

## Indian Oil Corporation Haldia Refinery

### UNIT PROFILE

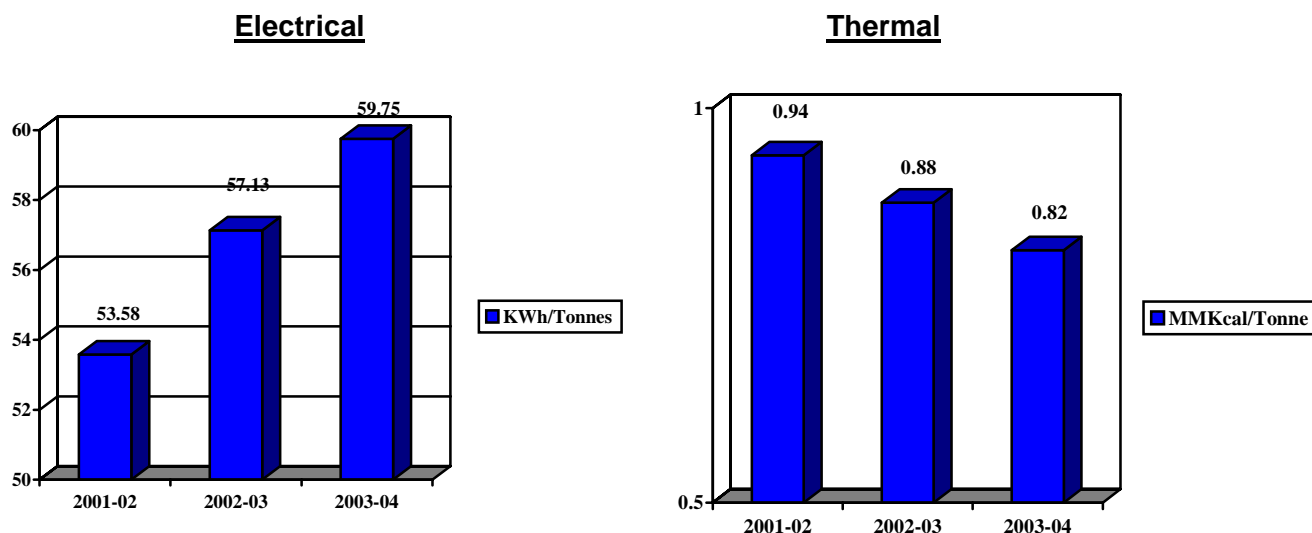
Haldia Refinery is the fourth in the chain of Seven refineries owned and operated by Indian Oil Corporation, the largest commercial enterprise in the country and the only Public Sector company in the "Fortune Global 500" listing of the world's largest corporation.

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 our process furnaces/ TPS boilers to bring down the SO<sub>2</sub> emission. Thus, the total installed capacity of the refinery is currently 4.6 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	2001-02	2002-03	2003 - 04
Annual Product Processing Rate	MT	3618842	4060976	4067040
Total Electrical Energy Consumption / annum	Lakhs KWh	1939	2321	2460
Specific Energy Consumption - Electrical	KWh/Tonne	53.58	57.13	59.75
Total Thermal Energy Consumption / annum	MMKcal	3385914	3556162	3315534
Specific Energy Consumption – Thermal	MMKcal/ Tonne	0.94	0.88	0.82
Total Manufacturing Cost	Rs. in Lakhs	409259.00	535083.00	543061.00
Total Energy Cost	Rs. in Lakhs	35201.27	41930.52	39045.62
Energy Cost as %age of Total Manufacturing Cost.	%	8.60	7.83	7.19



### Specific Energy Consumption Over 2001-2002

Increase in kWh/Tonne is mainly due commissioning of Catalytic Iso-Dewaxing Unit. But due to implementation of various ENCON projects Specific energy consumption of Thermal energy is reduced considerable in the year 2003 – 2004.

### 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 head 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 Deputy 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 conducted 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 Heat integration through state of art Pinch technology in Crude Distillation Unit through which substantial gain in preheat recovery was achieved.
- o Soaker technology in Visbreaker has yielded substantial savings of fuel in furnaces besides yield improvement.
- o Implementation of Pinch in Solvent Dewaxing unit.
- o High emissivity refractory coating in Crude Distillation Unit-II and Vacuum Distillation Unit-I furnace to reduce fuel consumption.
- o Residuum Oil Super Critical Extraction Process incorporated in existing Propane Deasphalting Unit, which uses a process of super critical extraction for separation of solvent with less energy than conventional resulting utility saving. This technology was adopted first time in the country.
- o Replacement of existing refractory with ceramic fiber in CDU-I furnace to reduce the thermal loss.
- o Conversion of motor driven to turbo driven pump in TPS Cooling Tower.
- o Installation of High efficiency furnace in Hydrofinishing unit.
- o Provision of Calcium Silicate insulation in VM/VB steam header (Phase-II).
- o Installation of Gas Turbine (20MW) with HRSG (Heat Recovery Steam Generator) for improving overall thermal efficiency.
- o Reduction in Steam consumption of Main Air Blower in FCCU.
- o MP Steam Condensate recovery in FCCU (Naphtha Splitter Reboiler).
- o Condensate recovery from TG Condensate pump seal flushing lines.
- o Furnace Efficiency Improvement through in-house modification.
- o Installation of Balance pressure thermostatic traps in copper tube steam tracing line to reduce steam loss.

- o Control valves related to flare upgraded to higher Class valves to reduce flare loss.
- o Provision of fuel gas firing facility in Furfural Extraction unit furnace to improve Refinery Fuel Gas Balance.
- 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 pump to improve Refinery Steam –Power Balance.

### **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 Provision of Insulation for eight nos. of high temperature tanks in 700 tank farm (Intermittent Product storage tanks).
- o Replacement of old Reciprocating Air Compressor with High Efficiency Compressor.
- o Reduction of GT-HRSG Deareator Operating pressure from 2.4 kg/cm<sup>2</sup> to 1.0kg/cm<sup>2</sup>.
- o Installation of Mechanical trap (Float type) in steam outlet line of Boiler IV Steam coil Air Preheater.
- o Pinch modification in the preheat circuit of Kerosene Hydro-Desulphurization Unit.
- o Calcium Silicate insulation in MP & LP Steam header – Phase –III & Phase – IV
- o Installation of flash vessel in 11E111(CDU-I add. Naphtha Stabilizer reboiler) condensate line to recover MP Steam Condensate.
- o Pre-heat improvement in CDU-I by providing addition exchanger in Crude pre-heat chain.
- o Pre-heat improvement in CDU-II.
- o Heat recovery from Vacuum Distillation Unit -II tampered water system.

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

<b>ENCON Projects</b>	<b>Investment in (Lakhs)</b>	<b>Energy Savings in FO MT/annum</b>
Under implementation & future Projection	787. 90	10230

### **Environment and Safety**

Haldia Refinery has always taken the lead to undertake environmental improvement programmes with respect to the liquid effluent, air emission and solid waste management. Haldia Refinery has well-established Environmental Management System certified under ISO-14001. An investment of around 750 Crore has been made by Haldia Refinery towards environmental improvement. Haldia Refinery received Golden Peacock Environment Management Award given by World Environment Foundation, New Delhi during the year 1999 & 2000 (runners-up) and Indo-German Greentech Award for 2001 for outstanding achievement in the field of Environment management. Haldia Refinery also received the prestigious “ Millennium Business Award (2000) for Environmental Achievement” from International Chamber of Commerce, Paris.

### **Measures taken by Haldia Refinery to control Pollution**

WWTP (Effluent Treatment Plant) – Augmented Capacity up to 790 M<sup>3</sup>/hr and modernized.

Treated water reused as Make up in Cooling tower, Process area and as Fire Water make up.

5 nos. ambient air-monitoring stations and one continuous ambient air monitoring station are installed.

HDPE lined pit for storing of residual sludge to prevent water & soil pollution. In addition to that an Incinerator has been installed.

Development of Green belt in and around refinery and Township.

To develop Green Belt, 1112 nos. of tree had been planted in 2002-2003 and 2375 nos. of saplings were distributed to local locality.

The Four Star Rating awarded by the British Safety Council in May 2000 was a feather in the cap of Haldia Refinery in Safety Management System. Haldia Refinery also scored an impressive Level 6 rating under the International Safety Rating System during the assessment audit conducted by M/S DNV during August – 2001.

Haldia Refinery has also adopted the international standard on Occupational Health and Safety Assessment Series (OHSAS) in accordance with OHSAS-18001 and received the certification from M/s Det Norske Veritas, Netherland.

## Encon Project Implement in the year 2003 – 2004

### 1. Installation of High efficiency furnace in Hydro-finishing Unit.

The existing old furnace ( with radiation section only ) in HFU was replaced with new high efficiency furnace ( with both radiation & convection section) and with Low NO<sub>x</sub> & low excess air burners in May,2003 (M&I shutdown).

**Investments :**

Rs in Lakhs : 200 .00

**Benefits:**

Fuel Savings : 215 MT of IFO / annum on full T'put Operation.

Savings (Rs. in Lakhs) : 19 .40

### 2. MP Steam Condensate recovery in FCCU (Naphtha Splitter Reboiler)

In the original design around 5.0 MT/hr of M.P.Steam condensate from 18E31(Naphtha splitter reboiler) gets collected in 18B24 L.P. Steam flash drum and from the flash drum, the condensate was sent the deareator (18B01), after mixing it with other cold condensate stream. As the condensate from 18B24 flash drum is at 140°C during normal operation tremendous hammering occurs in the line when it meets with other cold condensate and to avoid the hammering the condensate ex. 18B24 flash drum was drained to OWS channel. A process scheme was implemented to recover this condensate by separating it from other cold condensate stream and routing it directly to deareator 18B01. This modification job carried out in May'03 M&I shutdown and implemented in consequent start up.

**Investment :**

Rs. in Lakhs : 1.00

**Benefits:**

Condensate recovered : 5.0 MT/hr at 140°C.

Savings (Rs. in Lakhs) : 80 .00

### 3. Condensate recovery from TG Condensate pump seal flushing line

52PM01A/02A, 52PM01B/02B, 55PM01C/02C pumps are used to pump condensate that is recovered from TG. For flushing the seal of these pumps, Condensate water from the same pump discharge is being used. For the above purpose a ¾" line is drawn from the discharge of each pump and connected to the seal flushing line. Finally the water used for seal flushing was drained to OW&S Channel. As the drained

water is as good as condensate itself, it can be used in Deareator to generate BFW. A process scheme was issued to recover this Condensate by routing the condensate drain line to condensate flash vessel (51B03). This modification job carried out in May'03 M&I shutdown and implemented in consequent start up.

**Investment:**

Rs. in Lakhs : 1 .00

**Benefits: -**

Condensate recovered : 3.0 MT/hr at Ambient Temperature.

Savings (Rs. in Lakhs) : 22 .00

**4. Furnace Efficiency Improvement**

Burner performance survey of all the furnaces was carried out jointly with external agency and the recommendations of the survey was implemented during May 2003 M&I shutdown. Various jobs carried out in furnaces during M&I S/D are Burner cleaning & alignment as per design, Replacement of burner tips, Regen tiles reshaping, Convection zone chemical washing, Revisioning of Air registers, Revisioning of ID/FD IGV, APH water washing and Stack damper revisioning. This has resulted in overall improvement of efficiency in the furnaces.

**Investment :**

Rs. in Lakhs : 3. 00

**Benefits:-**

Savings in IFO : 1610 MT of IFO/annum.

Savings (Rs. in Lakhs) : 145 .83

**5. Installation of Balance pressure thermostatic traps in copper tube steam tracing line**

In Lube Oil Block Balance pressure thermostatic traps were installed in Copper tube steam tracing line. Total 100 nos. of Steam traps were installed in May 2003 M&I S/D. Another 80 nos. of traps is installed in Mar'04.

**Investment :**

Rs. in Lakhs : 7 .60

**Benefits:-**

Savings in IFO : 330 MT of IFO/annum.

Savings (Rs. in Lakhs) : 30 .00

#### **6. Control valves related to flare upgraded to higher Class valves**

In order to reduce the flare loss due to the passing of flare control valves in various Units like H2U, FCCU & CIWD , the existing Class IV type control valve was upgraded to Class V type. 20nos. of flare control valve was upgraded from class IV type to class V type valves. This has resulted in reduction of the flare loss.

##### **Investment :**

Rs. in Lakhs : 5 .00

##### **Benefits:-**

Savings in Fuel gas : 429 MT of fuel oil/annum.

Savings (Rs. in Lakhs) : 38 .89

#### **7. Provision of fuel gas firing facility in Furfural Extraction unit furnace.**

To improve the refinery fuel gas balance, fuel gas firing facility provided in Furfural Extraction unit furnace. Total four nos. of fuel gas burners are installed. (i.e. 1 no. in 33F01 and 3 nos. in 33F02). This facility is implemented in May '03 M&I Shutdown.

##### **Investment:**

Rs. in Lakhs : 40 .00

##### **Benefits: -**

Savings in Fuel gas : 257 MT of fuel oil/annum.

Savings (Rs. in Lakhs) : 23 .33

#### **8. Improvement of VDU-II furnace efficiency through in-house modification.**

VDU-II furnace efficiency was low as compared to the design. On analysis, it was found that the atomization of fuel oil is not proper, even though atomising steam pressure is being maintained at the design level. On thorough study, the reason for improper atomization was observed due to the pressure drop across the NRV provided in individual atomization steam line. The individual atomization steam line NRV was removed and one common NRV is provided in common Steam distribution line. This modification implemented in May'03 M&I S/D and it improved the furnace efficiency considerably.

**Investment:**

Rs. in Lakhs : 0.50

**Benefits: -**

Savings in Fuel gas : 1072 MT of fuel oil/annum.  
Savings (Rs. in Lakhs) : 97.22

**9. Sick wagon unloading facility.**

Sick wagon material was transferred to other wagon by using a hand pump. This transfer takes lot of time and leads to hydrocarbon loss. So a sick wagon-unloading pump (motor driven) was installed in February'04 to avoid the time and hydrocarbon loss.

**Investment:**

Rs. in Lakhs : 1.00

**Benefits: -**

Savings in Fuel gas : 107 MT of fuel oil/annum.  
Savings (Rs. in Lakhs) : 9.72

**10. Replacement of Motor driven pump with Turbo-driven.**

To Optimize the Steam – power balance, Cooling water motor driven pump replaced with turbo-driven in TPS cooling tower. This modification is implemented in January'04.

**Investment:**

Rs. in Lakhs : 40.00

**Benefits: -**

Savings in Fuel gas : 3065 MT of fuel oil/annum.  
Savings (Rs. in Lakhs) : 277.76