



VISAKH REFINERY

HINDUSTAN PETROLEUM CORPORATION LIMITED



i) Unit Profile:

Hindustan Petroleum Corporation Limited (HPCL) was formed after Government of India took over the ESSO group of companies in Bombay in 1974. Caltex operations in India including its Refinery at Visakhapatnam was also taken over by Government of India and amalgamated with HPCL in 1978. Thus HPCL has got two Refineries at Mumbai & Visakhapatnam.

Visakh Refinery was the first Refinery on east coast of India and was commissioned in 1957 with a capacity of 0.675 million TPA. The old crude unit was modernized and revamped to increase its capacity to 1.5 million TPA. In 1984-85, Refinery's crude processing capacity was increased to 4.5 MMTPA by adding 3 MMTPA crude unit along with matching secondary processing capacity. In the second phase of expansion additional 3 MMTPA refining capacity was added, bringing the total refining capacity to 7.5 MMTPA. It is planned to upgrade product quality to EURO II & III standards. "Clean Fuel Project" is already under implementation.



Along with increase in refining capacity, Visakh Refinery implemented various environmental projects to minimize its impact on environment. For example, Sulfur

recovery unit for the desulfurisation of fuel gas were installed both to treat FG & off gases during Diesel hydrodesulfurisation to reduce SO₂ emission. A DHDS unit is installed for HSD desulfurisation, to meet the new reduced Sulphur specification of the HSD and will help in reducing SO₂ emission pollution. Refinery has got the ISO 14001 certification in May 2002 by implementing the Environmental Management System in the Refinery, and has been upholding it continuously till date.

Visakh Refinery is manufacturing petroleum fuel products like LPG, Propylene, Naphtha, Motor Spirit (MS), Superior Kerosene Oil (SKO), Aviation Turbine Fuel (ATF), High Speed Diesel (HSD), Light Diesel Oil (LDO), Jute Batching Oil (JBO), Wash Oil (WO), Furnace Oil (FO), Low Sulfur Heavy Stock (LSHS) and Bitumen.

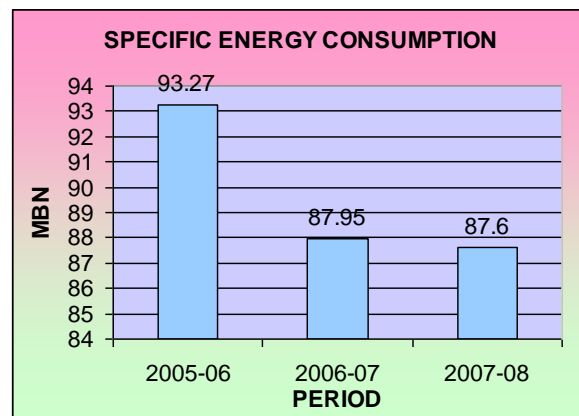
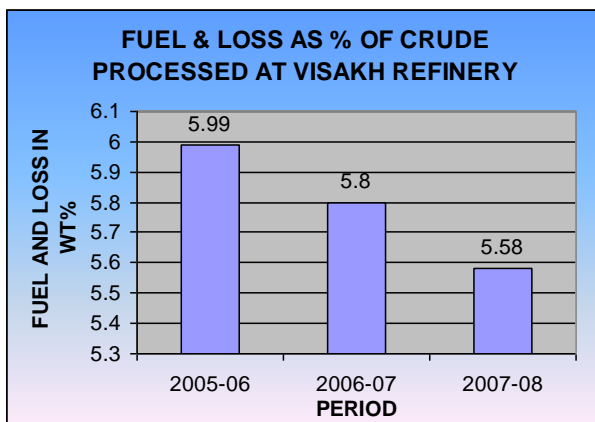
High capacity utilization with optimum yield and efficient energy uses is the operating philosophy of Visakh Refinery and to be environment friendly is one of our main priorities.

Over the years, Visakh Refinery has improved its product slate to meet the demand for different fuel products viz. LPG, SKO and MS in the country. The production of these high value products though more energy intensive, yields higher netbacks and increases returns on energy consumed. Value addition per ton of crude has been continuously going up year after year.

SO₂ emission at VR has dropped from 23-24 tons per day in early eighties to 9 to 11.5 tons/day after the commissioning of sulfur recovery unit & management control.

ii) Energy consumption:

Energy conservation is given utmost importance in the Refinery at all levels. Due to various energy conservation measures, the Refinery has made continuous progress in reducing fuel & loss and specific energy consumption over the years.



DESCRIPTION	UNIT	2005-2006	2006-2007	2007-2008
Specific Electricity Consumption	KWH/T	33.48	33.34	31.91
Specific Thermal Energy Consumption	Million KCal/T	0.4	0.4	0.37
Total Energy Cost	Rs. Lakhs	69915.40	97542.69	114168.79
Energy Cost as % Manufacturing Cost (excluding crude cost)	%	63.17	72.38	72.4

iii) Energy conservation commitment, policy and Organizational Set up:

Visakh Refinery is totally committed to energy conservation. Implementation of energy conservation schemes is not guided only by economic compulsion but also a part of its operating philosophy. Energy conservation training programs are conducted periodically for technicians and engineers by external renowned faculty. Oil and gas conservation fortnight is also observed every year and various activities are carried out for increasing awareness on energy conservation. Visakh Refinery was the first Indian Refinery to introduce glass APH. It was the first PSU Refinery to use effective online cleaning of furnaces (with arch temperature reduction of 80-120 deg.c.). The Refinery carries out periodic surveys (steam leak, compressed air leak) at regular intervals to minimize steam / compressed air losses and to save energy. The Refinery calculates theoretical fuel and loss for every 15 days. Actual fuel and loss, energy parameters, specific energy consumption are calculated every month. Status of energy conservation projects, in the form of Encon PIP (Performance Improvement Plan), along with status of various survey recommendations are released every month. Furnace efficiency calculation, steam balance, tentative fuel and loss calculation, specific fuel consumption, flare loss accounting etc. are also carried out daily.

The aim of the Refinery is to be a leading Refinery in India in terms of energy conservation.

Visakh Refinery has a Energy Conservation department headed by Sr. Manger-Technical. This Group is directly responsible to monitor and ensure efficient energy utilization in the refinery in coordination with Operations, Maintenance, Technical & Project departments.

iv) Energy conservation achievements:

Visakh Refinery has implemented various energy conservation projects during 2007-2008. The economic benefit due to the energy conservation measures were estimated at Rs 21.38 Crores.

1. Commissioning of FGAAU:



View of the new plant

For treating fuel gas, Amine Absorption Unit was commissioned and ARI SRUs were shut down.

- **Expenditure:** Rs. 1830 Lakhs
- **Electricity saving:** 5405.8 MWH
- **LSHS saving:** 1160 MT
- **Savings in chemicals:** Rs.446 Lakhs
- **Total saving** (electricity + LSHS + Chemicals): Rs 1034.3 Lakhs
- **Reduction in CO2 emission:** 10115 MT
- 100% compliance of daily SO2 emission set by Pollution Control Board.
- Less Maintenance /better Sulphur quality.
- Improvement in fuel gas quality, better life of burner gas tips in Refinery

2. Routing of Hot well Off Gases to Furnace in CDU-II:

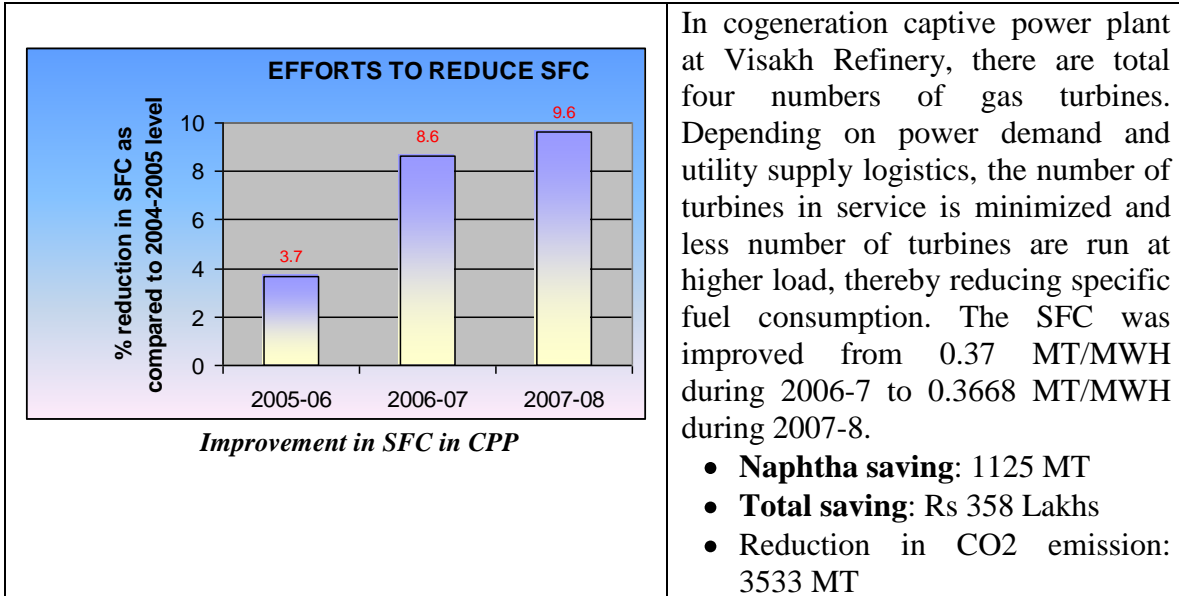


Bottom view of off gas burners installed

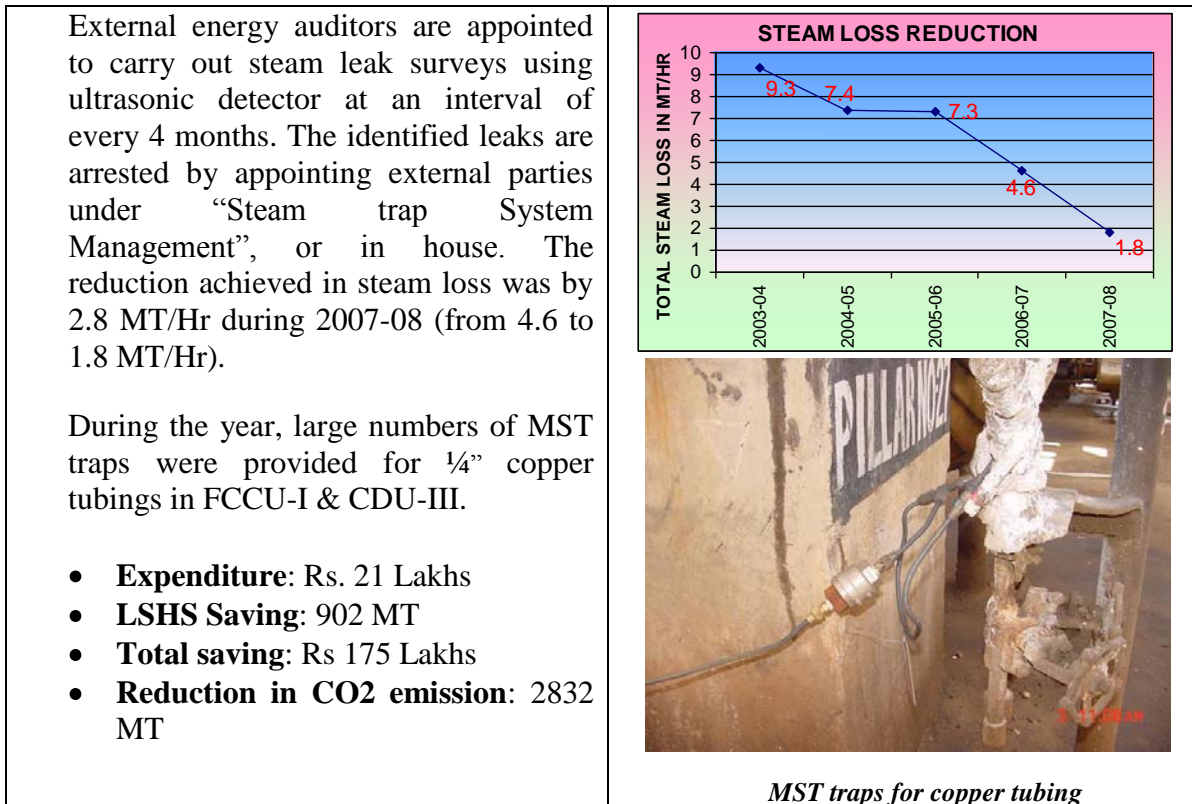
As per original design of the Crude / Vacuum Distillation Unit-II, hot well off gases from the Vacuum Column overhead was being routed to Atmosphere. Schemes were developed in-house and burners were installed to fire the gas inside Atmospheric Furnace.

- **Expenditure:** Rs. 34 Lakhs
- **Off Gas saving:** 2532 MT
- **Total saving:** Rs 535 Lakhs
- **Reduction in CO2 emission:** 10115 MT
- Reduction in VOC emission

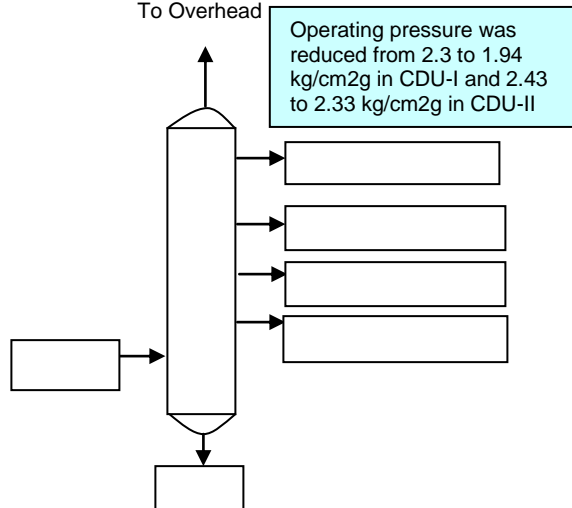
3. Reducing specific fuel consumption of Captive Power Plant:



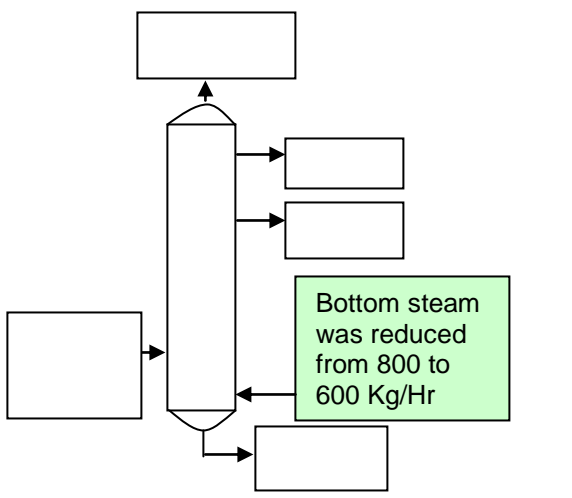
4. Reduction in steam loss:



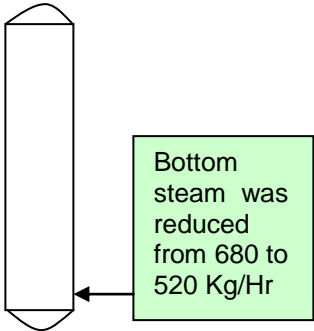
5. Reduction in operating pressure of Atmospheric Columns in CDU-I & II

	<p>Atmospheric Column operating pressures were reduced (with out resulting in flaring), thereby increasing vapourisation at lower furnace coil out let temperatures. This resulted in savings of fuel.</p> <ul style="list-style-type: none"> • Expenditure: Nil • Fuel gain: 587 MT • Total saving: Rs 113.6 Lakhs
-----------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------


6. Optimising stripping steam in Main Fractionator Column in FCCU-I

	<p>The bottom stripping steam to Main Fractionator in FCCU-I was reduced with out effecting the product quality.</p> <ul style="list-style-type: none"> • Expenditure: Nil • Fuel gain: 133 MT • Total saving: Rs 25.81 Lakhs
------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

7. Optimising stripping steam in PDS Column in Hydrogen unit

	<p>The bottom stripping steam to PDS Stripper Column in Hydrogen Unit was reduced with out effecting the process.</p> <ul style="list-style-type: none"> ● Expenditure: Nil ● Fuel gain: 107 MT ● Total saving: Rs 20.65 Lakhs
-----------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

8.Ex-situ processing of oily sludge & recovery of oil:

 <p style="text-align: center;"><i>View of the plant</i></p>	<p>Oil was recovered by treating sludge by appointing external agency. This resulted in double benefit of treating hazardous waste as well as recovering oil.</p> <ul style="list-style-type: none"> ● Expenditure: Rs. 96.2 Lakhs ● Fuel gain: 1461 MT ● Total saving: Rs 283 Lakhs ● Reduction in hazardous waste: 3568 m3.
------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

9.Oil recovery from crude tank bottom sludge by chemical treatment:

 <p style="font-size: small;">11/10/2007 07:09 am</p>	<p>Oil was recovered by chemical treatment of crude tank bottom sludge by appointing external agency.</p> <ul style="list-style-type: none"> ● Expenditure: Rs. 17 Lakhs ● Fuel gain: 571 MT ● Total saving: Rs 110.7 Lakhs
------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

10. Periodic compressed air survey and reduction in compressed air leak:



Ultrasonic leak detector being used for compressed air leak survey

At Visakh Refinery, compressed air surveys are carried out at every six month by external agencies. Ultrasonic leak detectors are used to identify leaks. Further improvement in compressed air leak was achieved during 2007-08 (around 93% reduction in compressed air leak is achieved over last three years).

- **Investment:** Rs. 2.1 Lakhs
- **Fuel gain:** 105 MT
- **Total saving:** Rs 33.3 Lakhs

11. Online cleaning of Furnace:



Chemical spraying in progress

Online chemical cleaning of furnaces was carried out to clean the furnace tubes without taking shutdown. Reduction in arch temperature was ~ 80-120 deg.c., & stack temperature was ~10-20 deg.c. All the four Atmospheric furnaces in the Refinery were cleaned 3 times and three Vacuum furnaces twice during 2007-08 (Total 18 cleanings). The cleaning was carried out by a group of experts from Korea using speciality chemicals.

- **Investment:** Rs. 500 Lakhs
- **Fuel saving:** 287 MT
- **Gain due to feed maximisation:** Rs. 32100 Lakhs.

v) Energy conservation plans and targets

Sl. No.	Description	Anticipated savings per year		Approximate investment (Rs.lakhs)
		Energy Value	Rs. Lakhs	
		(MT of Fuel oil)		
1	Hot feed maximisation to FCCU2	1523.60	294.91	4.5
2	Routing of hotwell offgas from CDU-I to Atmos furnaces	327.30	63.35	27.9
3	Providing FD Fan turbine to motor auto cut in for NCO boiler	58.12	11.25	13.5
4	Suppelementary firing in HRHGs	560.00	108.40	99.9
5	Replacement of stack dampers for 11-F-01/12-F-01 with multiple leaf	473.80	91.71	50.7
6	Condensate recovery in CDU-II,III,FCCU-I,II	995.59	192.71	70
7	CDU-I preheat optimization	814.00	157.56	9
8	Flare gas recovery	3998.71	774.00	1500

vi) Environment and Safety :

The company's commitment for Environment improvement and safety is of equal importance along with energy conservation. Visakh Refinery has always been committed to improvement of environment and has implemented various environmental improvement projects to minimize the effects of pollutants on the environment. It has also taken a keen interest in tree plantation activity.

Commitment to safety is another prime aspect of Visakh Refinery. Regular safety audits, monitoring and implementation of safe working practices are carried out in the Refinery. The Refinery is ISRS level 8 company. Mock drills are conducted and trainings are imparted to all the employees on handling emergency / fire fighting.




Following table indicates various investments made for Environment Protection including abatement of pollution taken by Visakh Refinery:




Project	Approx. Project Cost (Rs. Lakhs)
Conversion of Turbines to Motors in phases	1,100
On-line Stack Monitors	300
Treatment of Tank bottom sludge	27
Water Recycle	336
Flare System	1,741
SRU-I & II	5,078
Cooling Water System	3,859
SWSU Augmentation	260

Project	Approx. Project Cost (Rs. Lakhs)
ETP's Revamp	615
Circulating Cooling Water System	3,859
Ex-situ Processing of accumulated sludge	1,230
Integrated Hazardous Solid Waste Management Plan	30
Vermicomposting of canteen food waste	8
Bioremediation Farm	22
Mecon Study and implementation for modification of surface drains	620
EIL Study on excessive oil ingress into ETPs.	3
Continuous Ambient Air Monitoring Stations	220
Agar probe in Desalter	68
DHDS/DHDS SRU to reduce fuel S	79,400
Auto samplers for ETP effluents	8.7
Clean Fuels Project for Euro-III/ BIS-II	216,000
Empty Drum Washing Facility	4
ISO14001 Certification	3
Oil Spill Response Plan	10
Routing of CDU- II Hot Well Off Gases to Furnace	35.5
Condensate Recovery System for CDU-I	20
Excess Oil Ingress	720
CAAMS	75.2
Online SPM Analyser	271.4

List of major environmental improvements made during 2005-08

i. Auto Samplers for ETP (Effluent Treatment Plant) Effluents	
ii. Continuous Ambient Air Monitoring (CAAM) Stations at three locations inside the Refinery	

<p>iii. Implementation of Condensate Recovery System for CDU-I</p>	
<p>iv. Conducting of Flare Gas Recovery study through consultant (EIL)</p>	
<p>v. Replacement of Atmospheric Furnace Air Preheater (2F1 APH) panels</p>	
<p>vi. Stack Emissions Monitoring.</p>	
<p>vii. Usage of Gasoline Sulphur Reduction additive (GSR additive) in Fluidised Catalytic Cracking Units (FCCUs).</p>	 <p style="text-align: center;"><i>Automatic DeSOx & GSR loaders at FCCU-II</i></p>
<p>viii. Ex-situ sludge processing by M/s Balmer Lawrie.</p>	
<p>ix. VOC (Volatile Organic Carbon) Emission study</p>	
<p>x. Usage of Regenerator Flue Gas Desulphurisation Additive in Fluidised Catalytic Cracking Units (DeSOx additive in FCCUs).</p>	
<p>xi. Insitu sludge processing inside tanks during outage using chemical.</p>	
<p>xii. Procured of Oil Spill Response Equipment for Refinery. The Refinery has signed MOU with Visakhapatnam Port Trust for off shore Oil Spill Response Equipment procurement & use.</p>	
<p>xiii. Routing of CDU-II Hot Well Off Gases to Furnace.</p>	
<p>xiii. Online SPM Analyser</p>	
<p>xiv. Segregated Sour Water Study</p>	
<p>xv. Zero Effluent Discharge Study</p>	
<p>xvi. Evaluation of ETP-II Biosystem.</p>	
<p>xvii. Study on usage of Natural Gas in Furnace / Boilers & in Gas Turbo Generators</p>	

<p>xviii. Empty chemical drum washing facility</p>	
<p>xix. Excess Oil Ingress Control project.</p>	
<p>xx. Clean Fuels Project for Euro-III/ BIS-II (Project is in progress, approximate cost Rs 2160 Crores).</p>	
<p>xxi. Stack Emissions Monitoring.</p>	
<p>xxii. Implementation of LDAR (Leak Detection and Arresting).</p>	
<p>xxiii. Routing of CDU-I Hot Well Off Gases to Furnace (Project is in progress).</p>	
<p>xxiv. The Refinery is planning for installation of FGD (Flue Gas Desulphurisation) units in FCC Units.</p>	
<p>xxv. The Refinery has initiated for installation of secondary seals in 13 numbers of tanks storing lighter products to control VOC emission.</p>	
<p>xxvi. The Refinery procured portable stack analyzer for furnace & boilers efficiency and emissions monitoring.</p>	
<p>xxvii. Flare gas recovery project is being taken up in the Refinery.</p>	