO	5000 ug/M^3	< 600 ug/M^3
HC	-	< 1 ppm

STACK EMISSION RESULTS Average values for 2007-08		
Parameters	PCB Limit	Results
SO_X	80 mg /M^3	2.4 ug/M^3
NOx	120 mg/M^3	3.3 mg/M^3
SPM	150 mg/M^3	6.9 mg/M^3
CO	2000 ppm	49 ppm

Environment & Safety is given prime importance by compliance & adherence to various acts , such as Air act, Water act, Storage / handling / disposal of hazardous chemicals / waste (including bio-medical waste) & Compliance with the prescribed approvals / standards for - Effluents, Emissions, Hazardous / biomedical/ solid waste. & Explosive (CCOE) Licenses.

Our efforts in the area of safety & environment have been recognized by the various national & international organizations. No penalties have been imposed for any non compliance.

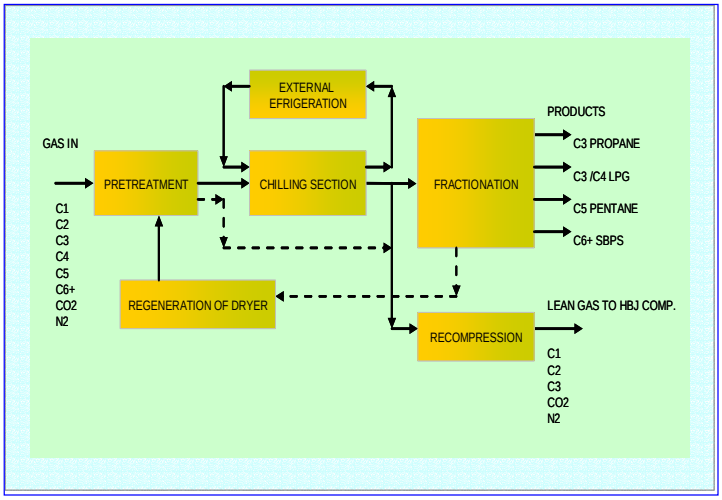
The awards received in this area are listed below:-

- Five Star Ranking' from British Safety Council for 2001, 2002, 2003 & 2005.
- Sword of Honour from British Safety Council for 2001, 2002, 2003 & 2005.
- Sarvashrestha Suraksha Puraskar by National Safety Council – 2005.
- OISD Safety Award to LPG Plant Vijaipur among other processing organizations- 92-93, 1998-99, 2006-07, 2007-08
- National Safety Council Award for 1997, 1999, 2001, 2002, 2003, 2007.
- Safety Innovation Award from Institute of Engineers 2007, 2008
- Greentech Foundation Gold Safety Award for 2002, 2005 & 2006,
- Greentech Environmental Excellence Award 2002, 2004, 2005, 2006 & 2007, 2008.
- Rajiv Gandhi National Award for Excellence in Environment and Ecological implementation for 2001.
- Prashansa Patra Puraskar by NSC, Mumbai 2001-02.
- National Gas Conservation Award – LPG 2004 & 2005
- Golden Peacock Environment Management Award – 2005

Process Description

The entire process of LPG recovery consists mainly of (i) Gas receiving, drying and regeneration (ii) Pre-cooling & Chill down in Expander & (iii) Distillation.

(i) Gas receiving, drying & regeneration:



Natural gas is received from HVJ (Hazira-Vijaipur-Jagdish pur) pipeline at a pressure of around 54.2 Kg/cm2g and temperature of around 30 degree C. The gas flows to a Knock Out Drum (KOD) where any liquid present in the gas is knocked off. After this the gas is dried in Molecular Sieve Dryers to remove the moisture to below 1 ppm level. A two bed dryer system is used – one for drying & another for regeneration.

(ii) Pre-cooling & Chill-down Section:

The dried gas is cooled to approx (-) 69 degree C in two stages. In the first stage it is pre-cooled to approx (-) 39 degree C in chiller by heat exchange with various cold streams generated later in the process in the chill down system and external Propane refrigeration. Propane refrigeration system is provided to supply additional refrigeration required in chiller and LEF condenser for Propane recovery. The condensed liquid is separated out in Separator-I and vapor is expanded through a single stage Turbo-expander. The vapor-liquid mixture from Turbo-expander is fed to Separator-II. The hydrocarbon liquid from the two separators, after heat exchange, is fed to the fractionation section to recover the products i.e. LPG, Propane, Pentane and SBP Solvent.

Vapors (Lean Natural Gas) from the second separator are taken through the chiller to recover refrigeration. Then it is compressed to about 30 Kg/cm2g by the expander compressor. The quantity of lean gas required for NFL Plant & branch line of HVJ pipeline is compressed in a GT driven two stage Lean Gas Compressor to 45 Kg/cm2g (Medium Pressure Lean Gas) and the rest of gas is compressed to 55.2 Kg/cm2g

(High Pressure Lean Gas) and sent to Vijaipur compressor station of HVJ pipeline for further transmission.

Vapors from LEF column are passed through the chiller to recover refrigeration before being compressed in a GT driven LEF O/H compressor to a pressure of about 90 Kg/Cm2 and mixed in the downstream HVJ line.

(iii) Distillation Section:

The distillation section consists of four columns namely LEF, Propane, LPG and SBPS columns.

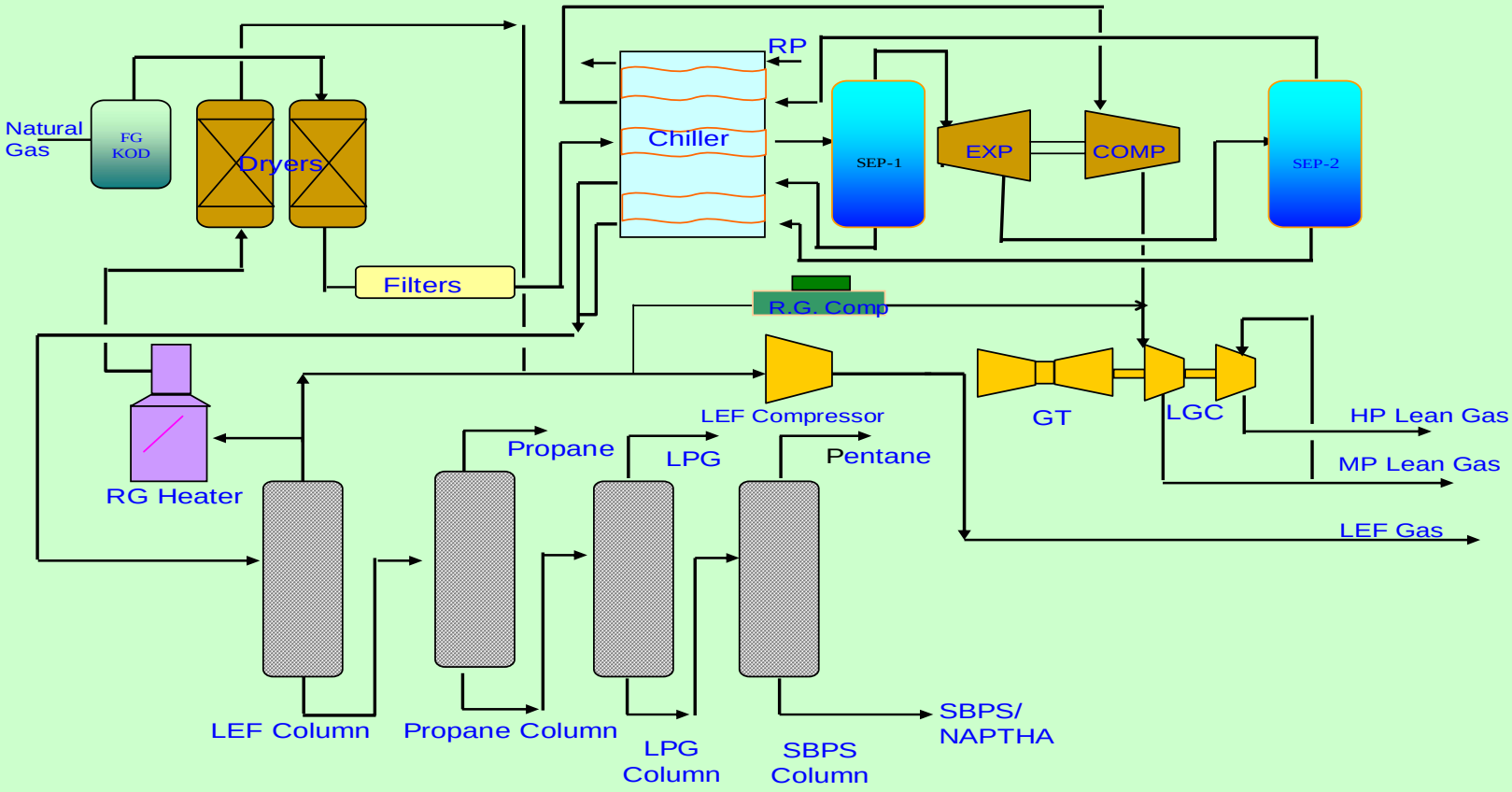
(a) LEF Column – Liquid from the two separators flows to chiller to supply cold & is then routed to Light Ends Fractionation (LEF) column. This column removes all Methane, Ethane and most of Carbon dioxide as overhead vapors. Bottom stream consists of part of Propane, Butane, Pentane & heavier hydrocarbons. Condensing a part of overhead vapors generates reflux. The refrigerant duty is supplied by vapors from second separator and external Propane refrigeration.

(b) Propane Column – Liquid from LEF column bottom is fed to Propane column where Propane is produced as top product.

(c) LPG Column – Liquid from Propane column bottom is fed to LPG column for separation of LPG & heavier hydrocarbons. This column separates LPG as top product.

(d) SBPS Column – Liquid from the LPG column bottom is fed to SBPS column where Pentane is produced as the top product and SBP Solvent as bottom product.

PROCESS FLOW DIAGRAM (GPU, VIJAIPUR)



Energy Conservation Measure implemented in 2007-2008

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Retrofitting of Regeneration Gas Heater & it's Burner Management System (BMS)**	Sector: **Refinery**
Year to be filled by BEE		Technology: **Indigenous**

Description of the energy conservation measure:

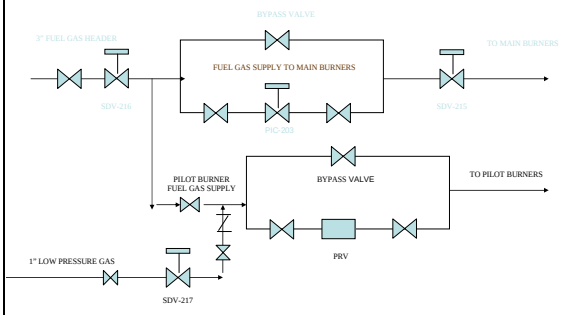
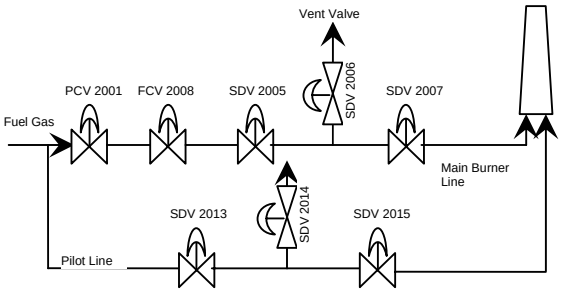
Natural gas being used as the feed gas contains moisture to the extent of 15 kg/MMSCM of gas. This moisture is removed in Feed Gas Dryers to bring water dew point around -75^0C (approx. 1 Kg/MMSCM) to ensure that moisture free gas enters feed gas chiller to avoid hydrate formation inside the chiller and associated pipes. There are two feed gas dryers one in service and other in regeneration cycle mode. Normal operation time for dryer in service is 40 hrs depending on moisture content after which it needs to be regenerated to make the dryer available for moisture absorption again. The heating of regeneration gas is achieved in Regeneration Gas heater (RG Heater) before carrying out the function of dryer regeneration.

Initially Furnace had four gas fired burners arranged at the bottom floor of the furnace and self aspirating gas pilot for each burner. There were primary air register and secondary air register at the bottom floor of furnace to control combustion air during burning. During burning operation primary air register was kept 2/3 open and secondary about half open. They were operated manually in synchronization to main burner fuel supply. During cutoff condition pilot burners were kept alive consuming 40-50 Nm^3/hr of fuel gas. As the operation was manual excess air was generally found more (about 200-250%) than what was ideally required (20% for fuel gas).

It was decided to go for a complete Retrofit of the old Burner system. New Burner Management System along with an efficient SDAF burner was worked out that was equipped with advanced safety features and higher fuel efficiency.

A forced draft single burner system was retrofitted in TR-12 RG-Heater during annual shutdown in Nov 2007. The Furnace has now been provided with one number secondary draft air flow register type burner. Following have been incorporated in the new system:

- One number pilot burner and one number flicker based ISCAN type flame scanner.
- Two number forced draft air blowers with TEFC electric motor
- Inlet air control by Variable Frequency Drive (VFD)
- Dedicated PLC based Burner Management System.
- HMI with user friendly displays and data logging.

Picture/ sketch/ drawing before modification	**Picture/ sketch/ drawing after modification**
	

Agency that executed the project (with complete address and email):
M/s Coen Bharat Limited, Vadodara

Total investment, Rs.: 1.06 Crores		Year of implementation: 2008			
First year energy cost savings, Rs.: 76 Lacs					
First year other savings, Rs.: Nil					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before		-	$1.29x10^6$	-	-
Energy consumption after		-	$0.97x10^6$	-	-
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …	Rs. 5/KWH	-	Rs.3.2 / SCM	-	-
Company complete address: Gas Processing Unit GAIL (India) Limited Vijaipur, Dist-Guna (M.P.)-473112 Contact person who could be contacted for more information: Mr. Vimal Kumar, DGM (O&M)			We authorise Bureau to use this information for dissemination Signature Date: 23/09/2008		

Note: Please submit this sheet separately for each Energy Conservation Measure implemented in 2007-2008 and a CD containing the above information may be please be enclosed.

Energy Conservation Measure implemented in 2007-2008

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Replacement of old 2x50KVA UPS with new UPS**	Sector: **Refinery**
Year to be filled by BEE		Technology: **Indigenous**

Description of the energy conservation measure:

Two sets of 2x50 KVA 'SCR' based old UPS are replaced by same capacity of with IGBT type inverter. Overall Efficiency of old UPS was about 53% & the new UPS installed is having efficiency of about 72% at running load. Due to replacement of old UPS with new UPS annual saving of electrical energy is 91628.36 KWH & resulting to saving of Rs 458142.00 annually.

Picture/ sketch/ drawing before modification	**Picture/ sketch/ drawing after modification**
	

Agency that executed the project (with complete address and email):
M/s Aplab Ltd,A-5,Wagle Industrial Estate,Thane-400604,
Ph-022 29201787,Email:aplabwr@aplab.com

Total investment Rs.: 3806675.00	Year of implementation: 2008
First year energy cost savings, Rs.: 458142.00	
First year other savings, Rs.: Nil	

On annual basis	kWhx1000	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before	350.1	-		-	-
Energy consumption after	258.4	-		-	-
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …	Rs. 5/KWH	-		-	-

Company complete address: Gas Processing Unit GAIL (India) Limited Vijaipur, Dist-Guna (M.P.)-473112 Contact person who could be contacted for more information: Mr. Anupam Mukhopadhyay, CM (Electrical)	We authorize Bureau to use this information for dissemination Signature Date: 23/09/2008

Note: Please submit this sheet separately for each Energy Conservation Measure implemented in 2007-2008 and a CD containing the above information may be please be enclosed.

Annexure 'B-3'

Energy Conservation Measure implemented in 2007-2008

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Fixing of Non Metallic Composite wearing ring as per API 610, (9th editions) in Cooling Water Circulation Pumps at GAIL, Vijaipur.**	Sector: **Refinery**
Year to be filled by BEE		Technology: **Indigenous**

Description of the energy conservation measure:

At LPG plant, Vijaipur 08 nos (04 nos.in each stream) of CWC Pumps installed for circulation of water to meet process requirement.

The existing 04 nos of pumps at cooling tower -2 (Make: M/s Beacon Weir) are installed & running since inception for catering the cooling water requirement of Heat Exchangers. These pumps are fitted with metallic wear rings All these wear rings are in service since inception & most of these are having increased clearances because of which flow / discharge through the of pump is getting down. With the recent technological up gradation & in line with API Standard 610 (9th Edition) to increase the flow through pump on trail basis, we have in house developed non metallic wear ring (MOC: PEEK) of Rider band of Dry lubricated piston for RG Comp & installed new modified composite wear ring (in-house modification) with reduced clearances of around 0.15 to 0.20 mm w.r.t earlier clearance of 0.6 to 0.75 mm in our CWC Pump- C at CT-2.

By carrying out the job of fixing of non metallic wear ring, the flow through pump C increased by @ 120 M^3/Hr (i.e. 5%) by keeping the energy consumption & all parameters almost same.

After monitoring the close performance of CWCP-C, we have done the same modification in CWCP-D where in also, the flow through pump D increased by @ 80 M3/Hr (i.e.3.15 %).

Analysis:

Analysis of various parameters for Pre & Post data is attached**.**

Sr No	Parameters	CWCP-C		CWCP-D	
		Previous (Pre)	After (Post)	Previous (Pre)	After (Post)
1	Flow (M3/hr)	2275	2395	2275	2355
2	Power Reqd (Kw)	237.77	238.69	247	250
3	Flow Increase (M^3/hr)	-	120 (5%)	-	80 (3.15%)

Conclusion:

Saving of Rs.9.30 Lacs / annum in CWC pumps at CT-2 by

- Increased flow by 200 M^3/hr with same energy consumption.

Picture/ sketch/ drawing before modification	**Picture/ sketch/ drawing after modification**
Removal of top cover casing of the pump. 	 Machining of metal wear ring at workshop to suit the fitting of non metallic ring
 View of impeller after opening of top cover of pump	Nonmetallic wearing ring ready for use 

Agency that executed the project (with complete address and email):

Job was done through in-house expertise.

Total investment, : very negligible		Year of implementation: 2007-08			
First year energy cost savings, Rs: 9.60 Lacs					
First year other savings, Rs.: Nil					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other Water Flow improvement (m^3/hr))
Energy consumption before		-		-	Pump C: 2275 & Pump D: 2275-
Energy consumption after		-		-	Pump C: 2395 & Pump D: 2355-
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …				-	
Company complete address: Gas Processing Unit GAIL (India) Limited Vijaipur, Dist-Guna (M.P.)-473112 Contact person who could be contacted for more information: Mr. S C Sharma CM (O&M)			We authorize Bureau to use this information for dissemination Signature Date: 23/09/2008		

Note: Please submit this sheet separately for each Energy Conservation Measure implemented in 2007-2008 and a CD containing the above information may be please b

Energy Conservation Measure implemented in 2007-2008

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Elimination of use of CW reclamation pump and increase the performance of IA compressor**	Sector: **Refinery**
Year to be filled by BEE		Technology: **Indigenous**

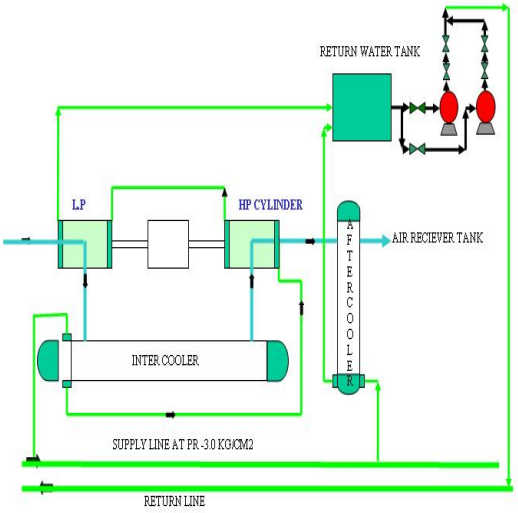
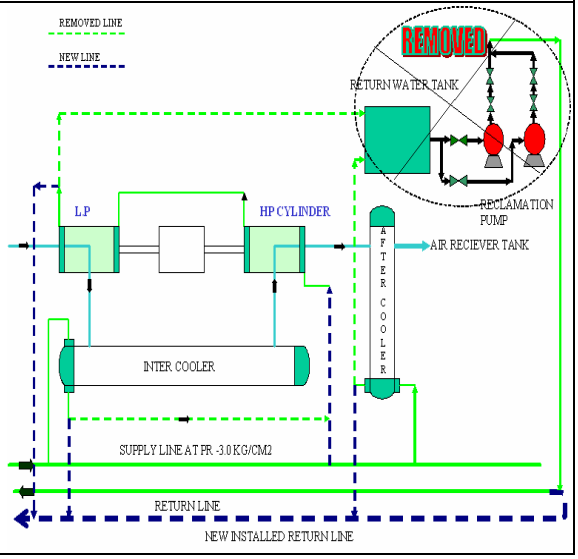
Description of the energy conservation measure:

At LPG plant, Vijaipur 04 nos of M/s KPCL make air compressors (20-K-201-A, B, C & D) Model-T-BTD-JM for catering the requirement of both plant air & instrument air for entire LPG plant. These compressors are quite critical considering the fact that all pneumatic based instruments for entire LPG plant are solely dependent on these compressors for instrument air supply

These compressors are two stage double acting type with reciprocation of piston being utilized for compression. These compressors are running on continuous basis with stand-by concept based on the operational requirement. In this two stage compressor we have use cooling system for improving efficiency of system & for cooling system, water is circulated through the intercooler, LP & HP Cylinder by 3" suction line and finally get discharged into return water tank. Return water tank connected to two pumps for circulated discharge water into cooling tower network by 3" discharge Line. These pumps are operated round the clock; with stand by concept and creating pressure ~ 1.7 kg for circulating water into CT network.

It has been observed that for circulating of discharge water, no need of water reclamation pump A/B. This flow of water possible by only small modification of line by providing extra supporting discharge line from compressor inter & after intercooler to cooling water return discharge header so that flow of water improves without any help of extra source.

Moreover, temp of second stage suction has reduced by 5 C and temp of second stage discharge has reduced by 10 C due to the remove of restriction in flow of cooler. IA compressor cylinder is cooled by water-jacketing. In existing system water used, for jacketing was discharge of inter cooler. By small modification, suction of water-jacketing is taking from main line of cooling water header. Therefore, heat flow from cylinder & piston to the water is more. Results are that work required for carrying out compression is reducing.

Picture/ sketch/ drawing before modification	Picture/ sketch/ drawing after modification
	

Total investment, Rs.: 70,000/-		Year of implementation: 2007			
First year energy cost savings, Rs.: 5.2 Lacs					
First year other savings, Rs.: Nil					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before		-		-	-
Energy consumption after		-		-	-
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …		-		-	-
Company complete address: Gas Processing Unit GAIL (India) Limited Vijaipur, Dist-Guna (M.P.)-473112 Contact person who could be contacted for more information: Mr. S. C. Sharma, CH MGR (O&M)			We authorise Bureau to use this information for dissemination Signature Date: 23/09/2008		