

**BARAUNI REFINERY**  
**INDIAN OIL CORPORATION**  
**Barauni (Bihar)**

**(i) Unit Profile**

**Barauni Refinery**, the second public sector oil refinery of the country, was built in collaboration with the erstwhile USSR and limited Rumanian participation. The Barauni Refinery in Eastern India was commissioned in 1964 with a capacity of 2.0 MMTPA. The refining capacity was increased to 3.0 MMTPA by 1969 and further to its current capacity of 6.0 MMTPA through low cost revamping and de-bottlenecking. Matching secondary processing facility such as RFCC (Resid Fluidized Catalytic Cracker) and Hydrotreater facilities for diesel quality improvement have been added. Earlier, refinery's crude input was primarily from the Assam oil fields through pipeline. With the commissioning of the 6.0 MMTPA Haldia-Barauni crude oil pipelines, the refinery now receives imported crude for processing. A CRU (Catalytic Reformer Unit) was also added to the refinery in 1997 for production of unleaded motor spirit. The installed capacity of crude oil processing has been enhanced from 3.3 MMTPA to 6.0 MMTPA since Jan'2003 after commissioning of process units like RFCCU, DHDT, HGU, SRU, ARU & SWS.

During the year 2007-08, Barauni Refinery processed 5.63 MMTPA crude oil. Barauni Refinery supplies distillate products to eastern India, Nepal and northern India through Road & Rail. Product is also sent to Northern India through product pipeline.

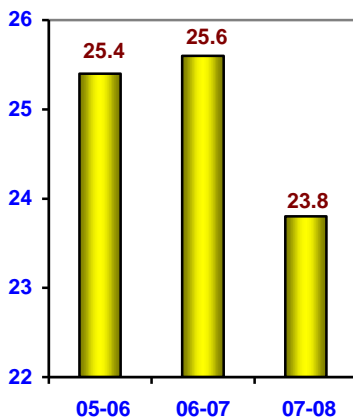
**20 (ii) Energy Consumption :**

Refining of crude oil being an energy intensive activity, the major chunk of expense in the process is the energy cost. Therefore, the need of energy conservation is of utmost importance. This leads to not only increase in profitability in the form of lower energy cost and adding on to the bottom line but also protection of environment and quality of life. Due efforts were made by the refinery to reduce energy consumption in Refinery through various energy conservation measures along with day to day monitoring of fuel

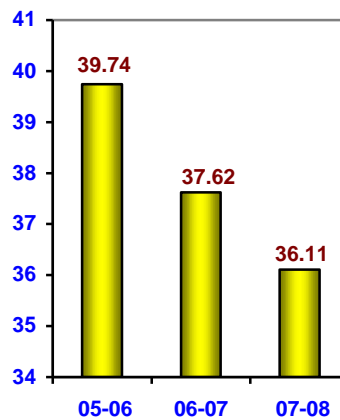
& loss, which helped to bring down the energy consumption level from 75 MBTU/BBL/NRGF in 2004-05 to 70 in the year 2007-08.

The energy consumption in refinery is reported in terms of % Fuel & Loss on crude and MBTU/BBL/NRGF (MBN), where the term MBTU refers to total heat value of fuel & loss in thousand BTU, BBL refers to barrel of crude processed and NRGF is a derived factor that depends upon actual intake in both primary and secondary processing units. The % fuel & loss, MBN and energy cost as % manufacturing cost for last three years is as given below:

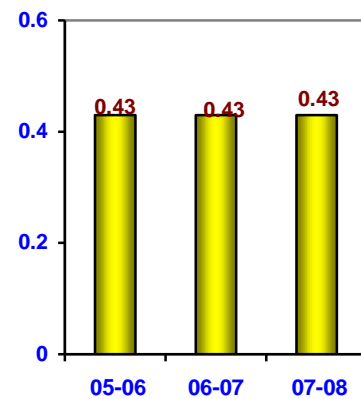
### Energy Cost & Specific Energy consumption (% OF MANUFACTURING COST)



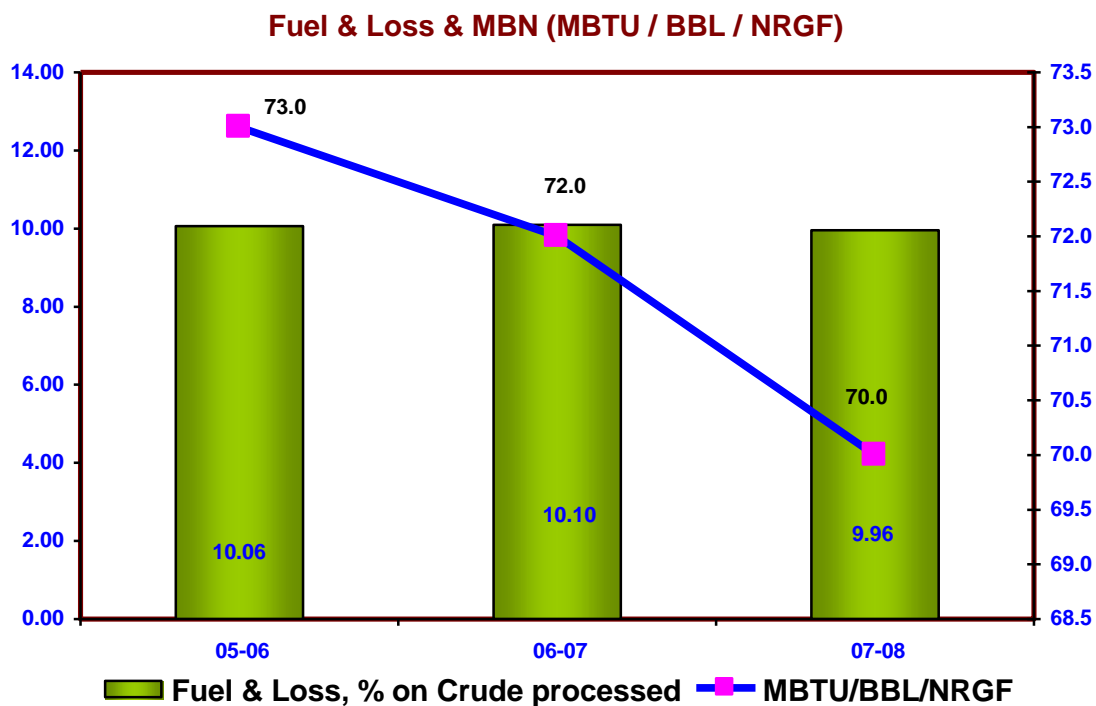
Trend of Energy cost, % on Manufacturing cost



Trend of Sp. Electrical Energy consumption, Kwh/MT of Crude processing



Trend of Sp. Thermal Energy consumption, MKCal/MT of Crude processing



### 20 (iii) Energy Conservation Commitment, Policy and Set Up :

To conserve energy, optimisation of the operation of the process heaters and boilers and maximum possible heat recovery from out going streams have been given utmost emphasis in day-to-day refinery operations. The efficient usage of utilities, optimisation of steam-power balance, and optimization of heat exchanger train have been the prime concern in the Energy Conservation area.

As a broad classification the energy conservation activities have been grouped under long term and short term ones. The long-term activities are the high investment projects spread over a long period. The short-term measures consist of continuous efforts for energy optimisation.

The specific energy consumption is monitored daily/weekly/monthly for effective control. The optimisation of process conditions and implementation of energy conservation scheme is given the highest priority.

Energy Conservation fortnight is celebrated every year from 15<sup>th</sup> Jan to 31<sup>st</sup> January. Various completion like essay, slogan, poster on energy saving and cycle rally & in-house seminar is conducted.

The importance of energy conservation is emphasized through TPM (Total Productive Maintenance) by achieving zero breakdowns, zero defect culture. Barauni Refinery has started TPM implementation in October'2002 and Coker-A unit has been selected for implementation of Pilot model by April'2004. TPM was formally Kicked off on 30<sup>th</sup> Aug'2004 after successful implementation of Pilot Model at process unit. Refinery wide implementation of TPM is planned to be completed by 2007 end.

Right from the beginning Barauni Refinery has an exclusive Energy Conservation Cell for monitoring energy consumption and implementation of ENCON measures.

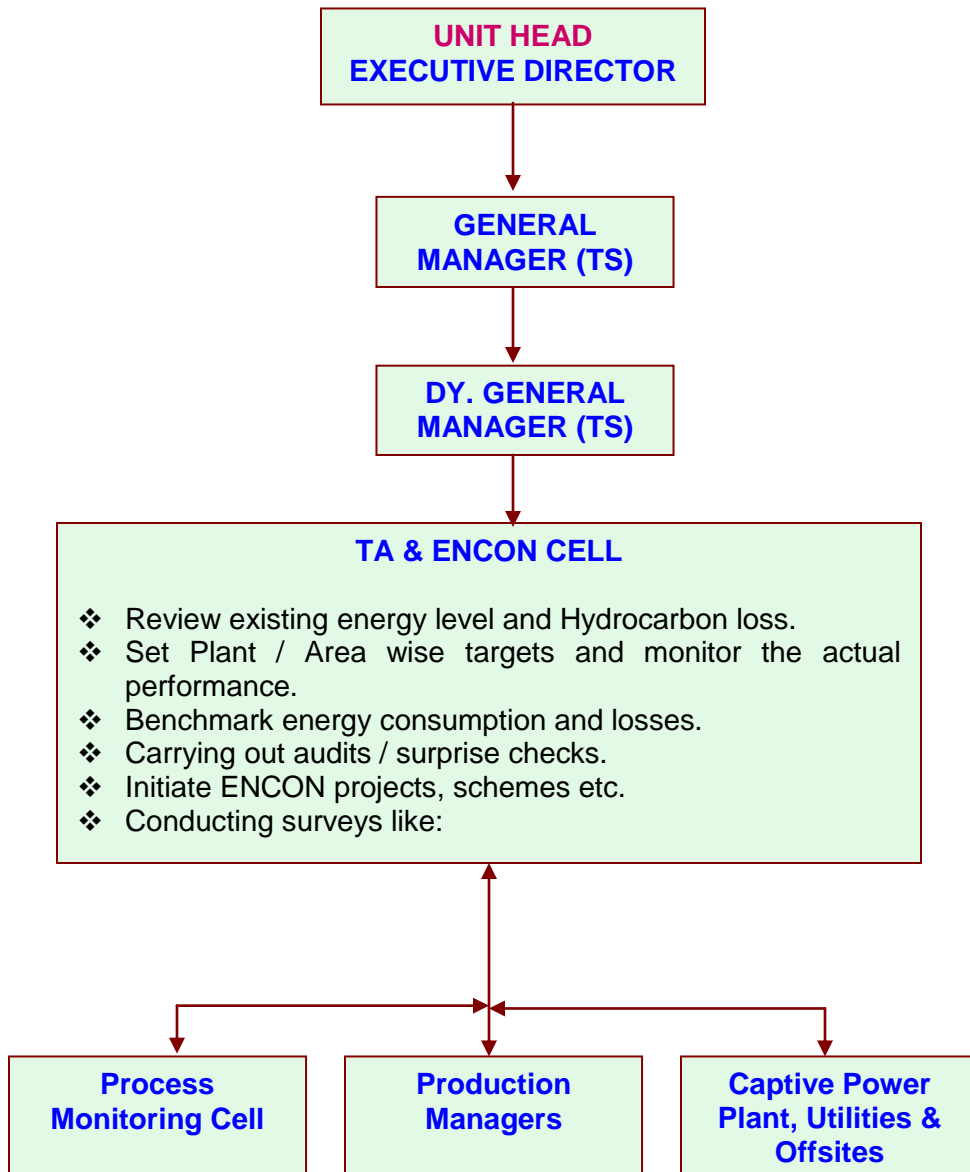
## **ENERGY POLICY:**

### **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.

**Set up:**

## **Energy Conservation Team Structure**



## 20 (iv) Energy Conservation Achievements:

The major projects implemented during 2007-08 are as under:

### 1. Revamping of Heat Exchanger Network & Fractionation improvement in AVU-1 & 2

The Energy & Yield Optimisation revamp of AVU-1 & 2 has been carried out during the year 2007-08. The major high lights of the revamp benefits are listed below:

- The yield of vacuum residue reduced significantly, which is normally a feed to, delayed Cokers.
- The yield of vacuum gas oil increased by almost equivalent amount, which is a feed to RFCC unit.
- The pre-heat temperature increased to 275 °C from 225 °C.
- One fired heater i.e. pre-Fractionator Reboiler has been isolated. Revamping of AVU-1 & 2 has resulted in savings of 6400 SRFT/Yr



**Investment** : Rs. 34.65 Crs.

**Savings** : 6400 SRFT/Yr .

## 2. Replacement of APH in AVU-I & II

Old cast APH of AVU-I & II were leaking badly resulting into poor heat transfer efficiency. To solve this problem it was planned to install new cast APH in AVU-1 & 2 same as the earlier design. New APH were installed and commissioned in AVU-1 & 2 in 2007-08. Overall energy savings by replacing APH in AVU -1 & 2 is estimated as 2000 SRFT/year per unit.

**Investment** : Rs. 2.0 Crs.

**Savings**



## 3. Online insulation of hot tanks

Online insulation of 7 Nos. of hot tanks of mainly in the service of Coker feed, slop, LSHS etc has been done. Online insulation was taken-up as these tanks are difficult to take out from service for a long period. The job has planned to be carried out in two parts.

- Surface preparation of tanks by grit blasting and applying two coats of ethyl inorganic zinc silicate paint.
- Online insulation on the shells and roofs of the tanks.



The overall energy savings in the project is estimated as 1400 SRFT/Yr.

**Investment** : Rs. 1.07 Crs.

**Savings** : 1400 SRFT/Yr.

## 20 (v) Energy Conservation Plan & Targets:

To improve the energy performance further, the following major projects are under implementation / active consideration:

SL. NO.	PROJECTS / MODIFICATIONS	TARGET (YEAR)	ANNUAL SAVINGS (SRFT)	ANNUAL SAVINGS (Rs. Lakhs)
1.	Change of drive of BXP air compressor	2008	4000	1000
2.	Installation of LP Burners in AVU-III	2009	1500	375
3.	Routing of CBD Flash steam of Boilers to De-aerators	2009	200	50
4.	Installation of flare gas recovery facility	2009	2600	650
5.	Rectification of steam leaks	2009	1500	375
6.	Step less control of compressor DHDT / CRU compressor	2009	2900	725
7.	Installation of energy efficient FRP blades in air fin coolers (Total 78 fans)	2009	350	88
8.	Installation of high efficiency aerodynamic FRP blades in BXP cooling tower fans	2009	140	35
9.	Hydrogen recovery from DHDT off gas	2009	1200	300
10.	Replacement of Two old steam turbines with a new TG & Boiler	2010	1100	275
	<b>Total</b>		<b>15490</b>	<b>3873</b>

With the implementation of above energy conservation projects, continuous monitoring for operational improvements, specific energy consumption of the refinery will be about 60 MBTU/BBL/NRGF.

## 20(vi) Environment Management System:

Barauni Refinery has a full-fledged Environment Protection Cell. In Indian oil, Environment Protection has always remained a thrust area. The Environment Protection Cell having qualified engineer's coordinates all the activities required to achieve continuous improvement in environmental performance related to Environmental Management in the Refinery. The goals and functions of the cell are:

- To achieve reduction of wastes and releases giving preference first to source reduction, second to recycle / reuse and third to treatment and thereby maintaining effluent and emission standards within the permissible limit and legislative requirements.
- To obtain legislative sanctions viz. emission and effluent discharge consent, NOC, Environment Clearance for new projects and to achieve compliance with NOC and EC conditions.
- To establish prevention mechanisms by application of engineering and operational control.
- System development with environment friendly. replacement/improvement within and around the Refinery.
- Training / awareness programs in the areas of environment protection within and around the Refinery.

The Refinery has a beautiful ecological park spread over an area of 75 acres. The park developed with in-house expertise and resources has lush green lawns large variety of trees and shrubs and the wonderful ECO pond where flora & fauna and aquatic life are thriving on treated effluent. The surrounding tranquil environment of the ECO pond of park attracts hundreds of migratory birds every winter. It is a testimony of refineries dedication to foster environmental excellence and enhancing quality of life in the region.

Barauni Refinery had developed Environmental Management System conforming to the International Standards, ISO-14001:2004 and Integrated the same with International Quality Management Standard, ISO-9001:2000 and with the Occupational Health Management System conforming to OHSAS-18001:1999. Refinery thus developed an Integrated Management System called SHEQ Management System. In the SHEQ system, a set of objectives and time bound action plans are set for the continual improvement and customer satisfaction in the area of Safety, Health, Environment & Quality.

### **Safety Management System:**

Barauni Refinery has an elaborate Safety Management System. Refinery is following stringent Oil Industry Safety Directorate (OISD) standards and other Rules/ Acts as applicable. Periodic Safety Audit of the facilities and system is carried out. Each recommendation's status is thoroughly discussed in the monthly Health & Safety Committee Meeting chaired by the top most official of the company. No efforts are spared to fulfill recommendations arising during Safety Audits, in shortest possible time.

To take care of the Safety of the refinery and surrounding and to minimise the impact of the probable emergencies, viz fire, explosion, toxic gas release etc., Refinery has prepared On-Site Disaster Management Plan and Off- Site Disaster Management Plan, and both are duly approved by competent authority. Material Safety Data Sheet (MSDS) consisting of paramount properties of chemicals & their safe handling is a part of Disaster Management Plan. To check the efficiency and bring improvement in the plan, periodic On-Site & Off Site mock drills are conducted.