

**BEE WORKSHOP
ON ENERGY MANAGEMENT
AT GACL
VADODARA**

01.09.2010



GUJARAT REFINERY - Where Growth is Essence of Life



GUJARAT REFINERY OVERVIEW



GUJARAT REFINERY - Where Growth is Essence of Life



- Foundation stone laid by Pandit Jawaharlal Nehru, the then Prime Minister of India in May, 1963.
- Refinery Commissioned in Dec 1965.

CRUDE DISTILLATION UNITS

UNIT	CAPACITY MMTPA	CRUDE PROCESSED
AU-1	2.0	SG/NG
AU-2	2.2	SG/NG/BH/IMP-LS
AU-3	2.7	NG/IMP-HS
AU-4	3.8	SG/BH/IMP-LS&HS
AU-5	3.0	BH / IMP-LS&HS
TOTAL	13.7	

MAJOR PROCESS UNITS

Figs in MMTPA

Unit	Current Capacity
Atmospheric Unit I (AU I)	2.00
Atmospheric Unit II (AU II)	2.20
Atmospheric Unit III (AU III)	2.70
Atmospheric Unit IV (AU IV)	3.80
Atmospheric Unit V (AU V)	3.00
CRU	0.33
Udex	0.170
Vacuum Unit (VDU)	1.20
Feed Prep. Unit I (FPU I)	2.50
FCCU	1.50

MAJOR PROCESS UNITS

Figs in MMTPA

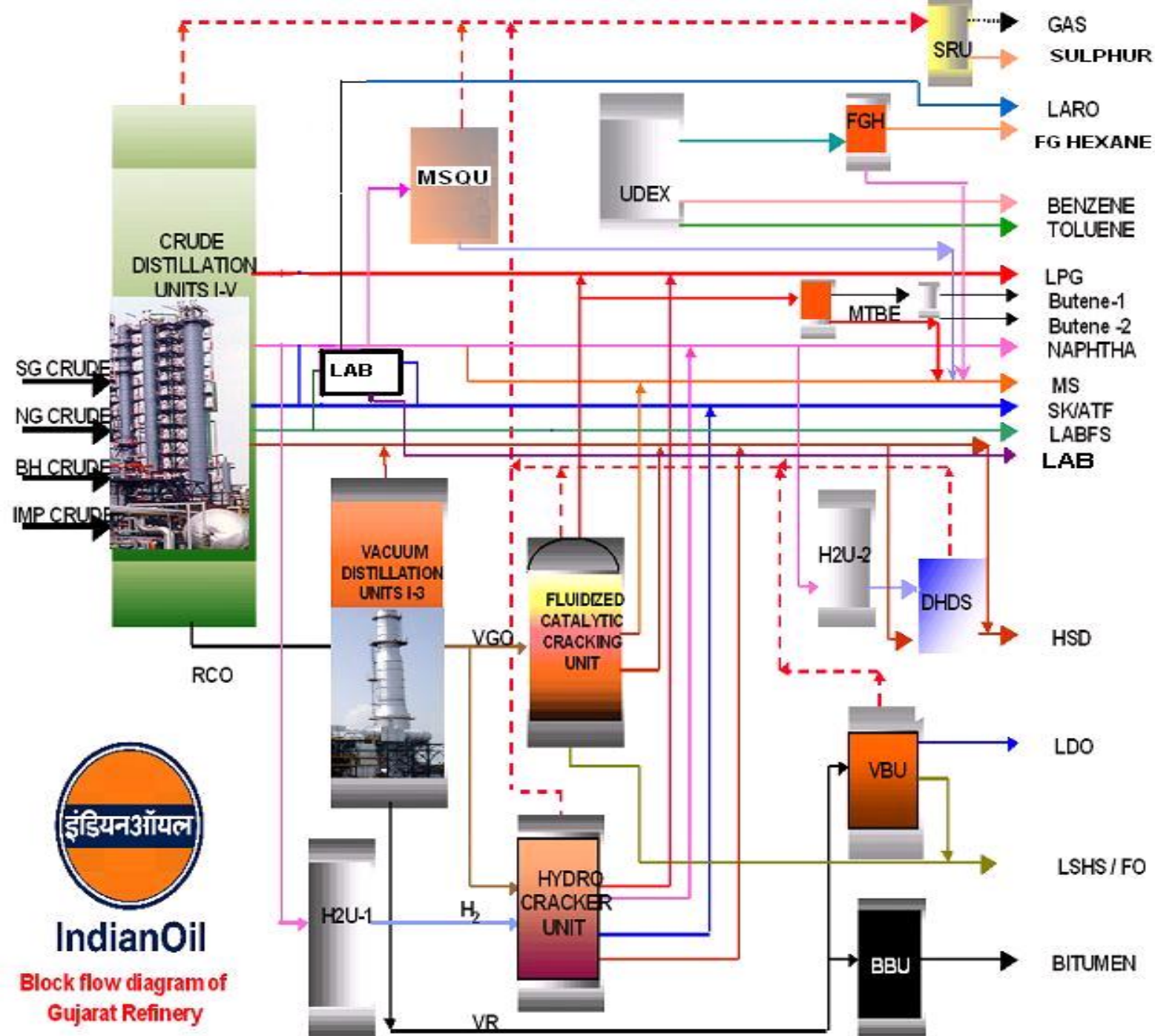
Unit	Current Capacity
Feed Prep. Unit II (FPU-II)	3.00
Hydrocracker	1.20
Hydrogen Unit – I (Linde)	0.038
DHDS Unit	1.70
Hydrogen Unit – II (HTAS)	0.02
Visbreaking Unit (VBU)	1.60
SRU – I	18 TPD
SRU – II	2 x 35 TPD
Food Grade Hexane (FGH)	0.100
MTBE	0.197
Linear Alkyl Benzene (LAB)	0.120 of LAB Production
MSQU	0.600

CRUDES PROCESSED

- SOUTH GUJARAT : 2.3 MMTPA
- NORTH GUJARAT : 3.5 MMTPA
- BOMBAY HIGH : 1.2 MMTPA
- LOW SULPHUR IMPORTED : 3.1 MMTPA
- HIGH SULPHUR IMPORTED : 3.6 MMTPA

CRUDE RECEIPT

	Crude	Mode	Quantity MMTPA
1	South Gujarat	Pipeline	2.3
2	North Gujarat	Pipeline	3.5
3	Bombay High	Pipeline (in parcels)	1.2
4	Imp - LS	Pipeline (in parcels)	3.1
5	Imp - HS	Pipeline (in parcels)	3.6
	Total		13.7



IndianOil

Block flow diagram of Gujarat Refinery

DESPATCH FACILITIES

(TW & TTL GANTRIES)

		Type	No of Gantries
Tank Wagon	White Oil	BTPN	3
	Black Oil	FOUR WHEELER	3
Tank Trucks	Total	Bays	32
	Black Oil	Bays	5
	LAB (LMW/HMW)	Bays	5



ONGC

Calico Land for proposed Coke yard



2ND FIRE STATION

Proposed Coker, VGO-HDT, MEROX Units Under RUP

GANTRY

3rd GREEN BELT

MAIN FIRE STATION

500 M WIDE GREEN BELT

100M WIDE GREEN BELT

TO KOYALI

Plant Area = 841 acre (3.4 million sq. meter)

Green Belt = 121 acre (0.5 million sq. meter)

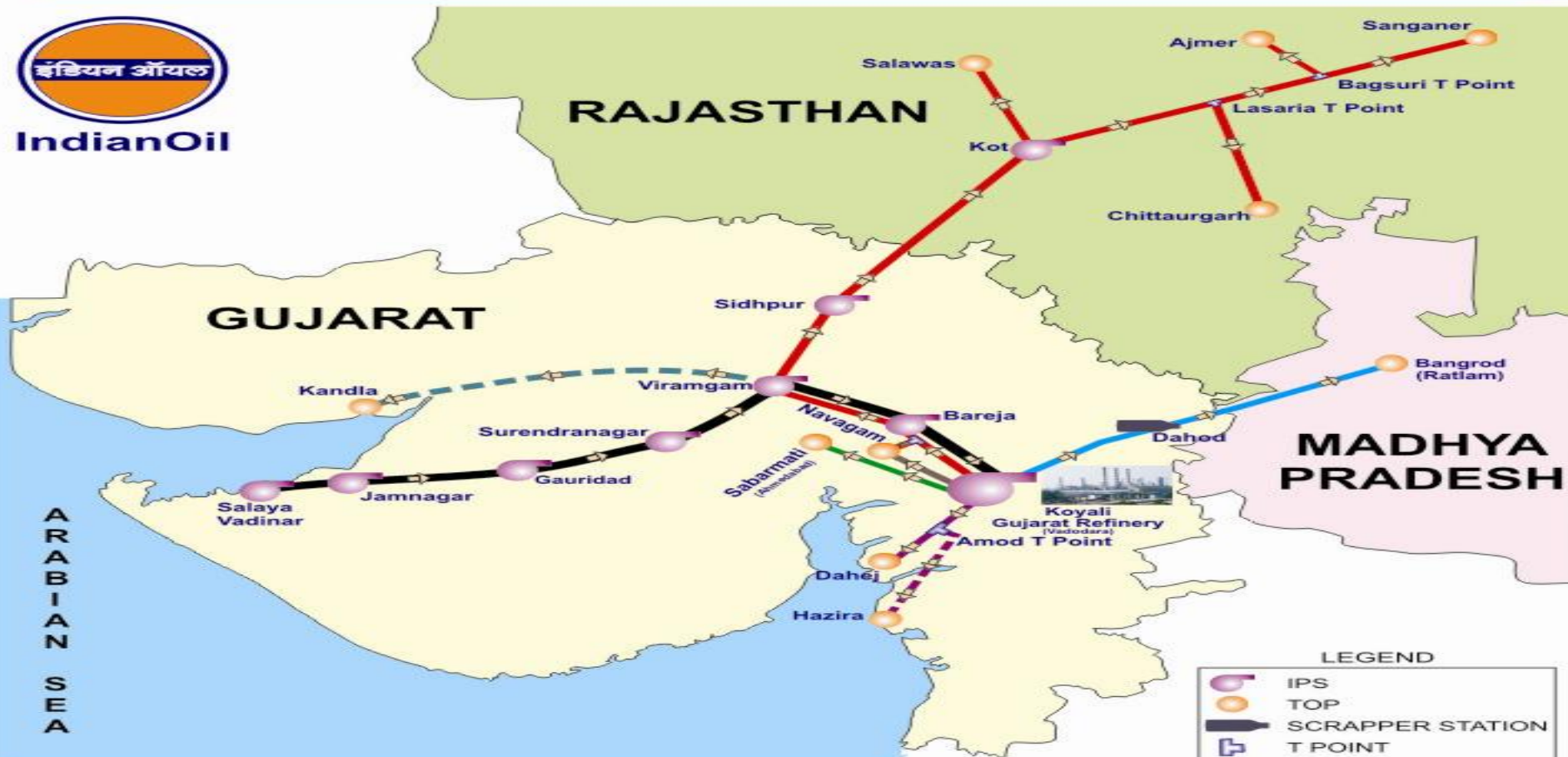
TO TOWNSHIP

TO BAJWA

We are here

- ** I - BUTENE-I
- II - MTBE
- III - PDF
- IV - FGH

WRPL KOYALI PIPELINE NETWORK



LEGEND

- IPS
- TOP
- SCRAPPER STATION
- T POINT

PRODUCT PIPELINES

Sr. No.	Pipeline	Symbol	Dt. of Commissioning	Length	Size	Capacity
1.	KAPL		1st April, 1966	115.7 Kms.	8"	1.10 MMTPA
2.	KNPL		13th March, 2003	78.0 Kms	14"	1.8 MMTPA
3.	KSPL		31st October, 2003	1055.65 Kms (Includes Br. Pipelines)	18"/12"/10"/8"	4.1MMTPA
4.	KDPL		26th December, 2006	102.854 Kms	14"	2.6 MMTPA
5.	KRPL		17th February, 2009	265.234 Kms	16"	2.0 MMTPA (PH-1), 2.6 MMTPA (PH-2)

CRUDE PIPELINE

6.	SMPL		5th September, 1978	148.263 Kms	28"	7.5 MMTPA
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ON GOING PROJECTS PRODUCT PIPELINES

7.	AHPL			94.026 Kms	12"	0.65 MMTPA (PH-1) 0.72 MMTPA (PH-2)
8.	VKPL			230.0 Kms		

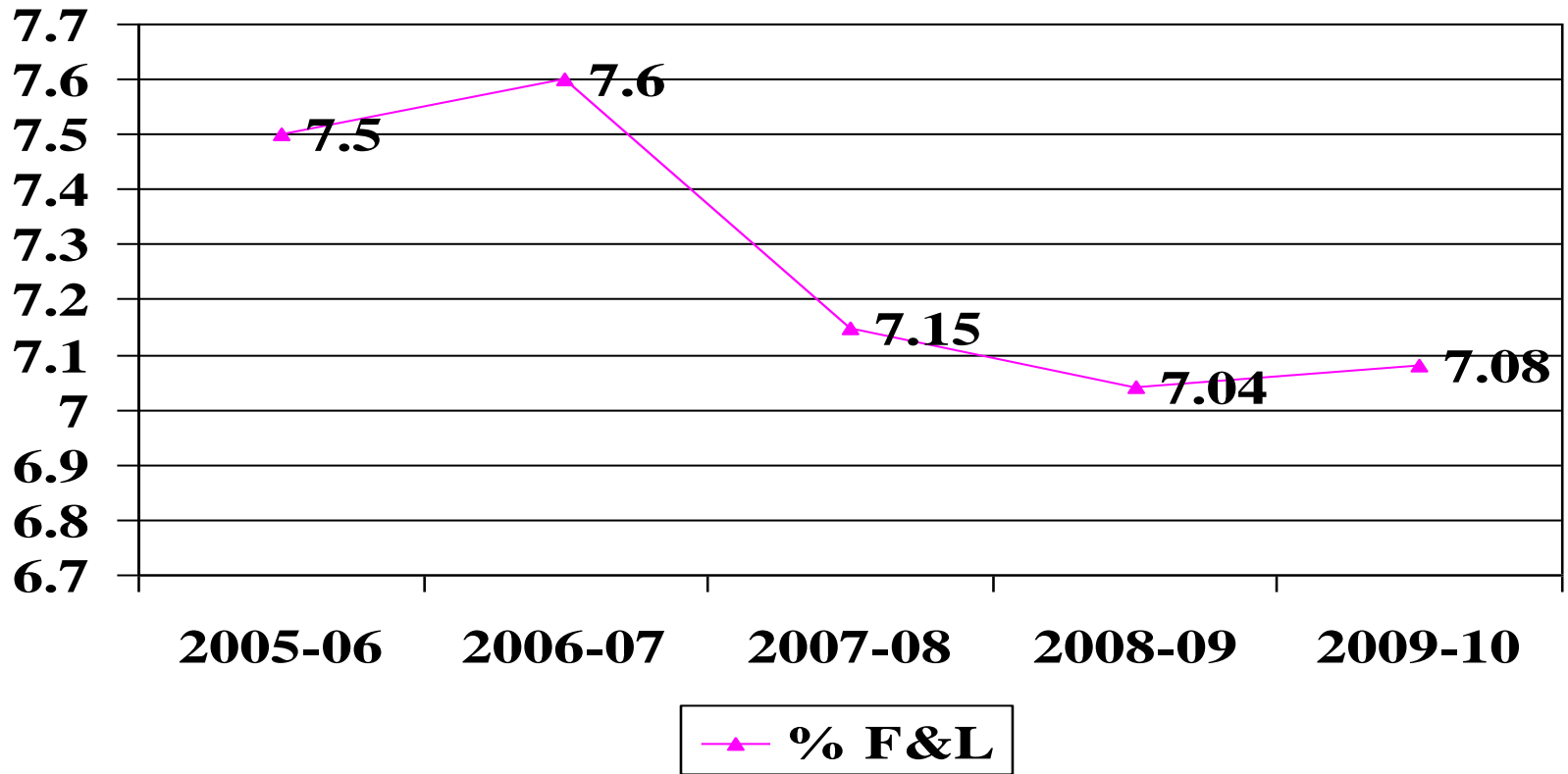
ENCON PERFORMANCE OF GUJARAT REFINERY



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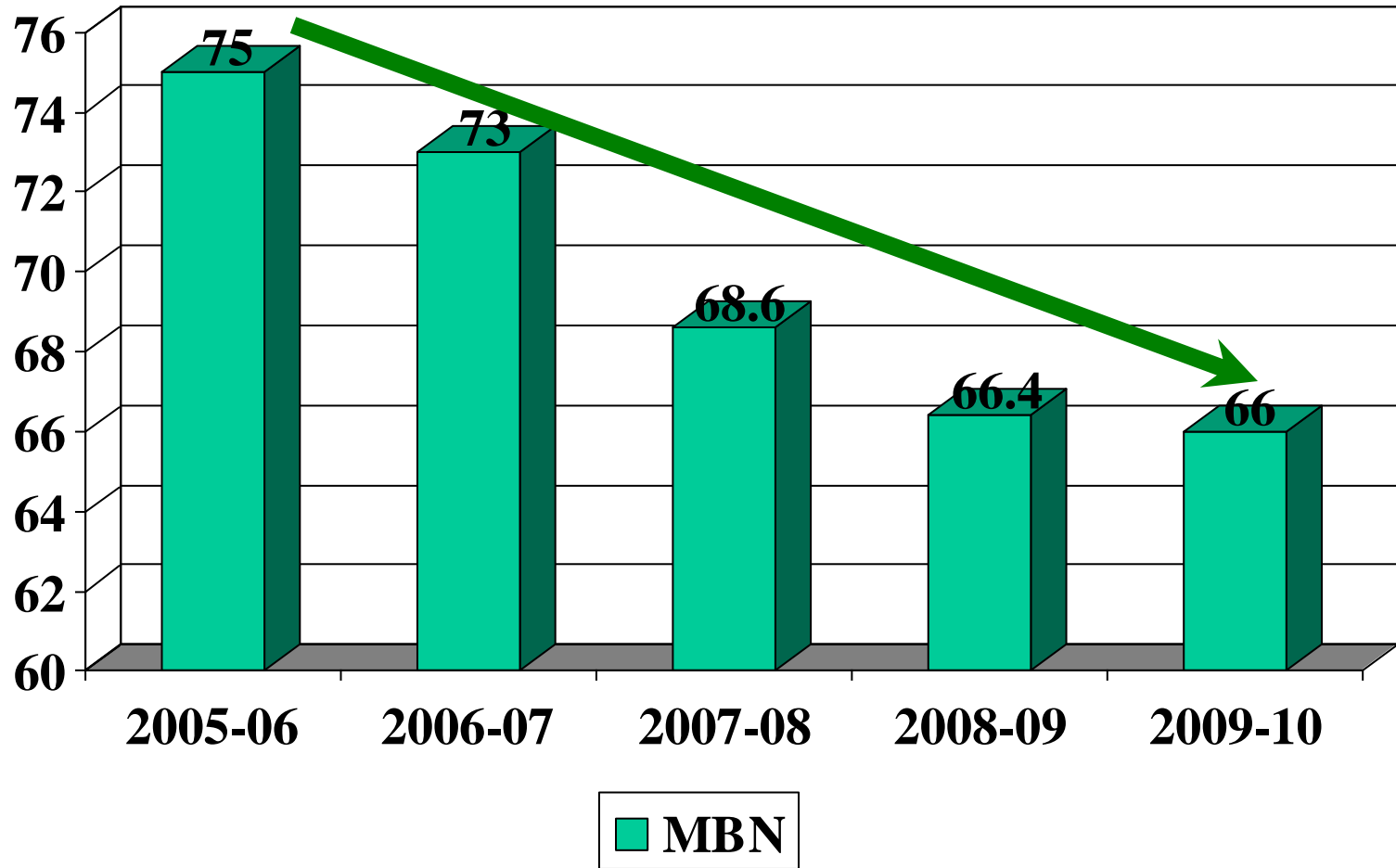


YEARWISE FUEL & LOSS , % ON CRUDE



YEAR WISE SPECIFIC ENERGY CONSUMPTION

MBBTU/MBBL/NRGF



ENCON INITIATIVES



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LIST OF ENCON INITIATIVES

- **H2 RECOVERY FROM CRU OFF GASES**
- **FLARE GAS RECOVERY**
- **H2 RECOVERY FROM CLPS OFF GAS**
- **MAGNETIC RESONATORS IN GTs**
- **RECOVERY OF VACUUM COLUMN HOT WELL OFF GASES**
- **CORROCOATING OF COOLING WATER PUMPS**

RECOVERY OF H₂ FROM CRU OFF GASES

OBJECTIVE OF THE SCHEME

- CRU plant reformer off gas which is rich in hydrogen was routed to fuel gas system.
- Cushion in existing PSA to recover the valuable hydrogen component

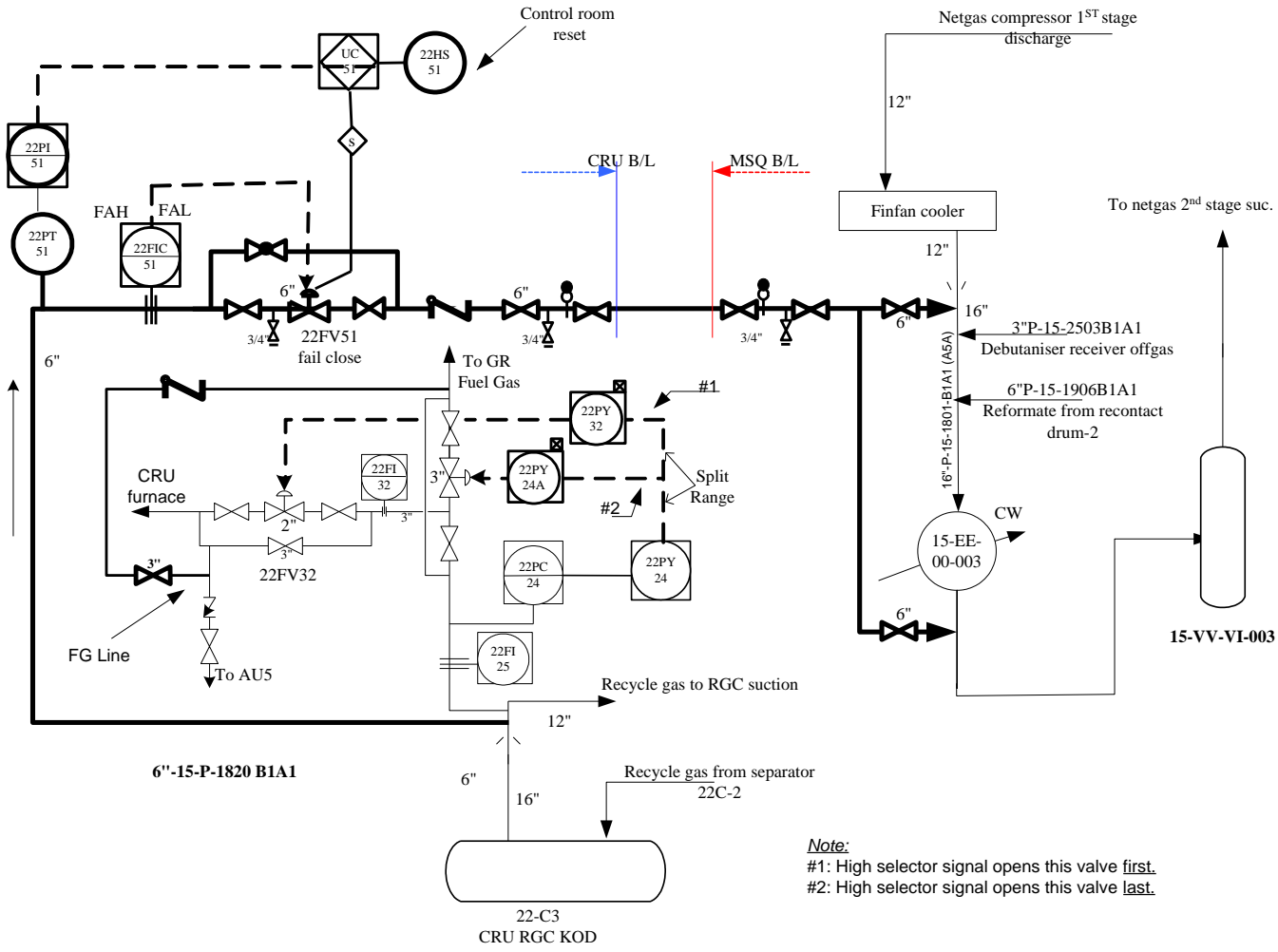
MODIFICATIONS CARRIED OUT

- H₂ potential and purity of CRU off gas was studied.
- MSQ net gas compressors availability was studied.
- A tapping from CRU-RGC suction KOD was taken and hooked up with MSQ Net gas compressor second stage suction.

BENEFITS ACHIEVED

- 2850 MTPA of H₂ equivalent to Rs 25 crores

Routing of CRU OFF gas to MSQ PSA via Net Gas Compressors in MSQU



Note:
 #1: High selector signal opens this valve first.
 #2: High selector signal opens this valve last.

TECHNICAL DATA

SR. NO.	Fluid/Service	OP. PR. KG/CM2 (g)	OP. TEMP. DEG. C
1	Hydrogen rich gas	15.5	40
2	Fuel gas	2.5	40

Note:

1. UC51:
Cause : On low low Line pressure (22PSLL51) the control valve (22FV51 will close) and the controller will reach manual mode with zero output.
Settings: 22PSLL:- 14.5 kg/cm2g (CRU RGC trip at 13.5 kg/cm2g)
2. 22FI51 to be shown in MSQ (in MSQ DCS graphics) via RTDB.
3. (0-50%) signal from 22PY24 corresponds to (0-100%) opening of 22PY32 and (50-100%) signal from 22PY24 corresponds to (0-100%) opening of 22PY24.
4. LPD's and HPV's to be provided as per site condition

8	NRV	3"	1 no	
7	NRV	6"	1 no	
6	Globe valve	6"	1 no	
5	B/V	3"	1 no	
4	B/V	3/4"	3 no	
3	B/V	6"	8 no	
2	CONTROL VALVE	6"	1 no	
1	Pipe	6"	900 m	
SR. NO.	DESCRIPTION	RATING	SIZE	QTY.

APPROX. BILL OF MATERIAL

**GUJARAT REFINERY
 TECHNICAL SERVICES DEPARTMENT**

**Routing of CRU off gas to MSQ PSA via
 Net Gas Compressor**

LEGEND:

— EXISTING LINE
 — PROPOSED LINE

REV. NO.	DATE	REVISION DETAILS	DRG. BY	REVIEW BY	APP. BY	DRG. NO.
2	15.03.08	HAZOPed, Issued for engineering and execution				
1	12.03.08	Comments Incorporated, issued for HAZOP	KB	IBP	PKM	
0	17.11.07	Issued for comments	KB	IBP	PKM	



FLARE GAS RECOVERY SYSTEM

OBJECTIVE OF THE SCHEME

- **Recovery of Flared gases for utilization as fuel gas in refinery furnaces**
- **Flare Gas Recovery System (FGRS) is considered as a means now available to reduce CO₂ emissions to atmosphere and improve image of the Refinery**

MODIFICATIONS CARRIED OUT

FGRS Consist of mainly:-

- **Liquid Ring Compressor :Capacity-1605 m³/Hr, Differential Pressure-6.485 KG/CM².**
- **Three phase separator vessel and**
- **Water Cooler.**

BENEFITS ACHIEVED :

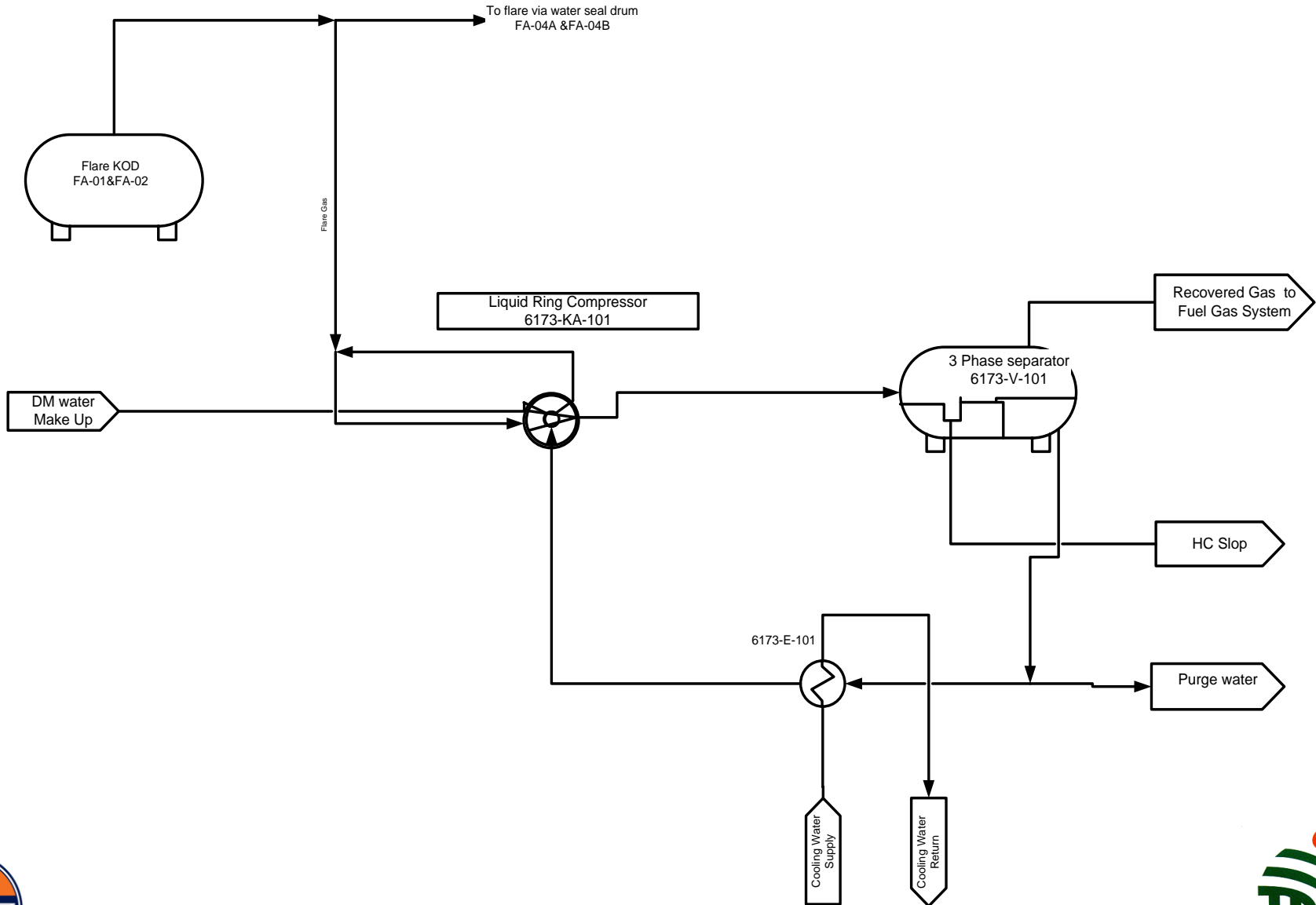
**2100 NM³/HR FLARE GAS RECOVERED EQUIVALENT
TO RS 135 LACS /YEAR**



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FGRS System



Flare Gas Recovery System (FGRS)

- Process Conditions:-

Parameters	Value (Min / Normal/ Max)
Suction pressure, kg/cm ² g	0.005/0.015/0.3
Suction Temperature, Deg C	20/45/65
Discharge flow , nm ³ /hr	1400 nm ³ /hr
Discharge pressure , kg/cm ² g	6.5
Discharge temperature , DegC	40/45/60

H2 RECOVERY FROM CLPS OFF GAS

OBJECTIVE OF THE SCHEME

To recover the valuable hydrogen component from HCU off gas from cold low pressure separator (CLPS) which is rich in hydrogen

MODIFICATION CARRIED OUT

Hydrogen rich CLPS off gases after cooling are now provided with a new facility including HP absorber to treat and process the treated gas in RUP off gas PSA & MSQ PSA to recover Hydrogen

BENEFITS ACHIEVED

H2 RECOVERED : 3100 MTPA EQUIVALENT TO RS 27 CRORES



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MAGNETIC RESONATORS IN GTs

OBJECTIVE OF THE SCHEME

Improvement in combustion efficiency of fuel

MODIFICATIONS CARRIED OUT

A device called Magnetic Resonator has been developed by Chennai based M/s Technov & M Systems, which is installed on fuel supply lines. Hydrocarbon fuel flowing in the pipeline is subjected to strong magnetic field under whose influence the polarization of fuel molecules takes place. This increases the specific area of contact of the fuel with air, thus improving the combustion efficiency

BENEFITS ACHIEVED

1. Magnetic resonator improves the combustion efficiency and reduces the fuel consumption(0.5 to 1% of Fuel saving)
2. Easy installation in fuel gas /Fuel oil circuit and no shutdown is required for installation of the same.(Installation in outer surface of fuel line)
3. Proven technology and adopted in other IOCL Refineries
4. Also, no additional utilities and man power is required for the operation of Magnetic resonators

Savings : Rs.29.24 Lacs/yr



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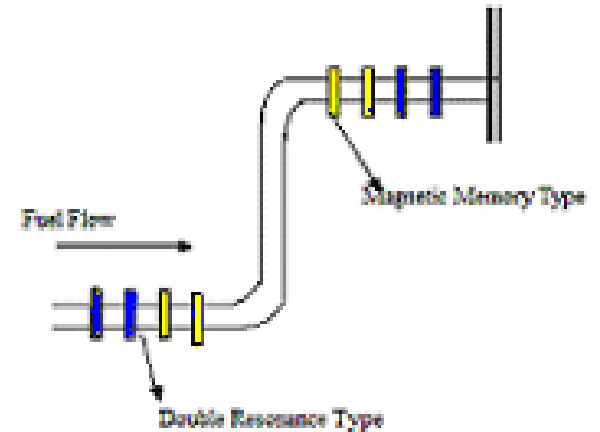
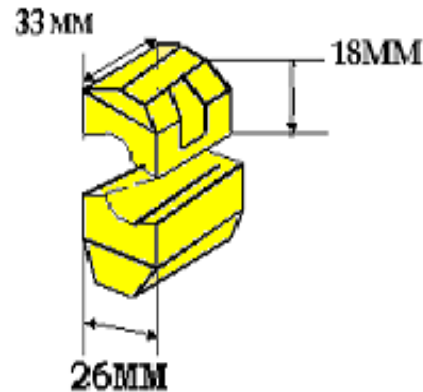
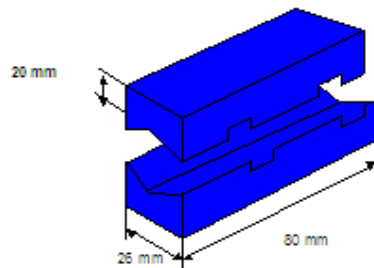


CONFIGURATION OF MAGNETIC RESONATORS FOR PREDICTED RESULTS

DOUBLE RESONANCE TYPE

MAGNETIC MEMORY TYPE

SCHEMATIC DIAGRAM



RECOVERY OF VACUUM COLUMN HOT WELL OFF GASES

OBJECTIVE OF THE SCHEME

- The vacuum column hot well off gas was vented to atmosphere from ejector – condenser platform which can contribute to 2.5 Gcal/Hr heat liberation if fired in the furnace LP burners . In view of that this off gases are routed to Furnace through LP burner to reduce the FG burning in the furnace from FG header.

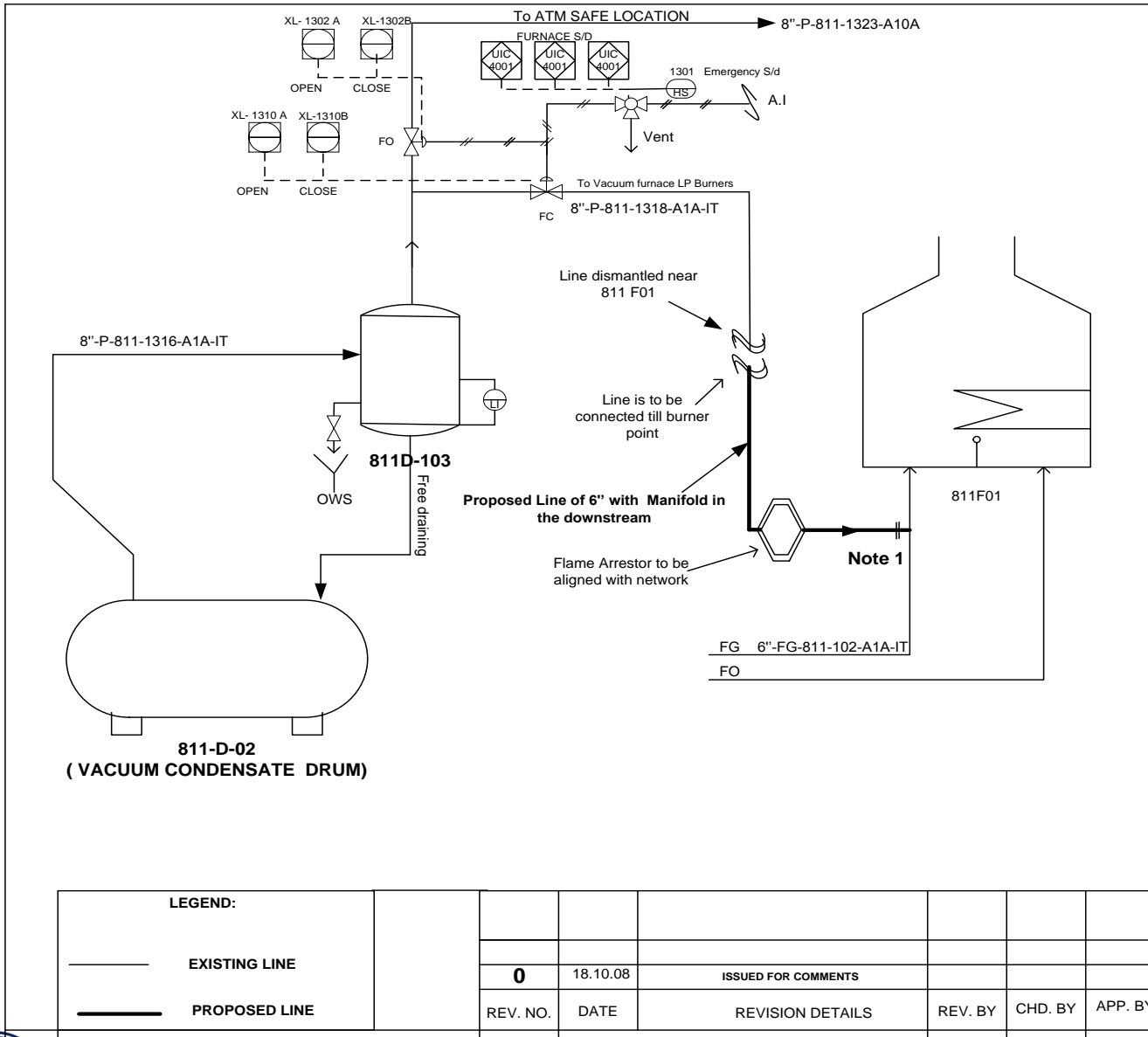
MODIFICATIONS CARRIED OUT

- 8” line was connected from hot well catch pot with two Shut down valves (One in off gas line to furnace with flame arrestor and another in vent line) to burners .

BENEFITS ACHIEVED

- Reduction in FG burning from FG header and spared FG for other furnaces
- Reduction in Environmental pollution

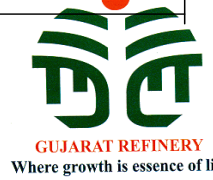
Savings : Rs. 914.6 lacs/year



TECHNICAL DATA				
SR. NO.	FLUID		OP. PR. KG/CM2 (g)	OP. TEMP. DEG. C
1	Vacuum off gas		100 mmwc	40 Degc
Note;				
1. Vacuum Off gas to be routed to burner no 2,5,8,11 and 14 in 811 F01 with 4" in downstream line. Individual black valve (Gate valve) only to be provided in the suction of all five LP Burners.				
3	Gate Valve		4"	05
2	PIPING		4"	15 M
1	PIPING		6"	10 m
SR. NO.	DESCRIPTION	RATING	SIZE	QTY.
APPROX. BILL OF MATERIAL				
GUJARAT REFINERY TECHNICAL SERVICES DEPARTMENT				
Revival of FPU1 off gas recovery				
BT (SPSE)		RSP(CTSM)		
DRG. BY		APPROVED BY		
DRG.NO. TS/PS/SPF/SPF/FPU1 ,REV.00		18.10.08		



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CORROCOATING OF COOLING WATER PUMP

OBJECTIVE OF THE SCHEME

- To reduce the surface friction of the pumps and to improve the pumps efficiency
- The special polymer coating provides outstanding resistance to future erosion/ corrosion without inducing bi-metallic corrosion. It contains higher levels of abrasion resistance fillers, making it an ideal solution in aggressive high wear environments.

MODIFICATIONS CARRIED OUT

- Cooling tower pump was overhauled one by one and 'Corrocoating' was applied .

BENEFIT ACHIEVED

- Pump Efficiency 10% increased.



THANK YOU



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