Guwahati-Siliguri Products Pipeline, Assam

HISTORICAL BACKGROUND OF GSPL

Guwahati-Siliguri Products Pipeline is the first cross country product pipeline of India having a length of 434.7 KMs. It is also the first product pipeline in the East of Suez Cannel. The pipeline was commissioned on 25th October, 1964 with a initial design capacity of 0.481 MMTPA for uplifting Guwahati Refinery products and delivering them at Siliguri. The capacity was enhanced to 0.559 MMTPA in the year 1969 by adding a boosting station at Bongaigaon. The capacity was further enhanced to 0.818 MMTPA in the year 1982 by converting Bongaigaon boosting station into a full fledged pumping station and Madarihat scrapper station into a boosting station. In the year 1992 a Tap-Off-Point was added at Betkuchi at pipeline chainage 15.2 KM. In the year 2002 another Tap-off-Point was added at Hasimara at pipeline chainage 306 KM. The pipeline is laid in the R.O.W. of Oil India Ltd. and passes through the picturesque terrain of the state of Assam and West Bengal and crosses 56 rivers. It caters the petroleum product requirement of Bhutan, Assam, North Bengal, parts of Bihar and Defence installations. The pipeline has successfully completed four decades of trouble free operation and is still going strong. The health of the pipeline is excellent and there has been no leak or burst due to corrosion so far.

GSPL'S OPERATION PHILOSOPHY

Normally for transportation of petroleum products through pipeline, the products are drawn from storage tanks through a Booster Pump (BP) and fed to the suction of mainline pumping units (MPUs). The booster pump maintains required suction pressure and designed flow rate for MPUs. The MPUs raise the pressure to maximum allowable operating pressure (MAOP) for pushing the product ahead. On the way this pressure drops to certain level due to frictional losses, therefore, the pressure is again boosted at intermediate pumping station (IPS). In this way the desired flow rate according to the capacity of the pipeline is maintained. The number of IPS depends on the capacity and length of the pipeline besides various other factors like the type of products to be transported, grade of the material of the pipeline and its diameter, ground profile etc.
In GSPL the originating station is located inside Guwahati Refinery (G.R.). It has three booster pumps for drawing products from Guwahati Refinery storage tanks and three motor driven MPUs. In normal operation for transporting the products from Guwahati Refinery to Siliguri terminal one or two booster pumps in parallel and two MPUs in series are used.

The next IPS is located inside Bongaigaon Refinery and Petrochemicals Ltd. (BRPL) complex. In this station we have two BPs and four motor driven MPUs. While pumping heavier products like HSD/LDO we use one BP and two MPUs. But in case of lighter product like MS/NAPTHA three MP Us are used to attain the MAOP.

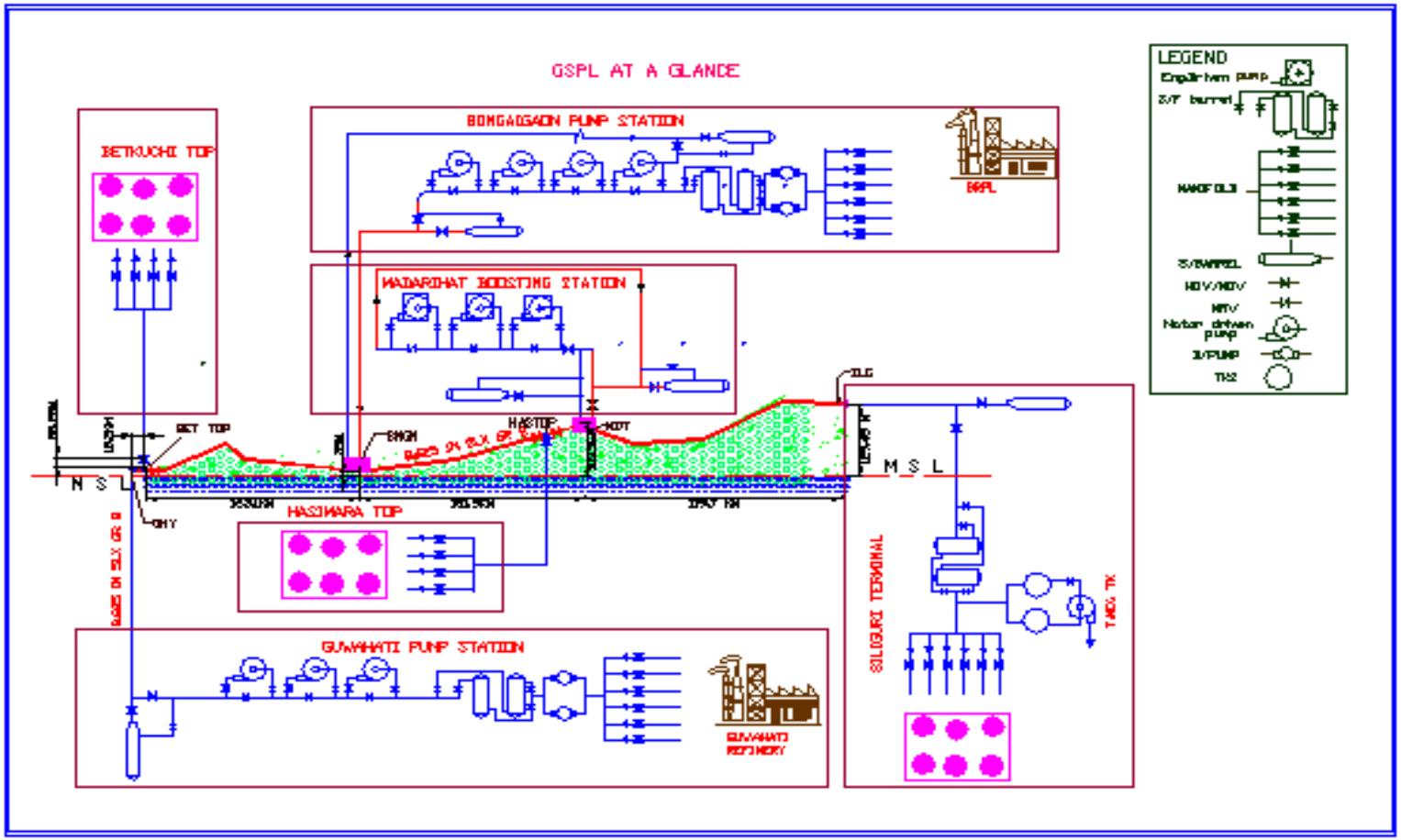
The next and the last IPS is situated at Madarihat in Jalpaiguri district of West Bengal. It has three Diesel Engine Driven MPUs. Normally we use two MPUs for boosting of the product which is finally delivered at Siliguri.

In GSPL there is a method of pumping known as blocked out pumping. During this operation the pipeline section between Guwahati and Bongaigaon is isolated by closing the upstream incoming valve at Bongaigaon. In this condition we evacuate products from BRPL and deliver them to either at Hasimara TOP or Siliguri terminal. While giving delivery at Hasimara the question of running MPUs at Madarihat does not arise as Hasimara is situated before Madarihat. The MPUs at Madarihat are used while effecting delivery at Siliguri. During blocked out operation we can simultaneously operate Guwahati-Betkuchi section also besides operating Bongaigaon - Siliguri section. In this way we simultaneously evacuate G.R. products as well as BRPL products.

TECHNICAL DETAILS OF GSPL

Sl No	**PIPELINE SPECIFICATION**	
1	Length of pipeline	= 435 km
2	Outside diameter	= 8.625 in
3	Pipe grade	= API 5LX GR. B ERW /SEAM LESS
4	Wall thickness at Mainline Rail bridge x-ing	 = 0.219 in.(5.56 mm) =0.322 in (8.18 mm)
5	Crossings Submerged Rail bridge Aerial	 = 30 nos = 25 nos = 1 no
6	MAOP	= 81.2 kg/cm^2
7	Line Fill	= 14724 kl at 15 deg C
8	Pump stations	= 2 nos
9	Boosting stn	= 1 no
10	Delivery stns	= 2 nos
11	CP stations	= 11 nos
12	Products pumped	= HSD,MS,LDO, NAPTHA & SKO

GSPL SET UP :


GSPL AT A GLANCE
BETKUCHI TOP
BONGAIGAON PUMP STATION
BRPL
MADARIHAT BOOSTING STATION
HASIMARA TOP
GUWAHATI PUMP STATION
GUWAHATI REFINERY
SILIGURI TERMINAL
M S L
N S L
LEGEND

TECHINICAL DETAILS OF M/L EQUIPMENTS
GUWAHATI PUMP STATION

M/L EQUIPMENT	EQUIP. ID NO	MFG	TYPE	CAPACITY	DIFF. HEAD/ CURRENT RATING
MP-1(PUMP) MP-2(PUMP) MP-3(PUMP)	G110 G120 G130	NUOVO PIGNONE ITALY	4BFH/A 8 STAGE	90.85 M^3/H 105 M^3/H 105 M^3/H	392.3 M 435.0 M 435.0 M
MP-1(MOTOR) MP-2(MOTOR) MP-3(MOTOR)	G110 G120 G130	ACEC BELGIUM	SQUIRREL INDUCTION MOTOR	MP-1 175 HP MP-2 250 HP MP-3 250 HP	400V/218A 400V/321A 400V/321A 2973 RPM
BP-1(PUMP) BP-2(PUMP)	G101 G102	NUOVO PIGNONE ITALY	4X9 VDC S/2 STAGE	103.8 M^3/H (EACH)	12.2 M (EACH)
BP-1(MOTOR) BP-2(MOTOR)	G101 G102	ACEC BELGIUM	SQUIRREL INDUCTION MOTOR	10 HP (EACH)	400 V/30A 50HZ 1450 RPM (EACH

TECHINICAL DETAILS OF M/L EQUIPMENTS
BONGAIGAON PUMP STATION

M/L EQUIPMENT	EQUIP ID NO	MFG	TYPE	CAPACITY	DIFF. HEAD/ CURRENT RATING
MP-1(PUMP) MP-2(PUMP) MP-3(PUMP) MP-4(PUMP)	G210 G220 G230 G240	BPCL	DVMX-4X6X10H 4 STAGE	150 M^3/H (EACH)	350.0 M 320.0 M 350.0 M 320.0 M
MP-1(MOTOR) MP-2(MOTOR) MP-3(MOTOR) MP-4(MOTOR)	G210 G220 G230 G240	SCHORCH GMBH RHEYDT, WEST GERMANY	SQUIRREL INDUCTION MOTOR	220 KW (EACH)	415/375A 50 HZ 0.9 PF (EACH)
BP-1(PUMP) BP-2(PUMP)	G201 G202	BPCL	VB-65X7B 2 STAGE	150 M^3/H (EACH)	66 M (EACH)
BP-1(MOTOR) BP-2(MOTOR)	G201 G202	BEP2175 DV& BEP 2176 DV	SQUIRREL INDUCTION MOTOR	45 KW (EACH)	415/80A 50 HZ (EACH)

TECHINICAL DETAILS OF M/L EQUIPMENTS
MADARIHAT BOOSTING STATION

M/L EQUIPMENT	EQUIP ID NO	MFG	TYPE	CAPACITY	DIFF. HEAD/ CURRENT RATING
MP-1(PUMP) MP-2(PUMP) MP-3(PUMP)	G310 G320 G330	BPCL	DVMX-4X6X10H 6 STAGE	150 M^3/H (EACH)	525M
MP-1 (ENGINE) MP-2 (ENGINE) MP-3 (ENGINE)	G210 G220 G230	MAN ENGINE SUPPLIED BY GRSE LTD	R6V 16/18 TLS 4 STROKE DIESEL ENGINE WITH TURBO CHARGER	505 HP (EACH)	RATED RPM 1500. BUT OPERATED AT 1250 RPM (MAX) ON A/C OF HIGH TEMP.& HIGH VIBRATION

PATERN OF FLOW RATE IN GSPL BEFORE DRA INJECTION

The flow rate in a pipeline transporting refined petroleum products varies with the line fill conditions. A line fill comprising of 100% heavier products like HSD & LDO has minimum flow rate whereas in case of 100% lighter products like MS & NAPHTHA being in the line the flow rate is maximum. When there is a combination of heavier and lighter products following each other during their movement, the flow rate varies between minimum and maximum limits depending upon the percentages of heavier and lighter products and their location in the pipeline while other parameters are kept unaltered. Therefore, in order to compare flow rate between two specific situation we take those cases of flow rates when the line fill conditions are almost similar.

EFFECT OF DRA ON FLOW RATE IN A PIPELINE

The flow rate in a pipeline transporting refined petroleum products can be enhanced by injecting Chemical Drag Reducer (CDR) which is a solution of high molecular weight Copolymer in a kerosene solvent. It reduces the friction and boosts throughput of crude oil

and petroleum products pipeline that are either restricted by pump capacity or pipeline pressure limits. It remains in solution and does not coat the pipeline wall. This chemical has no adverse effects on the physical properties, combustion characteristics or handling. However, when it passes through mainline pumps or other regions of high shear, its friction reducing effectiveness is significantly reduced.

We had conducted a trial run of CDR injection in GSPL and carefully monitored the flow rates with and without CDR injection under almost similar line fill conditions. The flow rates obtained in different pipeline sections of GSPL with various combinations of MPUs is given in Annex-‘A” in a tabular form for comparison. The rate of CDR injection was 20 PPM.

EFFECT OF CDR INJECTION OF ENERGY CONSUMPTION:

It is evident from the above description that in GSPL we use motors and diesel engines as prime mover for running the MPUs. In order to know the rate of energy input for pumping we convert the

electrical and fuel (HSD) energy into Kilo Calories and then calculate the rate of energy consumption in the form of Kcal/MT-KM. The rate of energy consumption for the last four years has been shown in Annexure "B". The astonishing effect of CDR injection on energy consumption is evident from the fact that the rate of energy consumption that was hovering around 32 Kcal/MT-KM. In the year 2000-2001, 2001-2002 without CDR injection came down drastically to 11.86 with CDR injection in the year 2003-2004 during which we had sparingly used diesel engine driven MPUs at Madarihat and achieved much higher throughput with CDR injection. In the year 2002-2003 both CDR injection and Madarihat MPUs were used for pumping and therefore the rate of energy consumption is lower than the previous two years. We have plotted graphs showing flow rates under different conditions as mentioned .

COST ANALYSIS OF CDR INJECTION

Since the running hours of GHY – SLG and BNGN – SLG sections are different in different years, therefore, in order to compare the result of CDR injection we need to calculate presumptive throughput and energy consumption by equalizing the running hours of pipeline operation without CDR injection and with CDR injection**.** For this purpose we have chosen the year 2000-01 when there was no CDR injection and the year 2003-04 during which a pipeline was operated almost through out the year with CDR injection. The result in a tabular form is shown in Annexure-"C". Based on the presumptive throughput and energy consumption we have an estimated savings of 5.86 crores early including the expenditure towards CDR injection as shown in Annexure-"D". If we add to this Rs. 20 lakhs towards the yearly maintenance cost of Mainline Engines at Madarihat then the net estimated gain on account of CDR injection would be Rs. 6.06 crores. Therefore, on account of such huge savings we have stopped running MPUs at Madarihat.

Comparison of Flow Rates in GSPL with and without DRA injection
(HSD & LDO as Total Line Fill.)

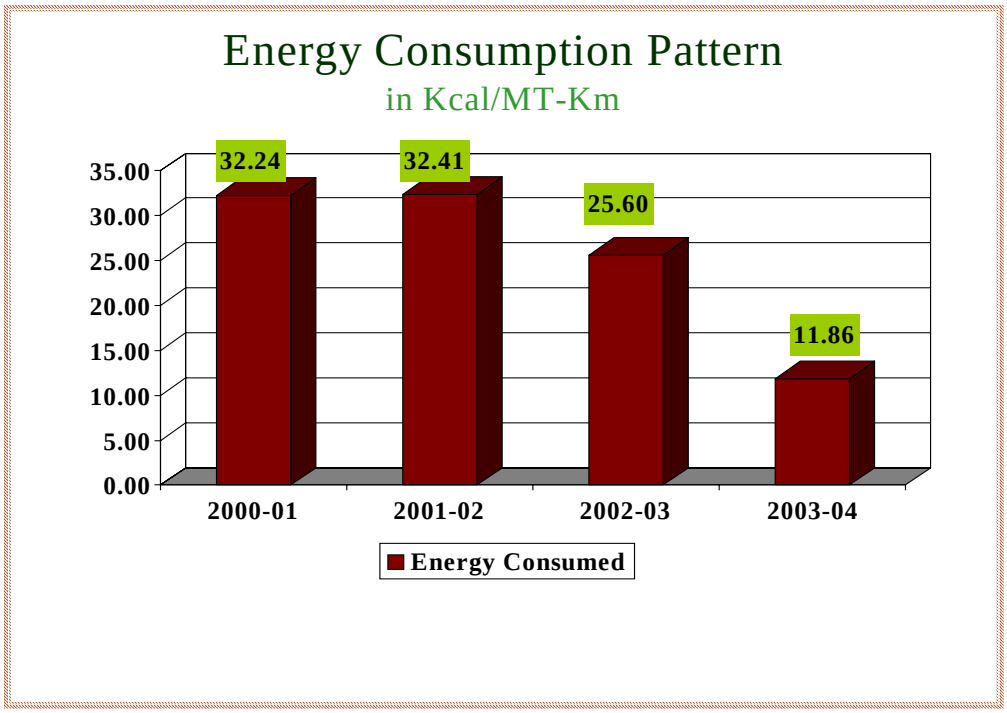
GUWAHATI – SILIGURI SECTION

	STATUS OF PUMPING STATIONS			Average Flow Rate (Kls/Hr)	Remarks
	GUWAHATI	**BONGAIGAON**	**MADARIHAT**		
1	TWO MPUs Running	TWO MPUs Running	ONE MLPU Running	99	Flow Rate without CDR injection at BNGN (Graph 1)
2	TWO MPUs Running	TWO MPUs Running	Shut Down	122	Flow Rate with CDR injection at BNGN @20ppm (Graph 2)
3	TWO MPUs Running	TWO MPUs Running	Shut Down	134	Flow Rate with CDR injection at GHY & BNGN @20ppm (Graph 3)

BONGAIGAON - SILIGURI SECTION (BLOCKED OUT PUMPING)

	STATUS OF PUMPING STATIONS			Average Flow Rate (Kls/Hr)	Remarks
	GUWAHATI	BONGAIGAON	MADARIHAT		
4	_	TWO MPUs Running	Shut Down	85	Flow Rate without CDR injection (Graph 4)
5	_	TWO MPUs Running	Shut Down	137	Flow Rate with CDR injection at BNGN (Graph 5A,5B)
6	_	TWO MPUs Running	ONE MPU Running	104	Flow Rate without CDR injection (Graph 6)
7	_	TWO MPUs Running	ONE MPU Running	160	Flow Rate with CDR injection at BNGN & Madarihat (Graph 7)
8	_	TWO MPUs Running	TWO MPUs Running	115	Flow Rate without CDR injection (Graph 8)
9	_	TWO MPUs Running	TWO MPUs Running	175	Flow Rate with CDR injection at BNGN & MDT (Graph 9)
10	_	TWO MPUs Running	TWO MPUs Running	137	Flow Rate with CDR injection AT BNGN only @20ppm (Graph 10)

** MPUs (Main Line Pumping Units)


Energy Consumption Pattern
in Kcal/MT-Km
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
32.24
32.41
25.60
11.86
2000-01
2001-02
2002-03
2003-04
Energy Consumed

COMPARISON OF THROUGHPUT AND ENERGY CONSUMPTION CONSIDERING EQUAL RUNNING HOURS

FOR THE YEAR : 2000-01 ---WITHOUT CDR INJECTION
2003-04---WITH CDR INJECTION

	DESCRIPTION	2000 – 2001	2003 – 2004
A.	GUWAHATI –SILIGURI SECTION		
1	THROUGHPUT ACHIEVED IN MT	266589	236559
2	ACTUAL RUNNING HOURS	3579	2168
3	PRESUMPTIVE THROUGHPUT IN 2168 HRS	**161489**	-
4	ACTUAL HSD CONSUMPTION IN MT(APPORTIONED)	124.49	7.6
5	PRESUMPTIVE CONSUMPTION OF HSD IN MT FOR 161489MT THROUGHPUT	**75.41**	-
6	ACTUAL ELECTRICAL ENERGY CONSUMED IN KWH IN 3579 HRS	1609993	541832
7	PRESUMPTIVE ENERGY CONSUMPTION IN KWH IN 2168 HRS	**975270**	-
B	BONGAIGAON-SILIGURI SECTION		
1	THROUGHPUT ACHIEVED IN MT	429909	626337
2	ACTUAL RUNNING HOURS	4435	5931
3	PRESUMPTIVE THROUGHPUT IN 5931 HRS IN MT	**574947**	-
4	ACTUAL HSD CONSUMPTION IN MT(APPORTIONED)	200.75	20.4
5	PRESUMPTIVE CONSUMPTION OF HSD IN MT FOR PUMPING 574947 MT	**268.48**	-
6	ACTUAL ENERGY COMSUMPTION IN KWH IN 4435 HRS	3250240	3200170
7	PRESUMPTIVE ENERGY CONSUMPTION IN 5931 HRS	**4346770**	-

COST ANALYSIS OF CDR INJECTION

ASUMING EQUAL RUNNING HOURS IN THE YEAR 2000-01 AND 2003-04
EXCLUDING DELIVERY TO BETKUCHI IN BOTH YEARS.

SL.NO.	DESCRIPTION	2000-01	2003-04
1.	THROUGHPUT IN MT		
	a. GHY-SLG SECTION	161489.0*	236559.0
	b. BNGN-SLG SECTION	574947.0*	626337.0
2	**TOTAL THROUGHPUT**	**736436.0***	**862896.0**
3	**EARNING IN RUPEES THROUGH COST OF TRANSPORTATION (COT)**	**249562711.00***	**299415991.00**
4	TOTAL HSD CONSUMED IN MT	344.0=404*KLS	28=33KLS
5	COST OF HSD IN RUPEES	6418752.00*	524304.00

6	TOTAL ELECTRICAL ENERGY CONSUMED IN KWH	5322040*	3742002
7	COST OF ELECTRICAL ENERGY IN RUPEES	23261664.00*	15451951.00
8	CDR CONSUMED IN LTRS	-	21664.0
9	COST OF CDR IN RUPEES	-	4914695.00
10	**NET EARNINGS (3-5-7-9)**	**219882295.00***	**278525041.00**
11	SAVINGS DUE TO CDR INJECTION	**58642746.00* (SAY 5.86 CRORES)**	
12	SAVINGS ON ENGINE MAINT. IN LACS.	**20.0**	
13	NET SAVINGS	**6.06 CRORES**	

***PRESUMPTIVE QUANITIES ON THE BASIS OF EQUAL RUNNING HOURS**

SUMMERY OF BEBEFITS ON ACCOUNT OF CDR INJECTION:

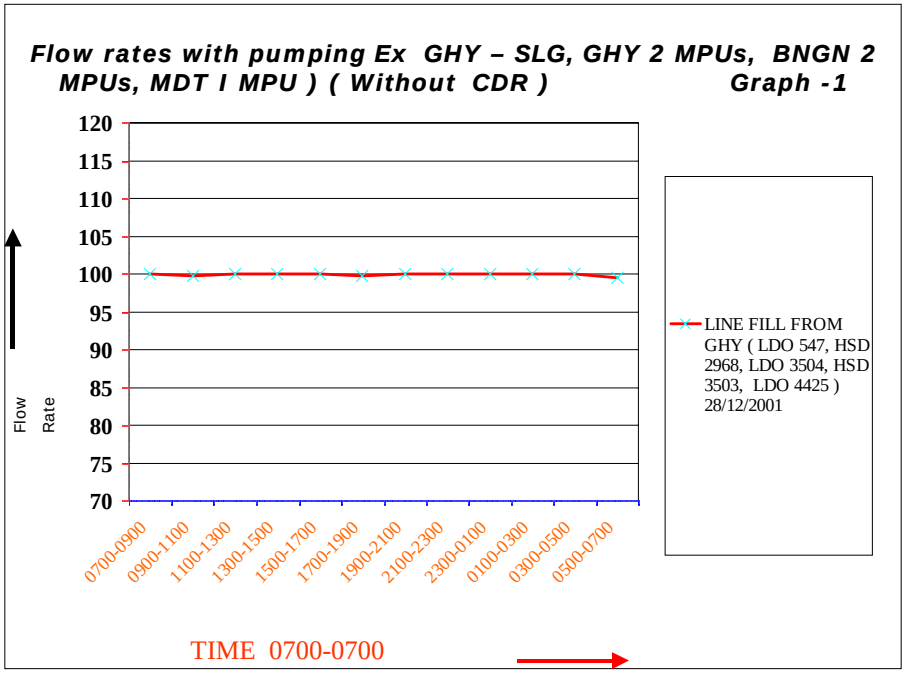
1. *GAIN IN THROUGHPUT :* *126460 MT*
2. ***SAVINGS IN HSD CONSUMPTION:*** ***316 MT***
3. ***SAVINGS IN COST OF HSD*** ***RS. 5894448.00***
4. ***SAVINGS IN CONSUMP. OF ELECT. ENERGY*** ***1580038 KWH***
5. ***SAVINS IN COST ELECTRICAL ENERGY*** ***RS. 7809713.00***
6. ***SAVINGS ON MAINT. OF MADARIHAT MPUs*** ***RS. 20 LACS***
7. ***CONSERVATION OF ENERGY, OIL AND PROTECTION TO ENVIRONMENT***

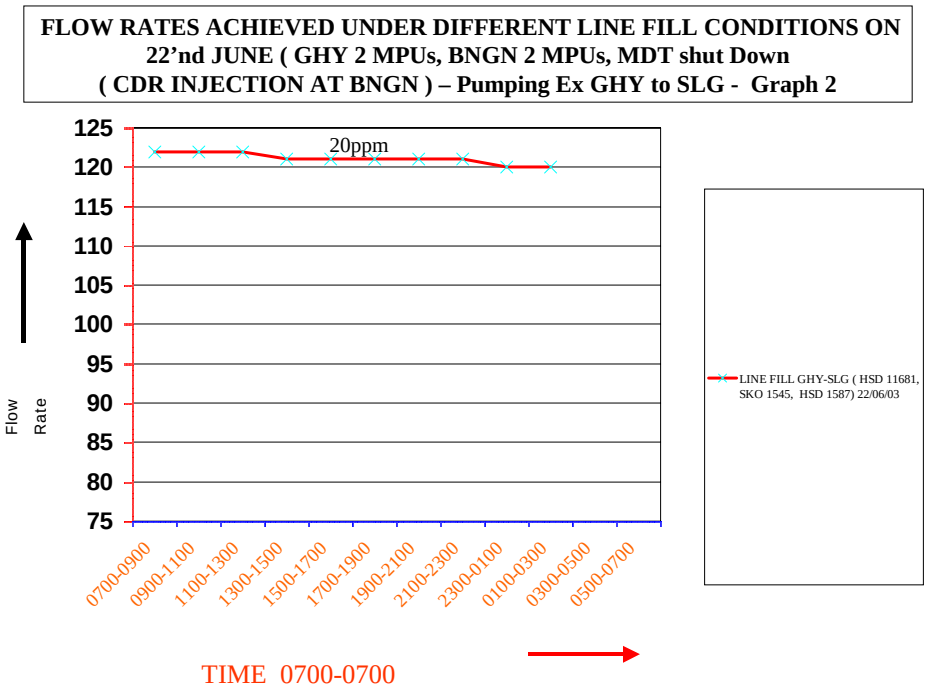
OVERALL SAVINGS IN TERMS OF MONEY 6.06 CRORES

Implementation Methodology of the project

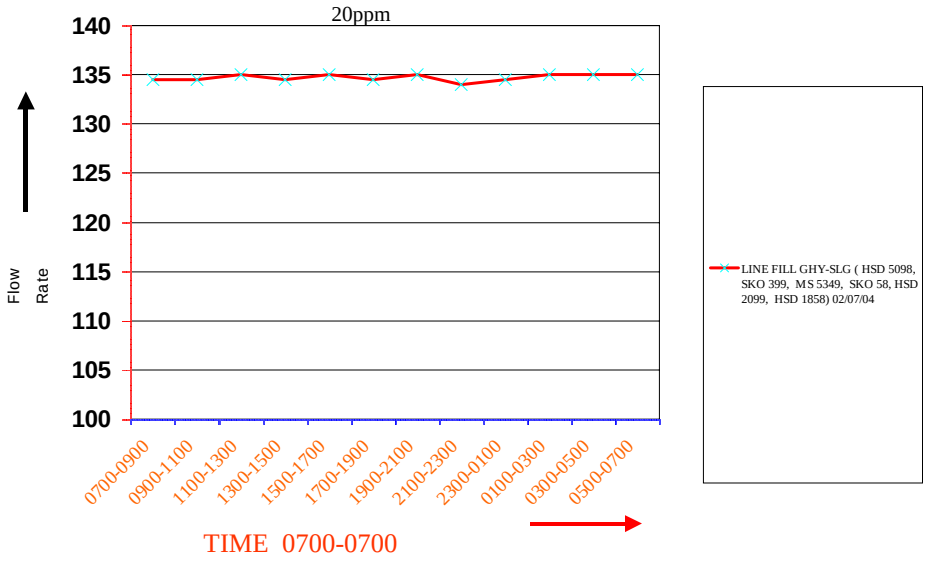
When the proposal for conserving energy and enhancing throughput through CDR injection was put before the management, it was approved for implementation. To implement the project CDR, which is an imported chemical, and its injection Skids were required for Guwahati and Bongaigaon Stations. CDR was imported from USA and was sent to the respective stations in containers. The management at PL,HO, Noida helped in completing all the formalities for importing the material and transporting it to the destinations. The dozing pumps also known as CDR injection skids were arranged for both the stations.

Middle Management in the field carried out the preparatory work for proper handling of the containers filled with CDR. The civil, electrical, mechanical and instrumentation works necessary for smooth operation of the system were carried out in the stations. The supervisory staff and the operating personnel were given on the job training and it was ensured that every concerned employee understood the system completely before starting its operation. After implementation, the project is running successfully

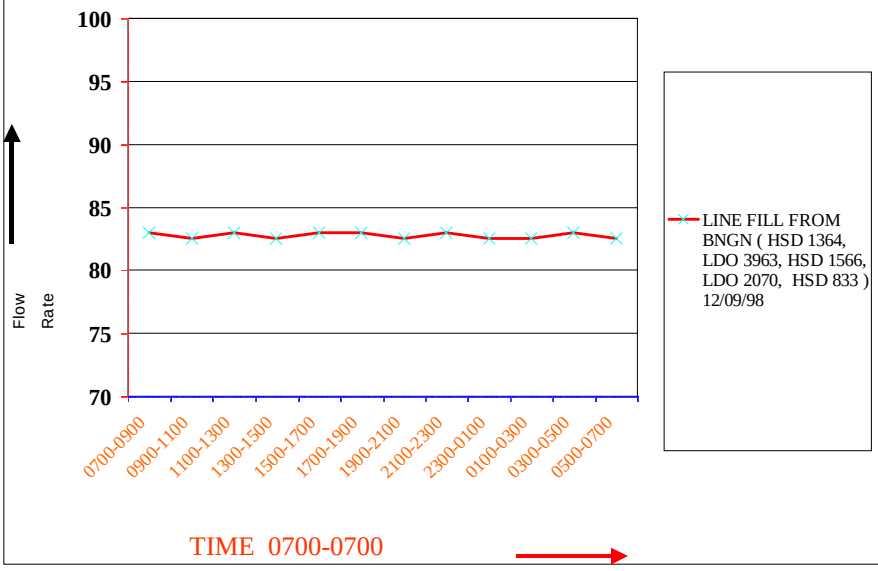

Flow rates with pumping Ex GHY – SLG, GHY 2 MPUs, BNGN 2 MPUs, MDT I MPU) (Without CDR)
Graph -1
120
115
110
105
100
95
90
85
80
75
70
Flow Rate
0700-0900
0900-1100
1100-1300
1300-1500
1500-1700
1700-1900
1900-2100
2100-2300
2300-0100
0100-0300
0300-0500
0500-0700
LINE FILL FROM GHY (LDO 547, HSD 2968, LDO 3504, HSD 3503, LDO 4425) 28/12/2001
TIME 0700-0700

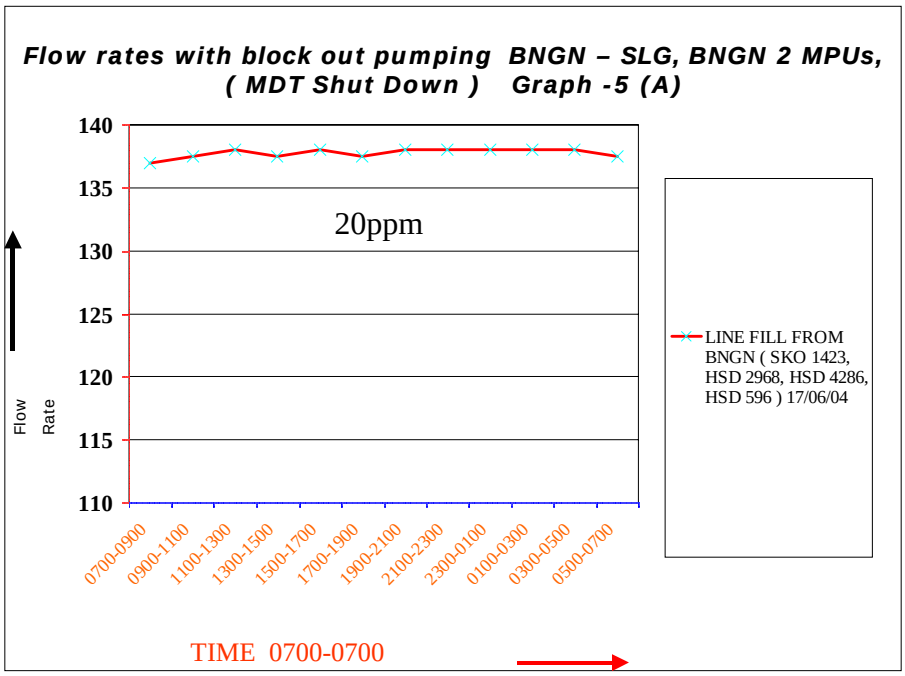

FLOW RATES ACHIEVED UNDER DIFFERENT LINE FILL CONDITIONS ON 22'nd JUNE (GHY 2 MPUs, BNGN 2 MPUs, MDT shut Down (CDR INJECTION AT BNGN) – Pumping Ex GHY to SLG - Graph 2
125
120
115
110
105
100
95
90
85
80
75
20ppm
Flow Rate
0700-0900
0900-1100
1100-1300
1300-1500
1500-1700
1700-1900
1900-2100
2100-2300
2300-0100
0100-0300
0300-0500
0500-0700
LINE FILL GHY-SLG (HSD 11681, SKO 1545, HSD 1587) 22/06/03
TIME 0700-0700

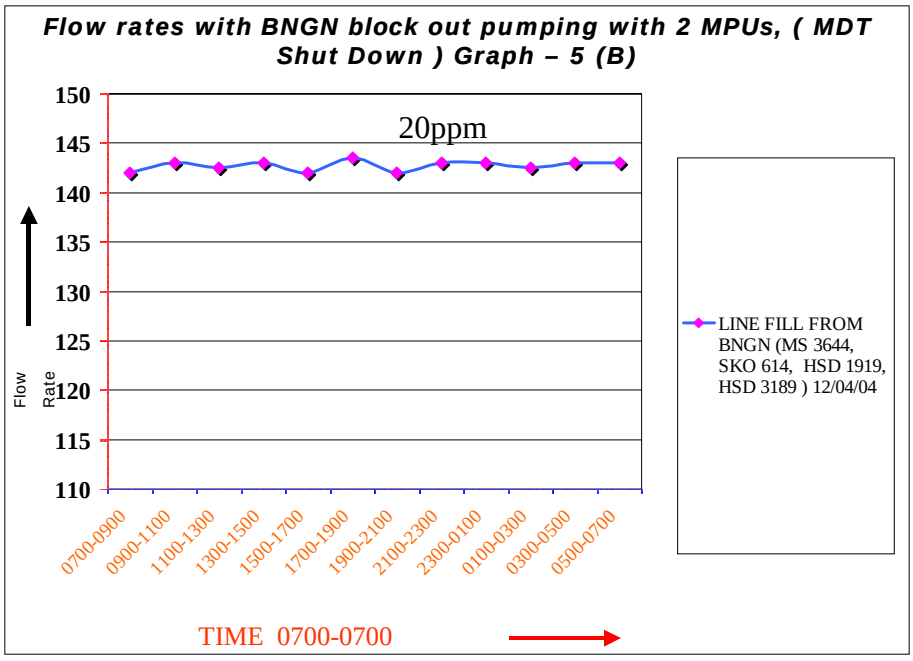
FLOW RATES ACHIEVED UNDER DIFFERENT LINE FILL CONDITIONS ON 02.07.04 (GHY 2 MPUs, BNGN 2 MPUs, MDT shut Down (CDR INJECTION AT GHY & BNGN) – Pumping Ex GHY to SLG - Graph 3



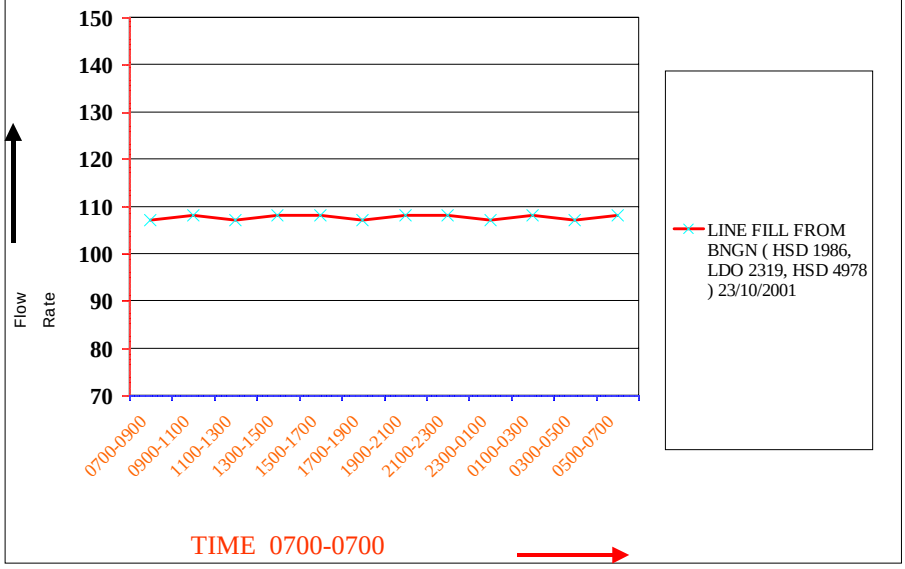
Flow rates with block out pumping BNGN – SLG, BNGN 2 MPUs, (MDT Shut Down) without CDR Graph -4



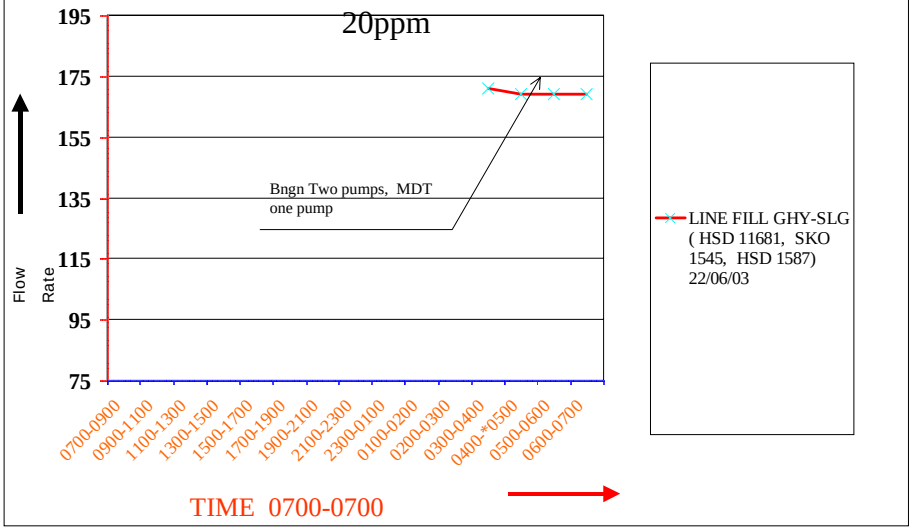

Flow rates with block out pumping BNGN – SLG, BNGN 2 MPUs, (MDT Shut Down) Graph -5 (A)
140
135
130
125
120
115
110
20ppm
Flow Rate
0700-0900
0900-1100
1100-1300
1300-1500
1500-1700
1700-1900
1900-2100
2100-2300
2300-0100
0100-0300
0300-0500
0500-0700
LINE FILL FROM BNGN (SKO 1423, HSD 2968, HSD 4286, HSD 596) 17/06/04
TIME 0700-0700


Flow rates with BNGN block out pumping with 2 MPUs, (MDT Shut Down) Graph – 5 (B)
150
145
140
135
130
125
120
115
110
20ppm
Flow Rate
0700-0900
0900-1100
1100-1300
1300-1500
1500-1700
1700-1900
1900-2100
2100-2300
2300-0100
0100-0300
0300-0500
0500-0700
LINE FILL FROM BNGN (MS 3644, SKO 614, HSD 1919, HSD 3189) 12/04/04
TIME 0700-0700

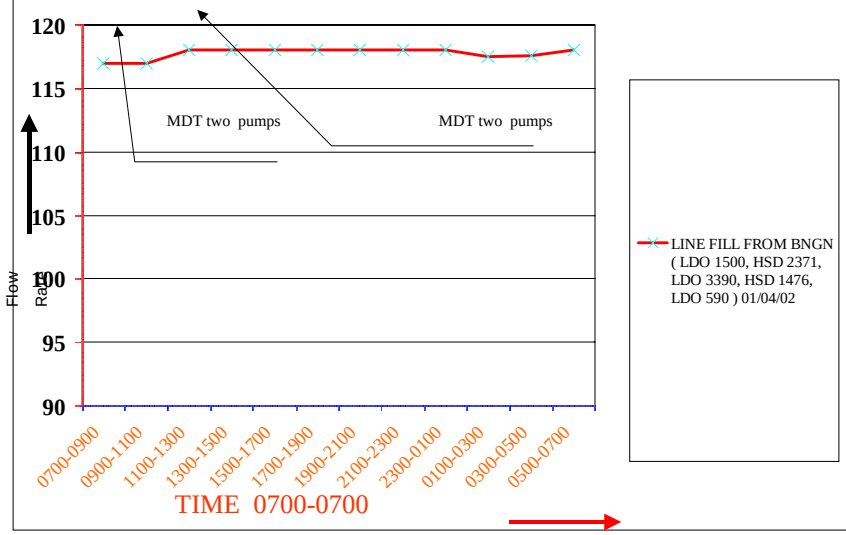
Flow rates with block out pumping BNGN – SLG, BNGN 2 MPUs, MDT 1 MPU) (Without CDR) Graph -6



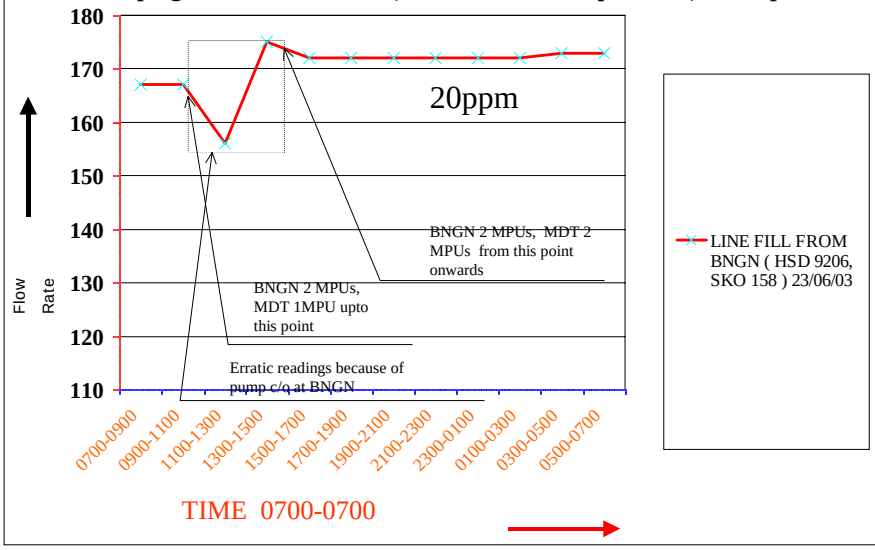
FLOW RATES ACHIEVED UNDER DIFFERENT LINE FILL CONDITIONS ON 22'nd JUNE (CDR INJECTION AT MADARIHAT & BNGN) –
Pumping Ex BNGN to SLG, (BNGN 2 MPUs, MDT 1 MPU in operation) Graph 7

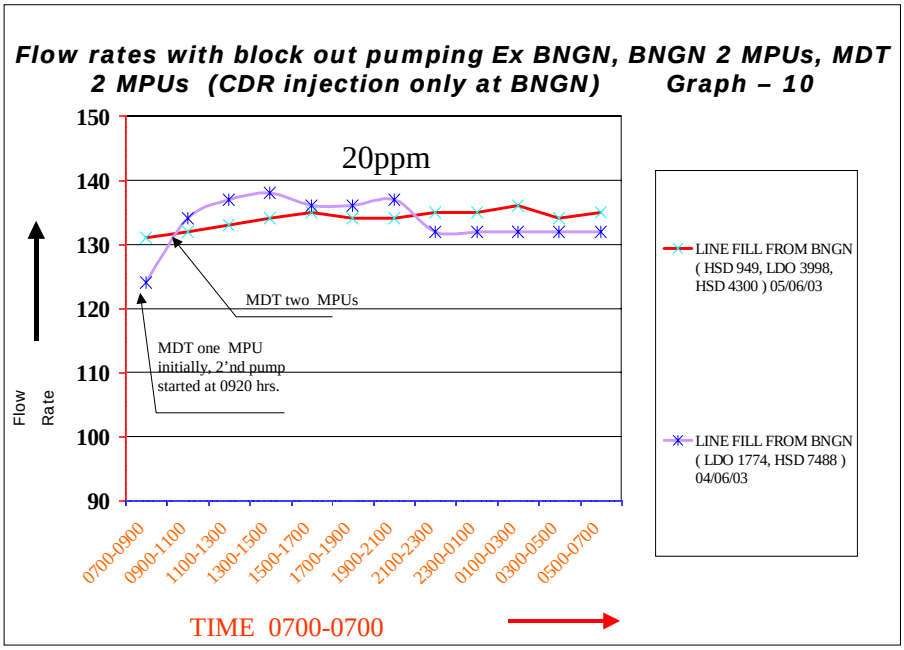


Flow rates with block out pumping Ex BNGN, BNGN 2 MPUs, MDT 2 MPUs (No CDR injection AT BNGN & MDT) Graph - 8



FLOW RATES ACHIEVED UNDER DIFFERENT LINE FILL CONDITIONS ON 23'rd JUNE (CDR INJECTION AT MADARIHAT & BNGN) – Pumping Ex BNGN to SLG, (MDT 2 MPUs in operation) Graph 9





ENERGY CONSUMPTION REPORT FOR THE MONTH OF APR'2003

SL No	PARTICULARS	FOR THE MONTH	UPTO THE MONTH FOR THE YEAR
1.	**DELIVERY OFPRODUCT(THROUGHPUT IN MT.)**		
1A.	TO BETKUCHI	20126.44	20126.44
1B.	TO SILIGURI(EX GUWAHATI)	0.00	0.00
1C.	TO SILIGURI(EX BONGAIGAON)	55111.04	55111.04
1D	TO HASIMARA (EX-GHY)	0.00	0.00
1E	TO HASIMARA (EX-BNGN)	3075.67	3075.67

2.	**DISTANCE TRAVELLED IN KM**		0.00
2A.	GUWAHATI-BETKUCHI	15.20	15.20
2B.	GUWAHATI-SILIGURI	434.70	434.70
2C.	BONGAIGAON-SILIGURI	271.60	271.60
2D	GUWAHATI-HASIMARA	306.00	306.00
2E	BONGAIGAON-HASIMARA	143.00	143.00
3.	**PIPELINE HAULAGE IN MT-KM** (1AX2A)+(1BX2B)+(1CX2C)+(1Dx2D)+(1Ex2E)	15274081.44	15274081.44
4.	**FUEL CONSUMPTION**		
4A.	FUEL CONSUMPTION IN KL	4.57	4.57
4B.	FUEL CONSUMPTION IN MT (4AX0.85)	3.88	3.88
4C.	ENERGY CONSUMPTION IN KCAL(4BX10880000)KCAL	42263360.00	42263360.00
5.	**POWER CONSUMPTION**		
5A.	POWER CONSUMED IN KWH	212454.13	212454.13
5B.	ENERGY CONSUMED IN KCAL (5AX860.5)	182816774.56	182816774.56
6.	TOTAL ENERGY CONSUMPTION 4C+5B	225080134.56	225080134.56
7.	**ENERGY CONSUMED PER MT-KM**		
7A	KCAL/MT-KM (6/3)	14.74	14.74
7B.	BTU/MT-KM(7AX3.97)	58.50	58.50

Vision

A major diversified, transnational, integrated energy company, with national leadership and a strong environment conscience, playing a national role in oil security& public distribution.

Mission

- To achieve international standards of excellence in all aspects of energy and diversified business with focus on customer delight through value of products and services, and cost reduction.
- To maximise creation of wealth, value and satisfaction for the stakeholders.
- To attain leadership in developing, adopting and assimilating state-of- the-art technology for competitive advantage.
  To provide technology and services through sustained Research and Development.
- To foster a culture of participation and innovation for employee growth and contribution.
- To cultivate high standards of business ethics and Total Quality Management for a strong corporate identity and brand equity.

To help enrich the quality of life of the community and preserve ecological balance and heritage through a strong environment conscience.