

INDIAN OIL CORPORATION LIMITED

BARAUNI REFINERY

Distt. Begusarai (Bihar)

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.

Energy Conservation

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 65.5 in the year 2008-09.

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 Major Actions Taken For Energy Conservation During 2008-09 Are As Under

1. Conversion of Air Compressor Turbine from Condensing Type to Backpressure Type

In BXP there were two air compressors of 2 X 6500 NM³/Hr capacity and both the air compressors were driven by HP steam turbine. Both the turbines were of low efficiency condensing type and steam condensate is pumped out in the DM water tanks of TPS. To improve the overall energy efficiency of the turbines both the turbines were changed from condensing type turbines to back pressure extraction type steam turbine. Extraction steam at around 4 kg/cm²(g) pressure was extracted @ 13.5 MT/Hr (at full load condition). This extraction steam was routed to the main LP steam header near BXP cooling tower area.

The following major benefits were achieved by commissioning of the scheme:

- Overall energy conservation as back pressure type steam turbine is more efficient than condensing type. Savings 6400 SRFT/Yr.
- Reduction / stoppage of MP to LP steam PRDS operation.

2. Two Boiler operations Instead of Three boilers

Earlier, to meet the high pressure steam demand of Refinery, 3 nos. of boilers were operated at low load. As a best practice, operation of 2 nos. of boilers started in place of 3 nos. which resulted in stoppage of 1 no. of ID & FD fan. Also excess air of Boilers was reduced from 40% to 20% as the load of boilers increased. Energy saving achieved 3000 SRFT/Year.

3. Improvement of preheat temp. of AVU-3 by 15 deg C by cleaning of fouled heat exchanger

11 nos. of fouled exchanger of AVU-3 was cleaned based on heat exchanger survey report which resulted in preheat temperature improvement by 15 deg C. The energy saving achieved is 3000 SRFT/Year.

4. Operational Improvements (Furnaces/Boilers Excess air control, Regular soot blowing, Damper operation in closed condition)

Various operational improvements like excess air control in process units furnaces & TPS boilers , regular soot blowing and damper operation in closed condition started. This has resulted in fuel saving of 4500 SRFT/Year.

5. Improvement of Preheat temp. of AVU-I / II by 10 deg C by using DHDT R/D hot stream

The temperature of the hydro treated diesel at the upstream of 702-E-01 is approx. 220°C. The Hot diesel product ex DHDT is to be blended with heating stream i.e. SRGO of AVU-I&II leading to more heat availability for Crude pre-heating & the blended SRGO ex AVU's is used for Back-blending.

The hot product in DHDT in 702-E-01 Exchanges heat with cold feed. Loss of heat due to diverting some Hot product diesel in DHDT is made up by routing of more hot SRGO from AVU's. This routing has increased the pre-heat by approximately 10°C which is equivalent to 1900 SRFT per year fuel saving.

6. Foam cleaning of DHDT Air Coolers

Air fin coolers external fins have been cleaned with in house technique using detergent spray. This has resulted, reduction in vibration by about 25% and temperature drop by 5 deg C. Fuel saving is 150 SRFT/Year.

7. Optimization of Circulating water pumps & cooling tower fans operation during Winter

The operation of circulating water pumps and cooling tower fans was optimized during winter season. 2 nos. of circulating water pumps of 695 KW and 3 nos. of Cooling Tower fans of 75 KW were stopped. Energy saving achieved is 1022 SRFT /Year.

8. Hydrocarbon loss reduction by recovery of oil from tank bottom sludge

As the oil content in tank bottom sludge is very high 40 %, the earlier treatment method of thermal extraction in steam heated melting pits was messy and ineffective it was decided to engage a proprietary party for the job of mechanical recovery of oil from oily sludge. The party had commissioned its skid in March 2007 and started operations immediately thereafter. The Sludge is pumped by hydraulic gun pumps into a preparation tank and mixed with diluent (Coker Gas Oil-heavy oil) and steam heated. The same is then routed through hydro cyclones centrifuges and decanters. The slop oil with <3 % BS&W and waster <100 PPM Oil is routed to Slop and OWS (Oily Water Sewer) Respectively. The residual sludge about 8-10 % of the tank bottom sludge and having oil content <10 % is discharged and collected in drums after which it can be safely and easily bio-remediated due to its low oil content. Approx. 2500 KL slop oil recovered per year.

9. Reduction in Slop Oil Generation by routing of Blowdown Scrubber Bottom stream back to the Fractionator of Coker-A

Column C-7 material generated during reactor blow down, steam cooling and vapor heating in Coker-A are slopped to OMS slop tank and used as slop quench in Coker-A reactors. This slop material is routed to main fractionator column C 001 by providing interconnection line between C-7 slop line and Gas oil reflux flow to C 001 d/s of C/V. This has resulted in reduction in slop generation by 1000 MT/year.

10. Low pressure operation of columns (splitter / absorbers, wherever possible)

Operating pressure of columns (splitters, absorbers) was reduced. In Naphtha splitter column the pressure reduced from 2.2 kg/cm²(g) to 2.0 kg/cm²(g). By doing this, reboiler fuel consumption reduced and 200 SRFT/year fuel saving achieved.

In ARU absorber, operating pressure reduced from 1.2 kg/cm²(g) to 1.0 kg/cm²(g). Hence, steam consumption reduced by 30 kg/hr which is equivalent to 300 SRFT per year fuel saving.

11. Reduction in Power consumption by 500 KWH in Refinery Township through creating awareness among people

Electrical energy saving awareness campaign has been conducted in the township for residents/housewives. Drawing competition for kids, slogan competition and quiz competition were organized during the campaign. This campaign will be continued in coming days on regular basis. Also, 50% street lights on main road at township were switched off.

This has resulted in reduction in power consumption in Township by 500 KWH.

12. Recovery of low pressure hot well gas in AVU-I/III

In AVUs, the hot well's vent gas which was vented to atmosphere was recovered and use the same as fuel gas in the Vacuum unit furnace by using low pressure Burners. Energy saving achieved is 1200 SRFT /Year.

Projects Implemented In 2007-08 And Benefits Derived In 2008-09 Because The Project Was Completed In Feb-mar'2008

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
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.

Savings: 4000 SRFT/Yr.

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.

Savings: 1850 SRFT/Yr.

Energy Conservation Plans and 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.	Installation of LP Burners in AVU-II	2009	300	375
2.	Routing of CBD Flash steam of Boilers to De-aerators	2009	200	50
3.	Installation of flare gas recovery facility	2009	2600	650
4.	Rectification of steam leaks	2009	1500	375
5.	Step less control of compressor DHDT/CRU compressor	2009	2900	725
6.	Installation of energy efficient FRP blades in air fin coolers (Total 78 fans)	2009	350	88
7.	Installation of high efficiency aerodynamic FRP blades in BXP cooling tower fans	2009	140	35
8.	Hydrogen recovery from DHDT off gas	2010	1200	300
9.	Replacement of Two old steam turbines with a new TG & Boiler	2010	1100	275
	Total		10290	2873

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.

Energy Conservation 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.

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.

**INDIAN OIL CORPORATION LIMITED
(Assam Oil Division) - Digboi Refinery,
Distt. Tinsukia (Assam)**

Unit Profile

The Digboi Refinery in North Eastern India is India’s oldest refinery and was commissioned in 1901. Originally a part of Assam Oil Company, it became part of IndianOil in 1981. Its original refining capacity had been 0.5 MMTPA since 1901. Modernisation project of this refinery has been completed and the refinery now has an increased capacity of 0.65 MMTPA. The Digboi refinery produces distillates, heavy ends and excellent quality wax from indigenous crude oil produced at the Assam oil fields. Petroleum products are supplied mainly to north-eastern India primarily through road and by rail wagons. A new Delayed Coking Unit of 1,70,000 TPA capacity was commissioned in 1999. A new Solvent Dewaxing Unit for maximizing production of micro-crystalline wax was installed and commissioned in 2003. The refinery has also commissioned a Hydrotreater in 2003 to improve the quality of diesel.

Energy Consumption

Specific Energy Consumption in 2008 – 09 in Digboi Refinery is as given below:

Year	Crude processed MMT	Specific Electrical Energy Consumption (MTOE/Bbl/NRGF)	Specific Thermal Energy Consumption (MTOE/Bbl/NRGF)	% Reduction Over 2007-08
2007 -08	563.55	0.000271052	0.001393538	—
2008 - 09	623.105	0.000252566	0.001192049	14.46

Energy Conservation Achievements

Major Energy Efficiency Improvement Projects / Measures Commissioned During the year 2008 - 2009 :						
SN	Project Description	Achievement of energy savings per year basis				Investment incurred on the project Rs. (Lakh)
		Electricity	Fuel (Gas)		Total savings in (Rs. Lakhs)	
		(Lakhs kWh)	Lakh Nm ³	Mkcal		
0.1	Crude Pre-heat train optimization in Crude Distillation Unit (AVU)	0.00	17.10	14877	61.56	192.00
0.2	Modification in the piping network in the Reservoir at Nazirating Raw Water Pumping Station.	1.52	0.00	0.00	2.74	0.20
0.3	Replacement of Incandescent Lamps (60W) with CFL (18W) in the township residential accommodation	13.56	0.00	0.00	24.41	23.00
0.4	Improvement in Routine Maintenance at Air Conditioning plant at CPP	1.27	0.00	0.00	2.29	0.20
0.5	Complete Revival of Condensate Recovery System in the Refinery	0.00	2.28	1984	8.21	1.00

0.6	Prevention of ice formation by putting compressed air on the surface near the plunger linkage of the cold box expansion valve at Nitrogen plant	0.25	0.00	0.0	0.45	0.10
0.7	Replacement of existing Glass Wool insulation of VDU Transfer line with Calcium Silicate.	0.00	1.14	992	4.10	12.00
0.8	Improvement in temp. drop (by around 20 deg C) across Desulphurizer at HGU.	0.00	0.13	113	0.47	0.50
0.9	Rationalization of plant lighting (61.38 KW saving in 2008-09)	2.23	0.00	0.0	4.01	0.10
1.0	Replacement of GRP blades with FRP at SDU Cooling Tower.	0.68	0.00	0.0	1.23	5.00
1.1	Reduction in Desalter oil content (Existing o/c > 200 ppm against design of 125 ppm).	0.00	0.04	35	0.14	0.00
1.2	Rationalization of Drinking water pumping at Nazirating Raw Water Treatment Plant and Refinery.	25.35	0.00	0.00	45.63	0.50
1.3	Replacement of 100 nos. 160W MLL lamps with 200 nos. 23W CFL lamps at AVU.	0.51	0.00	0.00	0.92	3.50

1.4	Rationalization of power : Disconnection of 9.83 KW load by adding LED based Aviation Obstruction Light of 67 W only.	0.35	0.00	0.00	0.63	3.00
1.5	Monitoring / Rationalization of Steam consumption	0.00	15.21	13233	54.76	2.00
TOTAL :		45.72	35.90	31233	211.54	243.10

1) Crude Pre-heat Train Optimization In The Crude Distillation Unit:

Digboi Refinery has a Crude Distillation Unit (Atmospheric & Vacuum Distillation) having Crude processing capacity of 0.65 MMTPA. This unit was commissioned in 1996 replacing the two age-old and obsolete Crude Distillation Units having Crude processing capacity of 0.25 MMTPA each. As per design, the Crude pre-heat temperature in the existing unit should be 274 deg C. But, it was later on observed that the Crude pre-heat temperature has come down to 252 deg C. As a result, to improve upon the Crude pre-heat temperature, M/s Engineers India Limited was engaged to study the Crude pre-heat train and accordingly as recommended by M/s EIL, 5 nos. of Heat Exchangers have been installed in the Crude pre-heat train circuit and commissioned in October, 2008. This has resulted in increase in Crude pre-heat temperature to 264 deg C (av.) and a saving in fuel gas consumption to the tune of around 1350 SRFT which is equivalent to financial benefit of Rs. 61.56 Lakhs/year against a total investment of Rs.192 Lakhs with a pay back period of around 3 years.

2) Modification In The Piping Network In The Reservoir At Nazirating Raw Water Pumping Station:

The entire process water requirement of the refinery and also majority of drinking water requirement in the refinery and township is met from the Nazirating Raw Water Treatment Plant situated about 10 KM away from the refinery. A study was carried out and accordingly the piping network in the water Reservoir was modified which has resulted in saving of 1.52 Lakh kWh power equivalent to financial benefit of Rs. 2.74 Lakhs/year against an investment of Rs.0.20 Lakh only.

3) Replacement Of 60w Incandescent Lamps With Cfl (18w) In The Township Residential Accommodation:

Digboi Refinery has a vast township with residential accommodation for all of its employees, around the refinery. The incandescent lamps (60W) used in the employees residential accommodation (about 1100 nos. bungalows/

quarters) was replaced with CFL (18W). This has resulted in saving of about 13.56 Lakh kWh power (535 SRFT/year) equivalent to financial benefit of Rs. 24.41 Lakhs against an investment of Rs. 23 Lakhs (pay back period : 11 months).

4) Improvement In Routine Maintenance At Air Conditioning Plant Of Captive Power Plant:

An Energy Audit of Digboi Refinery was carried out by M/s PCRA and as one of their recommendations, improvement in few routine maintenance in the Air Conditioning Plant of Captive Power Plant was taken up. This has resulted in saving of 1.27 Lakh kWh of power equivalent to financial benefit of Rs. 2.29 Lakhs/year against an investment of Rs. 0.20 Lakh only.

5) Complete Revival Of Condensate Recovery System In The Refinery:

The earlier Steam Condensate Recovery System in the refinery was not in operation for a long time due to some technical problems. With a view to conserve energy, it was decided to revive this system and accordingly the Condensate Recovery System was commissioned with modifications / rectifications in the old system / facilities. The condensate generated from the fuel sector was diverted to the DM Water header to recover the heat while the same from Wax Sector was diverted to the tank heating coils of the feed tanks at Wax Hydrofinishing Unit. This has resulted in saving of about 240 Kg/hr of steam equivalent to financial benefit of Rs. 8.21 Lakhs/year against an investment of Rs. 1.0 Lakh only.

6) Prevention Of Ice Formation By Putting Compressed Air On The Surface Near The Plunger Linkage Of The Cold Box Expansion Valve At Nitrogen Plant:

Earlier steam was used near the plunger linkage of the Cold Box Expansion Valve at Nitrogen Production Unit in order to prevent ice formation. The steam was replaced with compressed air. This has resulted in saving of equivalent of 0.25 Lakhs kWh power and a financial saving of Rs. 0.45 Lakh/year.

7) Replacement Of Glass Wool Insulation Of Vdu Transfer Line With Calcium Silicate:

The glass Wool insulation of transfer line at Vacuum Distillation Unit was replaced with energy efficient Calcium Silicate insulation. This has resulted in saving of about 120 Kg/hr of steam equivalent to financial benefit of 4.10 Lakhs/year against an investment of Rs. 12.00 Lakhs (pay back period : 2.9 years).

8) Improvement In Temp. Drop (By Around 20 Deg C) Across Desulphurizer At Hgu:

Digboi Refinery has a Hydrogen Generation Unit (HGU) which supplies pure hydrogen to the Kero / Diesel Hydrotreater. It was observed that the temp. drop across Desulphurizer of HGU is around 20 deg C against normal drop of 10 deg C of similar equipment in other refineries. Accordingly, the bare portions of the Desulphurizer were insulated and as a result an equivalent saving in 0.13 Lakh NM³/year fuel gas saving was achieved (financial benefit : Rs. 0.47 Lakhs/year).

9) Rationalization Of Plant Lighting:

As a part of energy conservation, rationalization in plant lighting in the refinery was taken up which has resulted in saving of about 61.38 KW of power with a financial benefit of Rs. 4.01 Lakhs/year.

10) Replacement Of Grp Blades With Frp At Sdu Cooling Tower:

Digboi Refinery has two Cooling Towers viz. DRMP Cooling Tower and SDU Cooling Tower. There are two fans in SDU Cooling Tower where in one of the fans, GRP blades were replaced earlier with energy saving FRP ones. The GRP blades of the remaining fan were also replaced with FRP ones in January, 2009. This replacement has saved around 25% of power with a financial benefit of Rs. 1.23 Lakhs/year against an investment of Rs. 5.0 Lakhs.

11) Reduction In Desalter Oil Content:

The oil content of Desalter effluent ex. Crude Distillation Unit was found to be > 200 ppm against a design value of 125 ppm max. With some modification in the water injection system / monitoring, the same has been brought down to below 100 ppm. This has resulted in saving of Rs. 0.14 Lakh/year.

12) Rationalization Of Drinking Water Supply:

The entire process water/drinking water requirement of Digboi Refinery and also majority of drinking water supply to the township are met from the Nazirating Raw Water Treatment Plant situated about 10 Km away from the refinery. Modifications / rationalizations were carried out in the drinking water supply network which has resulted in saving of 300 KW of power and equivalent to financial benefit of Rs. 45.63 Lakhs / year.

13) Replacement Of 160w Mll Lamps With Cfl At Avu:

As a part of energy conservation measures, 100 Nos. of 160W MLL lamps at Crude Distillation Unit (AVU) were replaced with energy saving 23W CFL (200 Nos.). This has resulted in saving of 0.51 Lakhs kWh of power, equivalent to

financial benefit of Rs. 0.92 Lakhs/year against an investment of Rs. 3.5 Lakhs (pay back period : 3.8 years).

14) Rationalization Of Power:

As a part of rationalization of power, 9.83 KW load was disconnected against an installation of LED based Aviation Obstruction Light of 67W only. This has resulted in saving of 0.35 Lakhs kWh of power which is equivalent to financial benefit of Rs. 0.63 Lakhs/year.

15) Monitoring/Rationalization Of Steam Consumption:

In some parts of the refinery, the steam supply network was modified and steam supply was rationalized. A close monitoring/repairs in steam consumption/steam lines has helped in minimization of steam consumption to the tune of about 2.0 MT/hr, equivalent to financial benefit of Rs.54.76 Lakhs/year.

Energy Conservation Commitment and Policy Set Up

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- 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 source of energy.
- Fostering a culture of participation and innovation amongst stack holders for continual improvement in energy conservation.
- Propagating the message of avoiding wastage of energy to the community.

Environment and Safety

Digboi Refinery is meeting all the environmental stipulations w.r.t Air, Water etc. Recently Digboi Refinery has installed and commissioned (in May'09) a 'Dissolved Air Flotation' system in its Effluent Treatment Plant to meet revised CPCB norm of oil & grease (5 ppm max).

Digboi Refinery has achieved zero accident during 2008 - 09. Digboi Refinery has been awarded Silver Award by Greentech Foundation, New Delhi, for excellence in safety, in its 8th Annual Greentech Safety Award-2009. Digboi Refinery was also awarded Ogale shield, instituted by Indian Oil Corporation Limited, jointly with three other IOCL refineries, for 2008-09 in recognition of its safety performance.

INDIAN OIL CORPORATION LIMITED

PANIPAT REFINERY

Panipat (Haryana)

Unit Profile

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Energy Conservation Achievements

Major Energy Efficiency improvement projects / measures commissioned during the year 2008 - 2009 :

SN	Project Description	Achievement of energy savings per year basis				Investment incurred on the project Rs. (Lakh)
		Electricity (Lakhs kWh)	Fuel (Gas)		Total savings in (Rs. Lakhs)	
			Lakh Nm ³	Mkcal		
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0.7	Replacement of existing Glass Wool insulation of VDU Transfer line with Calcium Silicate.	0.00	1.14	992	4.10	12.00
0.8	Improvement in temp. drop (by around 20 deg C) across Desulphurizer at HGU.	0.00	0.13	113	0.47	0.50

SN	Project Description	Achievement of energy savings per year basis				Investment incurred on the project Rs. (Lakh)
		Electricity (Lakhs kWh)	Fuel (Gas)		Total savings in (Rs. Lakhs)	
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0.9	Rationalization of plant lighting (61.38 KW saving in 2008-09)	2.23	0.00	0.0	4.01	0.10
1.0	Replacement of GRP blades with FRP at SDU Cooling Tower.	0.68	0.00	0.0	1.23	5.00
1.1	Reduction in Desalter oil content (Existing o/c > 200 ppm against design of 125 ppm).	0.00	0.04	35	0.14	0.00
1.2	Rationalization of Drinking water pumping at Nazirating Raw Water Treatment Plant and Refinery.	25.35	0.00	0.00	45.63	0.50
1.3	Replacement of 100 nos. 160W MLL lamps with 200 nos. 23W CFL lamps at AVU.	0.51	0.00	0.00	0.92	3.50
1.4	Rationalization of power : Disconnection of 9.83 KW load by adding LED based Aviation Obstruction Light of 67 W only.	0.35	0.00	0.00	0.63	3.00
1.5	Monitoring / Rationalization of Steam consumption	0.00	15.21	13233	54.76	2.00
	TOTAL :	45.72	35.90	31233	211.54	243.10

1) Crude Pre-heat Train Optimization In The Crude Distillation Unit:

Digboi Refinery has a Crude Distillation Unit (Atmospheric & Vacuum Distillation) having Crude processing capacity of 0.65 MMTPA. This unit was commissioned in 1996 replacing the two age-old and obsolete Crude Distillation Units having Crude processing capacity of 0.25 MMTPA each. As per design, the Crude pre-heat temperature in the existing unit should be 274 deg C. But, it was later on observed that the Crude pre-heat temperature has come down to 252 deg C. As a result, to improve upon the Crude pre-heat temperature, M/s Engineers India Limited was engaged to study the Crude pre-heat train and accordingly as recommended by M/s EIL, 5 nos. of Heat Exchangers have been installed in the Crude pre-heat train circuit and commissioned in October, 2008. This has resulted in increase in Crude pre-heat temperature to 264 deg C (av.) and a saving in fuel gas consumption to the tune of around 1350 SRFT which is equivalent to financial benefit of Rs. 61.56 Lakhs/year against a total investment of Rs.192 Lakhs with a pay back period of around 3 years.

2) Modification In The Piping Network In The Reservoir At Nazirating Raw Water Pumping Station:

The entire process water requirement of the refinery and also majority of drinking water requirement in the refinery and township is met from the Nazirating Raw Water Treatment Plant situated about 10 KM away from the refinery. A study was

carried out and accordingly the piping network in the water Reservoir was modified which has resulted in saving of 1.52 Lakh kWh power equivalent to financial benefit of Rs. 2.74 Lakhs/year against an investment of Rs.0.20 Lakh only.

3) Replacement Of 60w Incandescent Lamps With Cfl (18w) In The Township Residential Accommodation:

Digboi Refinery has a vast township with residential accommodation for all of its employees, around the refinery. The incandescent lamps (60W) used in the employees residential accommodation (about 1100 nos. bungalows/quarters) was replaced with CFL (18W). This has resulted in saving of about 13.56 Lakh kWh power (535 SRFT/year) equivalent to financial benefit of Rs. 24.41 Lakhs against an investment of Rs. 23 Lakhs (pay back period : 11 months).

4) Improvement In Routine Maintenance At Air Conditioning Plant Of Captive Power Plant:

An Energy Audit of Digboi Refinery was carried out by M/s PCRA and as one of their recommendations, improvement in few routine maintenance in the Air Conditioning Plant of Captive Power Plant was taken up. This has resulted in saving of 1.27 Lakh kWh of power equivalent to financial benefit of Rs. 2.29 Lakhs/year against an investment of Rs. 0.20 Lakh only.

5) Complete Revival Of Condensate Recovery System In The Refinery:

The earlier Steam Condensate Recovery System in the refinery was not in operation for a long time due to some technical problems. With a view to conserve energy, it was decided to revive this system and accordingly the Condensate Recovery System was commissioned with modifications / rectifications in the old system / facilities. The condensate generated from the fuel sector was diverted to the DM Water header to recover the heat while the same from Wax Sector was diverted to the tank heating coils of the feed tanks at Wax Hydrofinishing Unit. This has resulted in saving of about 240 Kg/hr of steam equivalent to financial benefit of Rs. 8.21 Lakhs/year against an investment of Rs. 1.0 Lakh only.

6) Prevention Of Ice Formation By Putting Compressed Air On The Surface Near The Plunger Linkage Of The Cold Box Expansion Valve At Nitrogen Plant:

Earlier steam was used near the plunger linkage of the Cold Box Expansion Valve at Nitrogen Production Unit in order to prevent ice formation. The steam was replaced with compressed air. This has resulted in saving of equivalent of 0.25 Lakhs kWh power and a financial saving of Rs. 0.45 Lakh/year.

7) Replacement Of Glass Wool Insulation Of Vdu Transfer Line With Calcium Silicate:

The glass Wool insulation of transfer line at Vacuum Distillation Unit was replaced with energy efficient Calcium Silicate insulation. This has resulted in saving of about 120 Kg/hr of steam equivalent to financial benefit of 4.10 Lakhs/year against an investment of Rs. 12.00 Lakhs (pay back period : 2.9 years).

8) Improvement In Temp. Drop (By Around 20 Deg C) Across Desulphurizer At Hgu:

Digboi Refinery has a Hydrogen Generation Unit (HGU) which supplies pure hydrogen to the Kero / Diesel Hydrotreater. It was observed that the temp. drop across Desulphurizer of HGU is around 20 deg C against normal drop of 10 deg C of similar equipment in other refineries. Accordingly, the bare portions of the Desulphurizer were insulated and as a result an equivalent saving in 0.13 Lakh NM³/year fuel gas saving was achieved (financial benefit : Rs. 0.47 Lakhs/year).

9) Rationalization Of Plant Lighting:

As a part of energy conservation, rationalization in plant lighting in the refinery was taken up which has resulted in saving of about 61.38 KW of power with a financial benefit of Rs. 4.01 Lakhs/year.

10) Replacement Of Grp Blades With Frp At Sdu Cooling Tower:

Digboi Refinery has two Cooling Towers viz. DRMP Cooling Tower and SDU Cooling Tower. There are two fans in SDU Cooling Tower where in one of the fans, GRP blades were replaced earlier with energy saving FRP ones. The GRP blades of the remaining fan were also replaced with FRP ones in January, 2009. This replacement has saved around 25% of power with a financial benefit of Rs. 1.23 Lakhs/year against an investment of Rs. 5.0 Lakhs.

11) Reduction In Desalter Oil Content:

The oil content of Desalter effluent ex. Crude Distillation Unit was found to be > 200 ppm against a design value of 125 ppm max. With some modification in the water injection system / monitoring, the same has been brought down to below 100 ppm. This has resulted in saving of Rs. 0.14 Lakh/year.

12) Rationalization Of Drinking Water Supply:

The entire process water/drinking water requirement of Digboi Refinery and also majority of drinking water supply to the township are met from the Nazirating Raw Water Treatment Plant situated about 10 Km away from the refinery. Modifications / rationalizations were carried out in the drinking water supply network which has resulted in saving of 300 KW of power and equivalent to financial benefit of Rs. 45.63 Lakhs / year.

13) Replacement Of 160w Mll Lamps With Cfl At Avu:

As a part of energy conservation measures, 100 Nos. of 160W MLL lamps at Crude Distillation Unit (AVU) were replaced with energy saving 23W CFL (200 Nos.). This has resulted in saving of 0.51 Lakhs kWh of power, equivalent to financial benefit of Rs. 0.92 Lakhs/year against an investment of Rs. 3.5 Lakhs (pay back period : 3.8 years).

14) Rationalization Of Power:

As a part of rationalization of power, 9.83 KW load was disconnected against an installation of LED based Aviation Obstruction Light of 67W only. This has resulted in saving of 0.35 Lakhs kWh of power which is equivalent to financial benefit of Rs. 0.63 Lakhs/year.

15) Monitoring/Rationalization Of Steam Consumption:

In some parts of the refinery, the steam supply network was modified and steam supply was rationalized. A close monitoring/repairs in steam consumption/steam lines has helped in minimization of steam consumption to the tune of about 2.0 MT/hr, equivalent to financial benefit of Rs.54.76 Lakhs/year.

Energy Conservation Commitment and Policy Set up

To be 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 source of energy.
- Fostering a culture of participation and innovation amongst stack holders for continual improvement in energy conservation.
- Propagating the message of avoiding wastage of energy to the community.

Environment and Safety

Digboi Refinery is meeting all the environmental stipulations w.r.t Air, Water etc. Recently Digboi Refinery has installed and commissioned (in May'09) a 'Dissolved Air Flotation' system in its Effluent Treatment Plant to meet revised CPCB norm of oil & grease (5 ppm max).

Digboi Refinery has achieved zero accident during 2008 - 09. Digboi Refinery has been awarded Silver Award by Greentech Foundation, New Delhi, for excellence in safety, in its 8th Annual Greentech Safety Award-2009. Digboi Refinery was also awarded Ogale shield, instituted by Indian Oil Corporation Limited, jointly with three other IOCL refineries, for 2008-09 in recognition of its safety performance.