

Indian Oil Corporation Ltd Haldia Refinery

UNIT PROFILE

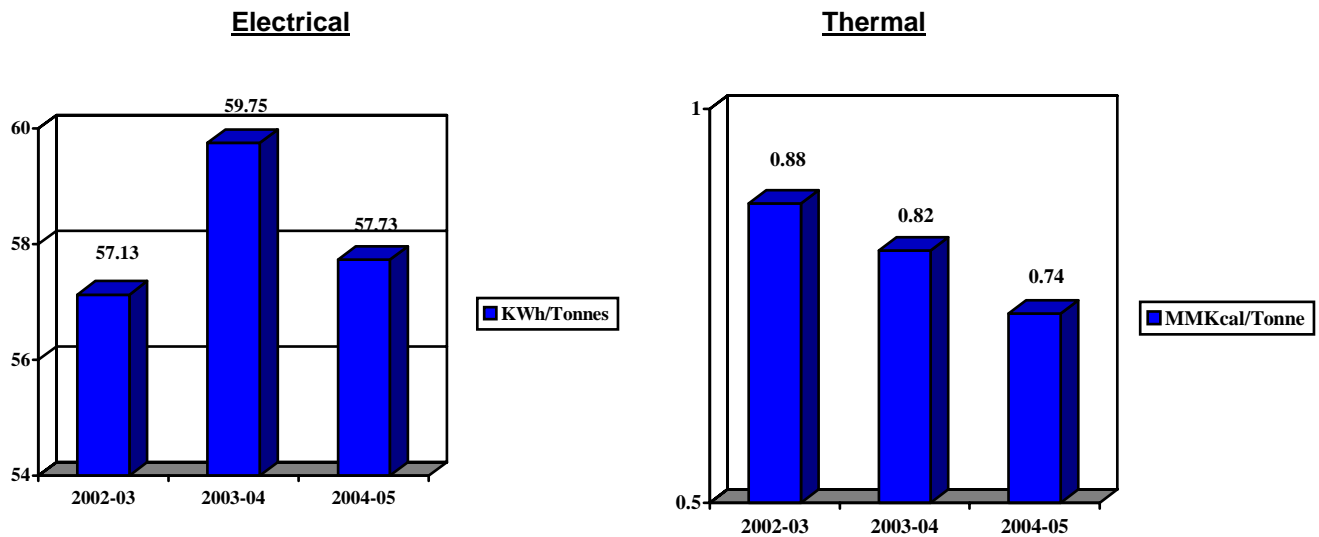
Haldia Refinery is the fourth in the chain of Seven refineries owned and operated by Indian Oil Corporation Limited, the largest commercial enterprise in the country and the leading Indian company in the "Fortune Global 500" listing of the world's largest corporations.

Haldia Refinery was commissioned in January 1975 with an initial crude processing capacity of 2.5 Million Tonnes per Annum (MMTPA); the capacity was progressively increased to a level of 3.6 MMTPA through low-cost debottlenecking and innovative technology. A new crude distillation unit with a capacity of 1.0 MMTPA was installed and commissioned in March, 1997 for processing of low Sulphur imported crude to generate low sulphur internal fuel oil for burning in process furnaces/ TPS boilers for reducing SO₂ emission; capacity of New Crude Distillation Unit was also progressively increased to a level of 2.4 MMTPA through low-cost debottlenecking. Thus, the total installed capacity of the refinery is currently 6.0 MMTPA. Apart from normal fuel distillates like, LPG, MS, ATF, SKO, HSD etc. Haldia Refinery also produces the high valued Russian Turbine fuel (RTF) for use in fighter plane (MIG) & Lube oil base stock (LOBS).

Energy Consumption.

The Energy Scenario of Haldia Refinery in the past three years is given below:

DESCRIPTION	UNIT	2002 - 03	2003 - 04	2004 - 05
Annual Product Processing Rate	MT	4060976	4067040	4935347
Total Electrical Energy Consumption / annum	Lakhs KWh	2320	2430	2849
Specific Energy Consumption - Electrical	KWh/Tonne	57.13	59.75	57.73
Total Thermal Energy Consumption / annum	MMKcal	3556162	3315534	3632066
Specific Energy Consumption – Thermal	MMKcal/ Tonne	0.88	0.82	0.74
Total Manufacturing Cost	Rs. in Lakhs	535083.00	543061.00	815486.00
Total Energy Cost	Rs. in Lakhs	41930.52	39149.54	46161.67
Energy Cost as %age of Total Manufacturing Cost.	%	7.94	7.19	5.66



Specific Energy Consumption Over 2002-2003

Energy Conservation Commitment, Policy and Setup

Haldia Refinery has always accorded top-most priority for energy conservation and a dedicated Energy Conservation and Technical Audit Cell has been set up in the Refinery right from the time of commissioning of the Refinery. This cell is headed by a Chief Technical Services Manager and includes Energy Manager and experienced chemical engineer for monitoring, reviewing the refinery operations and implementing energy conservation measures in the refinery.

The engineers from Encon/TA cell review the energy consumption on a daily basis after visit to the various major energy consuming centers. These are discussed in the daily review meeting conducted in the Refinery Shift Manager's office (called RSM meeting) under the chairmanship of General Manager (Technical).

Based on regular monitoring and periodical survey of the energy performance of the various process units, Thermal Power Station (TPS), heaters, heat exchangers etc., areas for further improvement in the energy efficiency are identified and are studied in details either through in-house efforts or external consultants. The outcome of these studies are discussed and reviewed with all the concerned departments before actually implementing the scheme.

Routine survey are carried out with regard to steam leaks, insulation effectiveness, HC loss survey (with Physical Acoustic Leak Detector, Fugitive Emission by GMI surveyors, product loading / despatch operations, energy balance etc. to identify potential areas of improvement.

Specialized studies are carried out through reputed process/energy consultants to compare the energy performance with the best practices adopted worldwide and new opportunities for energy conservation are explored/identified. The outcome of these studies are reviewed and analyzed in details at various levels and energy conservation measures that are practicable / feasible are implemented at the earliest opportunity. Monthly energy performance of the Refinery vis-à-vis the targets are discussed in details in the Monthly Refinery Performance Review Meeting chaired by the Executive Director.

Energy Conservation Achievements

Haldia Refinery has incorporated and implemented number of major energy conservation measures based on in house studies and studies by reputed external consultants. Some of major energy conservation schemes implemented during the recent past by the refinery are given below:

- o Installation of 20 MW Co-generation Gas Turbine along with Heat Recovery Steam Generator (HRSG) with additional auxiliary gas firing facility.
- o Reduction in Steam consumption of Main Air Blower in FCCU.
- o Calcium Silicate Insulation in MP/LP steam header - Phase-II.
- o Installation of high efficiency furnace in Lube Hydro-finishing unit.
- o MP Steam condensate recovery in FCCU (Naphtha Splitter Reboiler).
- o Condensate recovery from TG Condensate pumps seal flushing line.
- o Installation of Balance Pressure Thermostatic Traps (BPT) in copper tube steam tracing line.
- o Control valves related to flare upgraded to higher-class valves.
- o Provision of fuel gas firing facility in Furfural Extraction unit furnace.
- o Improvement of VDU-II furnace efficiency through in-house modification.
- o Sick wagon unloading facility.
- o Replacement of Motor driven pump with Turbo-driven.
- o Provision of Insulation for tanks in 700 tank farms.
- o Provision of High Efficiency and High Capacity Centrifugal Air Compressor.
- o Reduction of HRSG Stack temperature through Optimization of HRSG Deareator Operation.
- o Single FD fan operation in VDU-II.
- o Calcium Silicate insulation in MP & LP steam header - Phase – III.
- o Ceramic Fibre Insulation in VDU-I Furnace – 31-F-01.
- o Installation of Mechanical trap(Float type) in steam outlet line of Boiler IV Steam coil Air preheater.
- o Installation of Flash Vessel in 11E111 (CDU-I Add. Naphtha Stabilizer reboiler) condensate line to recover MP steam condensate (1.5 MT/hr).

Energy conservation Plan & Target

Refinery has time bound action plans to further bring down energy consumption and hydrocarbon loss from present level of operation. Some of the major schemes under implementation / planned are as under:

- o Upgrading FG control valve from Type IV to Type V.
- o Replacement of old Reciprocating Air Compressor with High Efficiency Compressor.
- o Pre-heat improvement in CDU-I.
- o Pre-heat improvement in CDU-II.
- o Pinch modification in the preheat circuit of Kerosene Hydro-Desulphurization Unit.
- o Ceramic insulation in PDA Heater.
- o Ceramic insulation in FEU Heater.
- o Heat recovery from VDU-II Tempered Water System.
- o Installation of Packinox Heat Exchanger in CRU.
- o Waste Heat recovery from KHDS furnace (23-F-01).
- o Calcium Silicate Insulation in MP & LP Steam header of Offsite Area (Phase-IV).
- o Efficiency improvement in PDA Heater (32-F-01).
- o Efficiency improvement in VBU Heater (37-F-01).
- o Liquid Ring Vacuum Pump in place of 2nd stage ejector in VDU-I.
- o Installation of GT-II & HRSG.
- o Installation of Flare Gas Recovery System.

Total investment planned vis-à-vis energy saving targets are given as under:

ENCON Projects	Investment in (Lakhs)	Energy Savings in FO MT/annum
Under implementation & future Projection	12646.20	25953

Encon Project Implemented in the year 2004 – 2005

1. Provision of Hot Insulation on tanks in 700 tank farm

Storage tanks for intermediate products like RCO, SR, Heavy extract, Dewaxed oil, light Vacuum gas oil, Asphalt and IFO are located in 700 tank farm. The respective intermediate products are fed to different process units for further processing / usage. As per original design, the above-mentioned tanks, storing intermediate products at higher temperature, were made of bare metal (i.e. without external insulation). This led to continuous heat loss (both by convection and radiation) from the tank surfaces to atmosphere.

Nine nos. of above said tanks were insulated using mineral wool mattress in running condition by clamping MS Strips (with pre-welded lugs) on the tank body. The job was completed in **May-2004** at a total cost of Rs. 59.00 Lakhs.

Benefits :

Savings in Heat energy : 4.4 MMKcal/hr
Savings in IFO : 4000 MT / annum
Financial Benefit : Rs. 3.93 crores/annum.



700 Tank Farm – After Insulation

2. Provision of High Efficiency and High Capacity Centrifugal Air Compressor.

In TPS as per original design 5 nos. of Reciprocating Air compressor were installed to supply Instrument Air and Service Air to different process units. Out of these five compressors, four compressors are of capacity 1500 Nm³/hr and one is of capacity 1900 Nm³/hr. The specific power consumption of these compressors are very high i.e. in the range of 14-15 kW/100 Nm³/hr of air. As these compressors are very old, maintenance cost of these compressors are also very high. On an average the maintenance expenditure is around 15-16 lakhs/annum. The total air requirement (both instrument and service) is around 4500 to 5000 Nm³/hr. If any one of the air compressor trips, air pressure comes down rapidly.

To sort out the operational constraint and to improve the air compressor efficiency High Efficiency and high capacity Centrifugal Air Compressor was installed in TPS in **April 2004**. The specific power consumption of Centrifugal Air Compressor is around 10-11 kW/100 Nm³/hr as compared to 15-16 kW/100 Nm³/hr of Reciprocating compressor.

Benefits :

Power savings due to high efficiency compressor	:	1680 MW/annum
Savings in reduction of maintenance cost	:	9.15 Lakhs/annum
Total savings	:	42.75 Lakhs/annum.



New Centrifugal Air Compressor

3. Reduction of HRSG Stack temperature and Optimization of HRSG Deareator Operation.

A test run was conducted in GT HRSG, with an objective to reduce the HRSG stack temperature, which was at a level of 173⁰C, by reducing Deareator pressure. The Deareator pressure was gradually reduced to 1.0 kg/cm² from 2.4 kg/cm². At this pressure, deareator temperature reduced to 118⁰C from 137⁰C. The LP steam injection rate to deareator, reduced to 11.05MT/hr from 13.65 MT/hr and HRSG stack temperature reduced to 163⁰C from 173⁰C.

Based on the test run report the HRSG operating pressure is being maintained at 1.0 kg/cm², from **May, 2004** which leads to following benefits:

Benefits :

Reduction in LP Steam Reduction to Deareator	:2.6 – 3.6 Tons/annum
Financial Benefits	:1.70–2.35Crores/annum

4. Installation of Flash Vessel in 11E111 (CDU-I Add. Naphtha Stabilizer reboiler) condensate line to recover MP steam condensate (1.5 MT/hr)

In CDU-I additional stabilizer column reboiler, provision was there to route MP steam condensate directly to desalter water vessel (11-B-03) through a steam trap. Due to high pressure of the condensate, tremendous hammering / bubbling was experienced in the vessel. To avoid this problem, condensate was being directly drained to the open system.

In order to recover this valuable condensate, a LP steam flash vessel was installed in CDU-I on **July 2004**, with a facility to route condensate to LP condensate header and flash steam to LP steam header.

Benefits :

MP Condensate Recovery	:	1.5 – 2.0 tons/hr
Financial Benefit	:	75.00 Lakhs / annum



Flash Vessel

5. Calcium Silicate insulation in MP & LP steam header - Phase – III

The mineral wool insulation (LRB mattress) of the MP / LP steam header of offsite area was replaced with Calcium silicate insulation in phased manner. In calendar year 2004, the MP / LP steam header of offsite area from LOB block to TPS was provided with Calcium silicate insulation. This project was completed on **November 2004**.

Benefit :

Savings in IFO consumption: 560 MT /annum

Financial Benefits : 56.00 Lakhs/annum.



Calcium Silicate Insulation Over Steam Header

6. Single FD fan operation in VDU-II.

As per original design, VDU-II furnace (Absorbed heat duty: 37.9 MMKcal) is provided with one (1) ID Fan and two (2) FD Fan for supplying combustion air under balanced draft condition. Since commissioning two (2) FD fans used to run in parallel, which leads to extra power consumption of around 295 MW/annum, which equivalent to Rs. 10 lakhs/annum.

On verifying the design of FD fans, it has been observed that one FD fan of the furnace is very much capable to supply 67,000 Nm³/hr of air at 100% load, where as the maximum air demand even at design throughput is around 42,000 Nm³/hr. Considering this fact, a trial run of the furnace was conducted with single FD fan in line at different throughputs. During the test run with single FD fan, fired heater operation was very smooth and trouble free. Based on the test run report, single FD fan operation was implemented in VDU-II from **June 2004**, with the following benefits:

Benefits :

Savings in Power Consumption : 295 MW / annum
Financial Benefit : Rs. 10.00 Lakhs/annum.

7. Ceramic Fibre Insulation in VDU-I Furnace – 31-F-01

Old castable refractory of VDU-I was replaced with Ceramic fibre insulation in February'05. This modification reduced the furnace wall temperature from 154 °C to 60 °C. Due to reduction in furnace wall temperature, setting loss of furnaces is reduced to 3.9% from a level of 6.5%.

Benefits :

Reduction in Heat Loss	:	645095 kcal/hr
Savings in IFO consumption:		527 MT/annum
Financial Benefits	:	52.00 Lakhs/annum



Ceramic Insulation Inside 31-F-01 Furnace

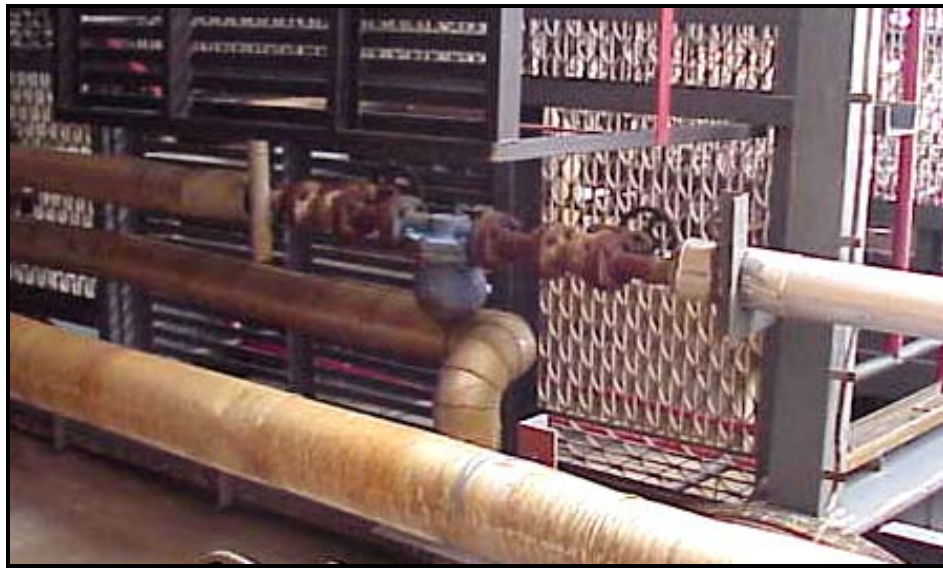
8. Installation of Mechanical trap(Float type) in steam outlet line of Boiler IV Steam coil Air preheater

To reduce the steam consumption in Boiler IV Steam Coil Air Prevent and to prevent live steam going to Atmospheric Condensate Flash Vessel, Mechanical trap(Float type) was installed in steam outlet line of Boiler IV Steam coil Air preheater.

Benefits :

Reduction in Steam Consumption : 1.70 Tons/hr [13600.00 Tons/annum]

Financial Benefits : 45.00 Lakhs



Float Type Steam Trap in Boiler IV SCAP Outlet Line

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 stakeholders for continual improvement in energy conservation.
- Propagating the message of avoiding wastage of energy to the community.