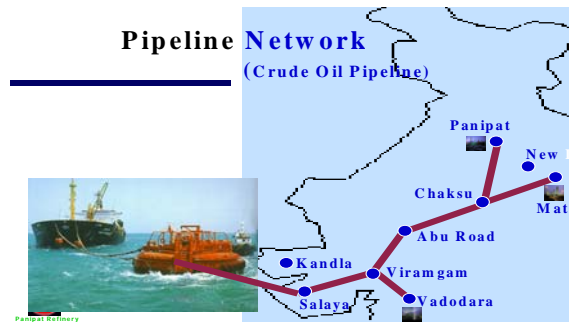




Indian Oil Corporation Limited Panipat Refinery



Panipat refinery is the 7th refinery of Indian Oil Corporation. It is located about 20 kms from Panipat city and 100 km from Delhi. Panipat Refinery built at the cost of Rs. 3868 crores (including Marketing and pipelines installation) with an installed capacity of processing 6 million metric tonnes per annum of crude oil. It is India's one of the most modern refinery with global technologies from IFP, France, Haldor Topsoe Denmark, UNOCAL/UOP, Stone & Webster USA. The refinery receives crude oil through a 1350-KM long pipeline originating from Salaya in Gujarat and reaching Panipat via Chaksu.



The Refinery produces annually about 2 lakh tonnes of cooking gas (LPG), 8 lakh tonnes of Petrol, 3 lakh tonnes of jet fuel, 6 lakh tonnes of kerosene & 24 lakh tonnes of Diesel apart from other products such as Naphtha, Bitumen, HPS, MTO & Propylene . For environment protection & conservation, the refinery has also commenced production of ultra low sulphur diesel and 1 % benzene petrol.

To meet the demand of various petroleum products the refinery has a

Products from Refinery

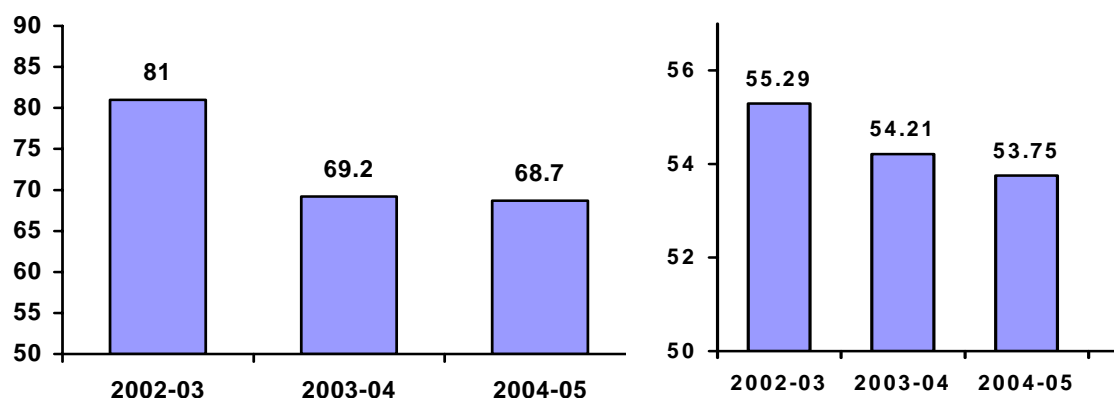
<p>96 RON GASOLINE</p> 	<p>LPG PROPYLENE</p> 	
<p>BITUMEN</p> 		<p>NAPHTHA</p> 
<p>SULPHUR</p> 		<p>MOTOR SPIRIT</p> 
<p>HEAVY PETROLEUM STOCK</p> 		<p>ATF</p> 
<p>HSD</p> 		<p>SKO</p> 

number of process units along with captive power plant, utilities block and effluent treatment facilities. The various units of the refinery are :

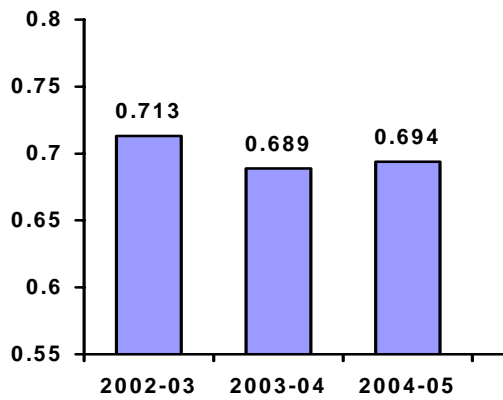
- AVU (Atmospheric & Vacuum Distillation Unit) : (6.0 Million Metric Ton Per Annum): Crude oil distillation / fractionation for further processing in secondary units
- HGU (Hydrogen Generation Unit) : (0.038 Million Metric Ton Per Annum): Hydrogen generation for processes requiring hydrogen
- CCRU (Continuous Catalytic Reforming Unit) : (0.5 Million Metric Ton Per Annum): For improving octane number of petrol component. This process eliminates requirement of environmentally hazardous TEL (Tetra Ethyl Lead) blending in petrol.
- RFCCU (Resid Fluidized Catalytic Cracking Unit) : (0.7 Million Metric Ton Per Annum): Catalytic cracking of heavy intermediate stocks for production of lighter products viz. LPG, Petrol, Diesel components
- BBU (Bitumen Blowing Unit) : (0.5 Million Metric Ton Per Annum): For production of Bitumen.
- VBU (Visbreaker Unit) : (0.4 Million Metric Ton Per Annum): Thermal cracking of Vacuum Residue is carried out for viscosity reduction and production of HPS Fuel
- OHCU (Once through Hydrocracker Unit): (1.6 Million Metric Ton Per Annum): Heavy petroleum stock is subjected to hydrocracking for production of lighter products viz. LPG, Petrol, Diesel components
- DHDS (Diesel Hydrodesulphurisation Unit): (0.7 Million Metric Ton Per Annum): For removal of sulphur components and production of low sulphur environment friendly Diesel

II. ENERGY CONSUMPTION

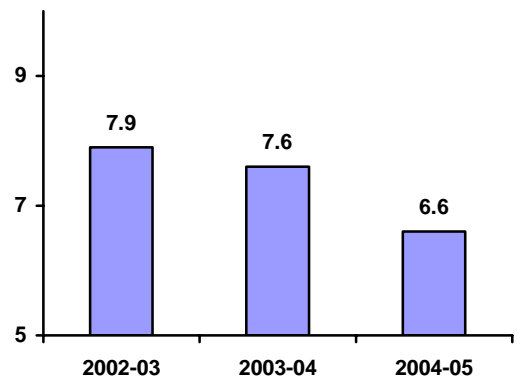
The refinery primarily consumes own generated Fuel Oil (IFO, LDO & Naphtha) and Refinery off-gas to meet its entire energy demand including power generation at its captive power plant. Power import is nominal. The total energy consumption is monitored on a daily basis, for which the daily operating report formats have been developed. Energy conservation receives top priority at Panipat refinery. The Top Management commitment to perform and outpace the international pacesetter refineries has percolated down to the line staff. As a result of various ENCON & other operational improvements the total energy cost of the refinery have steadily declined from a level of 9.2% in 2000-01 to the current level of 6.6% of the total manufacturing cost including crude oil cost. Specific electrical energy consumption has come down from 55.6 KWh/ MT crude processed in 2001-02 to 53.75 KWh/MT crude processed in 2004-05. Similarly, thermal energy consumption has come down from 0.738 MMKCal/ MT crude processed in 2001-02 to 0.694 MMKCal/MT crude processed in 2004-05. Energy & loss performance in terms of MBN (MBTU/BBL/NRGF – the measure extensively used in crude oil refining sector for energy performance evaluation) has come down from 81 in 2002-03 to 68.7 in 2004-05.



**ENERGY + LOSS PERFORMANCE :
MBN (MBTU / BBL /NRGF)**



**SPECIFIC ELECTRICITY CONSUMPTION :
KWH / MT CRUDE PROCESSED**



**SPECIFIC THERMAL ENERGY CONSUMPTION :
MMKcal / MT CRUDE PROCESSED**

ENERGY COST AS % OF MANUFACTURING COST

III. ENERGY CONSERVATION COMMITMENT, POLICY AND SETUP

ENERGY POLICY

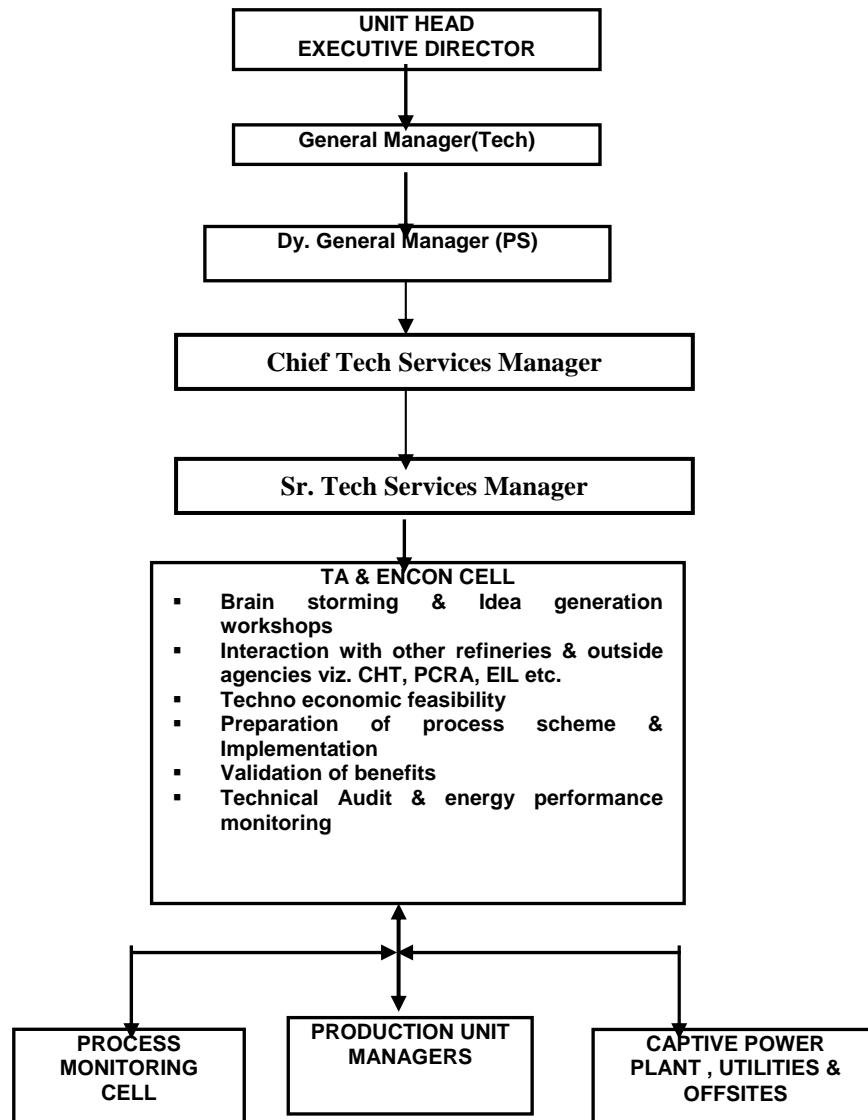
To be a World Class Performer in Energy Management by

- Adopting energy efficient and environment friendly technologies.
- Benchmarking our performance with the best in the world and endeavoring to be ahead.
- Promoting use of renewable sources of energy.
- Fostering a culture of participation and innovation amongst stake holders for continual improvement in energy conservation.
- Propagating the message of avoiding wastage of energy to the community.



Indian Oil Corporation Limited

Energy Conservation Team Structure



iv. Energy Conservation Achievements :

Details of Schemes Implemented in 2004-05 :

1. **Scheme : Recovery of LP steam from HP condensate in Hydrogen Generation Unit**

Background :

HP steam is used In Hydrogen Unit for heating / vaporization of feed and fuel Naphtha. The condensate generated was routed to deaerator. This heat input to de-aerator was high and excess steam generated in de-aerator was vented.

Observation :

Prior to routing to de-aerator, flash steam could be recovered from HP condensate. 2.5 MT/hr flash steam recovery potential exists.

Technical / Financial Analysis :

Flash vessel installed and flash steam recovered into LP steam header.

Savings : 11130 Million Kcal/Year

Impact of Implementation :

Financial Savings : Rs. 109 Lac per year

2. **Scheme : Direct routing of CCRU low purity hydrogen rich gas to OHCU Make Up Gas compressor suction by-passing PSA**

Background :

In the Hydrocracker Unit of the refinery, hydrogen is required continuously for carrying out the hydrocracking process. One Hydrogen Generation Unit is provided to cater hydrogen requirement. Some amount of Hydrogen rich gas also gets generated in the Continuous Catalytic Reforming Unit (CCRU) during the Naphtha Reforming process. The hydrogen rich streams coming from Steam Reformer of HGU and from CCRU are fed to PSA (Pressure Swing Adsorption system) for improving hydrogen purity. About 11000 NM³/Hr of CCRU low purity hydrogen rich gas is routed through PSA (Pressure Swing Adsorption) for improving hydrogen purity (99.99% purity) for utilizing it in Hydrocracker Unit.

Observation :

The PSA is designed to process a maximum 11000 NM³/Hr of CCRU H₂ rich gas along with 75000 NM³/Hr of Synthesis gas coming from Hydrogen unit. Because of this limitation, about 8000 NM³/Hr of surplus CCRU hydrogen rich gas was being routed to fuel gas system and could not be utilized for hydrogen recovery. A low cost option to rout the low purity H₂ to the MUG suction (bypassing PSA) along with the pure H₂ from PSA was explored.



Hydrocracker Unit

Technical / Financial Analysis :

H₂ Rich Gas diverted to OHCU bypassing PSA = 5000 NM³/Hr = 423 kg/hr H₂ (earlier 3000 NM³/hr was diverted in 2003-04)

Reduction in HGU fuel consumption: 423 kg/hr * 37185 Kcal / kg= 15729255Kcal/Hr

Fuel reduction in FG system equivalent to 423 kg/hr of H₂ = 12126987 Kcal/Hr

Net Savings = 3602268 Kcal/Hr

Equivalent savings = 28800 Million Kcal/Year

Impact of Implementation :

With implementation of the scheme, CCRU H₂ rich gas routing to Hydrocracker unit has increased and H₂ demand from Hydrogen Generation Unit has decreased proportionately resulting in savings of about 2880 MT fuel per year.

Financial Savings : Rs. 282 Lac per year

3. Scheme : SSRU stack damper modification / rectification for increased waste heat recovery for steam generation

Background :

In SSRU unit (Standby Sulphur Recovery unit), the damper in the bypass of waste heat boiler was not holding properly and some amount of hot gas was bypassing the waste heat boiler.

Observation :

By modifying / rectifying the damper, additional 3 TPH steam generation could be possible.

Technical / Financial Analysis :

Savings : 12000 Million Kcal/Year

Impact of Implementation :

Financial Savings : Rs. 118 Lac per year

4. Scheme : Recovery of H₂ from LP Separator Gas of OHCU

Background :

Hydro-cracker offgas from cold low-pressure separator (CLPS gas) has very high H₂ content and are routed to sour gas due to very high H₂S content.

Observation :

OHCU CLPS gas can be treated for H₂S removal and then H₂ can be recovered by routing it through PSA. As per OHCU design, the LP separator gas depending on feed sulphur, consist of 70.70 – 88.39 % vol of H₂; the H₂S content in this gas is in the range of 18.1 – 19.98% vol. In actual operation, the hydrogen content of this gas is about 87 % vol with normal feed ('S' – 1.6 wt%). The existing PSA unit in HGU is designed to handle the LP separator gas after suitable treatment at OHCU. Hence, a suitable amine treating system in OHCU has been provided.

Technical / Financial Analysis :

Net Savings = 20000 Million Kcal/Year

Impact of Implementation :

Financial Savings : Rs. 196 Lac per year

5. Scheme : Rationalisation of lighting load and provision of energy efficient lighting

Background :

The refinery has a captive power plant and supplies power for refinery use, allied services like Marketing & Pipelines complex and also to refinery township. Existing conventional tube lights are having copper wound chokes consuming 53 Watt.

Observation :

Surveys were carried out in township, refinery, marketing & pipelines complexes with a view to optimizing lighting load. 500 numbers energy efficient tube lights of 28 Watt were procured and installed at locations where tube light glowing is required for 24 hours, like QC lab and OM&S building.



Technical / Financial Analysis :

Lighting load reduction potential : 12.5 kW, Power savings = 100000 kWh/year

Impact of Implementation :

Financial Savings : Rs. 3.5 Lac per year

6. Scheme : Provision of MP steam to Auxiliary steam PRDS (16/ 11ATA)

Background :

The auxiliary steam for TG's gland sealing & ejectors were supplied through 100/11 ata PRDS.

Observation :

To improve steam turbine reliability, it was observed that it is beneficial to supply this 11 ata steam through 16/11 ata PRDS..

Technical / Financial Analysis :

After commissioning of 16/11 PRDS, fuel savings : 620 MKcal per year.

Impact of Implementation :

Financial Savings : Rs. 6 Lacs per year

7. Scheme : Replacement of existing metallic fan with new Energy efficient FRP Fan at AVU & Cooling Tower

Background :

There are metallic/GRP fans in process units and Cooling towers at Panipat Refinery. Based on experiences in other refineries and pipeline locations, replacement of these fans with Energy efficient FRP fans will give power savings.

Observation :

In order to improve Energy efficiency of the Refinery and thereby to get savings, it was observed that replacement of existing metallic/GRP fan with new Energy efficient FRP Fan in our process units and Cooling towers would give a power savings of 30% (+/- 5%). The same was established thru' trial runs of 6 nos. of fans installed in AVU (5 nos.) and Cooling tower (1 no.).

Technical / Financial Analysis :

With the installation of the FRP fans, power savings is 448000 Kwh/ year.

Impact of Implementation :

Financial Savings : Rs. 12.7 Lac per year

8. Scheme : Provision of mass flow meter in place of turbine meter in LPG and HSD transfer line

Background :

For custody transfer of LPG and HSD to Marketing, Turbine meter was installed since commissioning.

Observation :

Accuracy of Turbine meter is +/- 0.25% against accuracy of mass flow meter +/- 0.10%.

Technical / Financial Analysis :

Installation of mass flow meter results in custody transfer loss reduction by about 213.4 MT per year to the refinery.

Impact of Implementation :

Financial Savings : Rs. 44 Lac per year

V) Energy Conservation Plans and Targets

Panipat refinery is committed to achieve international standards of excellence in energy consumption. The Refinery has following major plans for reduction of Energy Consumption:-

* Estimated total project cost including Encon.

Energy conservation measures (planned)	Anticipated savings in Energy		Approx. Investment (Rs. Lakhs)	Project commencement & completion year
	Energy value (MT Fuel/Yr)	Rs. Lakhs/ Yr		
Recovery of H2 from LP Separator Gas of PREP HCU	4000	380	593	2005-06
Enhancing capacity of WHB in SSRU (SRU/ SSRU segregation job)	2860	270	100	2005-06
Low cost RFCCU revamp - Additional steam by Heat Recovery from bottom stream	2500	237	9021 *	2006-07
Provision of Plug Valves/ Zero Leak Slab Gate Valves for Naphtha and MS Tanks Manifolds	1100	93	207	2006-07
Replacement of metallic fan with energy efficient FRP fan in cooling towers and process units in phases	1830	174	170	2006-07
Heat Recovery from NSU bottom stream under PX/PTA project	800	76	51040 *	2005-06
H2 recovery from additional CRU off-gas generation after CCRU revamp	6000	570	7809 *	2005-06
Provision of mass flow meter in place of turbine meter in MS, ATF and Naphtha transfer line	900	23	97	2005-06
Heat recovery from CDU pre-flash column – CDU revamp	4000	380	80600 *	2007-08
Secondary seal in floating roof tanks of MS & Naphtha	150	23	119	2006-07
Total	24140	2226	149587	

Process Block Flow Diagram - Panipat Refinery

