Project Details Sr No 1

Routing of Rich Amine flash gases from Rich Amine flash drum in VGOHT-1 to Sat gas Absorber

Background : Rich Amine from Recycle gas Scrubbers in DHT 1 & VGOHT-1 was flashed in R.A flash drum at a pressure of 6.8-7.2 Kg/cm2g. The flashed gas containing more than 80% H2 was being flared to LP Flare. An innovative scheme was developed to route these flash gases to Sat Gas Absorber using high pressure flash gases from the Cold flash drum as motive fluid to increase the pressure to 9 kg/cm2g with the help of Ejector.

Observations :
Flash gas equivalent to 256 Kgs/hr which was being flared is being recovered in the Sat Gas Absorber & after removal of H2S in the Absorber is routed as feed to Hydrogen

Technical & Financial Analysis

Savings for VGOHT-1 are

= 256/1000 X 8000 x 11,000 =Rs 226 lakhs/annum

Implementation : The above changes were implemented in December 2003

Project Details Sr No 2

Bypass of Combined Feed heater in VGOHT-1 at S.O.R Condition

Background : The Combined Feed heater (Sweet VGO + Recycle gas) in the VGOHT maintains the Reactor Inlet temperature. Our internal reviews indicated that by adjusting the temperature of feed streams to this unit (from upstream units) it is possible to stop this heater at SOR condition to save fuel.

Technical & Financial Analysis

Savings of 0.17 T/hr of Fuel due to bypassing of heater resultedin savings equivalent to Rs 117 lacs/Annum

Implementation : The above changes were implemented in December 2003

Project Details Sr No 03

FLARE GAS RECOVERY

Background:

Hydrocarbon losses in Petroleum Refinery result in substantial energy losses if losses are not checked. A hydrocarbon loss in refinery flare is a direct energy loss. The objective in a Flare Gas Recovery Project is to minimize hydrocarbon loss by recovering Flare loss from Main Flare System and reuse as Fuel gas in process furnaces, Gas Turbines, HRSGs (Heat Recovery Steam Turbine) and Auxiliary Boilers.

Observations made:

Particulars		Flare Gas Recovery Compressor	
	UNITS	Before	After
Average Hydrocarbon Flaring via stack	MT/Hr	2.2	0.4
Net recovery of Hydrocarbon Via Compressor	MT/Hr	0	1.8
Power consumption by compressors(2 nos)	KW		720
Fuel saving /annum	Rs Crores/annum		15.5
Cost of running compressor motor of 360 KW each	Rs Crores/annum		1.4
Net Benefit	Rs Crores/annum		14.0
Cost of the Project	Rs Crores		10.0
Payback period	Months		8.6

Technical & Financial analysis

The savings have been calculated after the Flare Gas Amine absorber was taken into line. The Hydrocarbon recovery via the two compressors is 2 T/Hr (4000 Nm3/Hr at Amine absorber outlet). But since fuel gas flared via the control valve is 0.2T/Hr, net hydrocarbon recovery is 1.8 T/Hr. Net benefit achieved is 14 Crores (after deducting compressor power consumption)

Implementation : The above changes were implemented in April 2004.

FLARE GAS RECOVERY COMPRESSOR:

Project Details Sr No 4

Fuel Savings in HMU-1 Reformer due to installation of New Flue Gas- Air Preheater

Background : The Air Preheater in HMU-1 was continuously getting fouled up due to deposits from Flue Gas side. This was causing a reduction in HMU throughput & increase in Fuel consumption in Heater. A new design Flue Gas Preheater was installed. The result was large improvement in HMU-1 throughput & reduction in Fuel consumption

Observations :

Plant throughput was increased from 82% to 94%.Fuel gas consumption reduced by 2.55 MT/day

Technical & Financial Analysis

The marginal reduction in Fuel works out @ 2.55 MT/day

Or RS 74 Lacs/annum

Implementation : The above changes were implemented in November 2003

Project Details Sr No 5

Reduction of reflux in Tatoray Stripper Column

Background :

Reflux reduction in Tatoray Stripper was identified as a no cost option of reducing Energy Consumption without effecting the Benzene purity

Procedure :

The column was operating at a reflux to feed ratio of 0.578 & it was targetted to reduce the reflux to feed ratio to 0.3 in steps of 5 m3/hr & after each reduction observe that the Benzene purity of 99.80 wt%

Observations made :

Operating Conditions :

Before Reduction of Reflux

Column Pressure : 7.33 Kg/cm2g

Reflux to feed ratio : 0.58

Target Benzene Purity : 99.8 wt%

Total HP Steam to Reboiler : 60.802 T/hr

After Reduction of Reflux

Column Pressure : 7.33 Kg/cm2g

Reflux to feed ratio : 0.44

Target Benzene Purity : 99.8 wt%

Total HP steam to Reboiler : 51.851 T/hr

Reduction in HP Steam in Reboiler : 8.951 T/hr

Technical & Financial Analysis

The savings are on account of the reduction in HP steam in reboiler

This works out to Rs 859 Lacs/Annum

Savings : Rs 859 Lacs/ Annum

Implementation : The above changes were partly implemented in June 2004.

Project Details Sr No 6

Reduction of Column Pressure in Xylene Column Fractionators

Background :

Reduction in Xylene Column pressure in all three trains was identified as a no cost option of reducing Energy Consumption without effecting the OX purity (minimum 99.10%)

Procedure :

The columns was operating at a Overhead pressure of 7.00 Kg/cm2g & it was targetted to reduce the pressure to 6.5 Kg/cm2g in two steps by maintaining (OX purity @99.10%) in Xylene Column bottoms & C9A (max 470ppm) in the ovhd

Observations made :

Before Pressure reduction

	Xylene Train 1	Xylene Train 2	Xylene Train 3	Units
Column Ovhd Pressure	7.00	7.00	7.00	Kg/cm2g
Fuel to reboiler	8653	9429	9109	Kgs/hr

After Pressure reduction

	Xylene Train 1	Xylene Train 2	Xylene Train 3	Units
Column Ovhd Pressure	6.7	6.7	6.7	Kg/cm2g
Fuel to reboiler	8525.4	9048	8796	Kgs/hr
Net Reduction in Fuel	127.6	381	313	Kgs/hr

Technical & Financial Analysis

The savings are on account of the reduction in Fuel in the Reboiler

This works out to Rs 677 Lacs/Annum

Savings : Rs 677 Lacs/ Annum

Implementation : The above changes were partly implemented in July 2004.

Project Details Sr No 7

Fuel Gas Firing in Gas Turbines in place of LCO

Background :

Gas Turbines in CPP were firing liquid fuel(mainly LCO). The Gas Turbines at CPP had the provision of firing dual fuel, Gas as well as Liquid fuel.

Consumption of the FCC FG in CPP releases the equivalent quantity of LCO from CPP, which will be available for sale. At the same time, equivalent qty FG is not available for firing in the Process Furnaces.This deficit of FG is met by consuming CSO withdrawing this quantity of CSO from the pool. The economics was worked out based on the extra sale of LCO and reduction of CSO,

Observations made :
App 18 T/hr of Fuel Gas was consumed in CPP GT in place of LCO

Technical & Financial Analysis

The savings are on account of the Fuel substitution from LCO to CSO
For Fuel substitution of 18T/hr of FG this works out as Rs 2112 Lacs/Annum (For eleven months only)

Savings : Rs 2112 Lacs/ Annum

Total Expenditure on modifications in GT's : Rs 307 Lacs/annum

Implementation: The above changes were partly implemented in April 2003.

Project Details Sr No 8

Energy savings by On line water wash in Five nos of Gas Turbines (1,2,3,5 & 8)

Background:

As per original design , only GTs of Nuovo pignone make were having Nozzles for On-Line water wash.BHEL GTs did not have Nozzles installed for On-line water wash.

The losses/risks for not carrying out On-Line water wash in GT were:

-Continuous fouling in GT compressor blades and thereby lowering in its base load capability.

-Increase in the G.T heat rate and thereby increase in the fuel consumption in Gas Turbine for the same power output.

-Forced shut down of GTs after every 3 months reducing the power generation capability and also loss of fuel during start-up.

On line water Wash Skid

Observations made:

Improvement in GT heat rate after Online water wash: 6.11 Kcals/KW per Gas Turbine

Savings in Fuel are 0.014 MT/hr

Considering 345 days of operation this works out to

0.014 * 345 24 * 5 = 600.26 MT

Technical & Financial Analysis

The savings are on account of savings in Fuel

Savings : Rs 371 Lacs/ Annum

Implementation: The above changes were implemented in November 2003.

Project Details Sr No 9

Energy savings by stopping Augmenting air of BHEL HRSGs (1 to 6)

Background:

Supplementary firing takes place in all HRSG's in order to meet the Steam demand of the Refinery. Additional air Blowers are running to augment the air flow to HRSG's .Stopping the airflow results in savings in Fuel. The reduction in %O2 is 0.4%

Observations made:

As an energy saving measure in CPP , the the Augmented air fans of BHEL HRSGs (HRSG1to6) were stopped while firing RFG as supplementary fuel . This can save energy in terms of

a) Reducing heat loss through stack by reducing air supply by stopping the augmenting air fan.

The effect on oxygen content of the flue gas with and without Augmenting was observed and found coming down by 0.4%O2 from the normal of 13.3%O2 which is acceptable.

Technical & Financial Analysis

The savings are on account of savings in Fuel

Savings : Rs 355 Lacs/ Annum

Implementation : The above changes were implemented in November 2003.

Project Details Sr No 10

STRIPPER OFF GASES TO PRIMARY ABSORBER (BYPASS HP RECIEVER) IN CRUDE UNIT.

Background:

The Overhead vapour from the Stripper Column (mainly C1,C2,H2S with small qty of C3/C4's) were recycled back to the HP receiver. These gases got reabsorbed in HP receiver liquid and get recycled again to stripper increasing the Stripper Reboiler load.

To reduce the recycled load to the Stripper, the overhead vapour was directly routed to the Primary Absorber via a new condenser

Observations made:

Due to the reduced load on the Stripper lead to savings of 9 T/hr per train of MP steam in the Stripper Reboiler

Technical & Financial Analysis

The savings are on account of savings in MP Steam

Savings : Rs 210 Lacs/ Annum

Implementation : The above changes were implemented in December 2003.

Project Details Sr No 11

INLET AIR FOGGING IN GAS TURBINES

Background:

The objective of Inlet Air fogging in Gas Turbines is to minimise fuel consumption and to maximise power production capability and increase specific power output of the Gas turbines by carrying out fogging at GT intake air duct to lower the suction air temperature close to wet bulb temperature.

Thus saving fuel by load improved GT heat rate lowering STG condensing load and consistent power margin for Gas turbines leading to energy efficient and reliable captive power plant operation.

Observations made:

Benefit Cost analysis after commissiong of Inlet Air Fogging system

Particulars	Units	Value
Average Depression of GT Suction air Temp for 12 hrs in a day	Deg C	8
Total Extra power gain from 8 GT's	MW	= 0.915 * 8 = 7.32
Corresponding Reduction in Condensing load of STG	T/hr	=3.93 * 7.32 =28.77
Cost of Condensing (A)	Rs/hr	=28.77 * 942.5 =27115
Cost of Additional Fuel Consumption in GT's (B)	Rs/hr	12055
Net Benefit due to reduced condensation (C)	Rs/hour	(A)-(B) =15060
Benefit due to increased unfired Steam (D)	Rs/hr	=7.32 * 1.8* 942.5 =12418.4
Benefit of Fogging (E)	Rs/hr	(C) + (D) 27478
Cost of DM Water for 8 GT's (F)	Rs/hr	=1.61 *8 *45.7 =588.6

Cost of Power for fogging (G)	Rs/hr	=7.45 KW * 8 * Rs 3.05 =181.8
Net Benefit of Fogging	Rs/hr	(E)-(F)-(G) =26707.6
Net Benefit of Fogging/annum (8500 hrs)	Rs Crores/ annum	22.7
Investment	Rs Crores	9.456
Payback period	Months	5.0

Technical & Financial Analysis

The savings are on account of savings are Rs 2267 Lacs/annum

Implementation : The above changes were implemented in April 2004.

INLET AIR FOGGING IN GAS TURBINES: