Attachment-I

PROCESS UNIT CAPACITIES

UNITS OF PARADIP REFINERY PROJECT	CAPACITY AS PER EC DATED 6TH JULY'2007	REVISED CAPACITY
REFINERY UNITS		
Crude & Vacuum & Unit (AVU), MMTPA	15.0	15.0
Delayed Coker Unit, MMTPA	4.1	4.1
Diesel Hydro Treating Unit, MMTPA	**5.8**	**5.2**
VGO Hydro Treating Unit, MMTPA	**5.2**	**5.4**
Fluidised Catalytic Cracking Unit, MMTPA	**3.9**	**4.2**
Sulphur Recovery Unit, TPD	**(2+1) x450 TPD of Sulphur**	**2x525 TPD + 1 TGTU**
Hydrogen Plant, TMTPA	*	72.8(Hydrogen)
Various Treating Units	*	--
Alkylation Unit, TMTPA	**500**	**650**
PETROCHEMICAL UNITS		
Polypropylene Unit, TMTPA	2x340	2 x 340
Para-Xylene Unit (Naphtha Hydrotreating Unit, Continuous Catalytic Reformer, Reformate Splitter Unit(I&II), Xylene Isomerization Unit (2 Trains), Parex Unit capacity (2 Trains), Sulfolane Extraction Unit, Benzene/Toluene Factionation Unit, Tatoray Unit).	1200 TMTPA of Paraxylene)	1200 TMTPA of Paraxylene)
Ethyl Benzene and Styrene Monomer, TMTPA	**600**	**631**
Captive Power Plant and Cooling Tower	*****	GT with HRSG (3x102 MW) STG (2 x 30 MW), UB (4x300T/hr) Standby GT with HRSG of 1x 30 MW **(366 MW, 1200 TPH)**
DETAILS OF THE TREATING AND OTHER UNIT CAPACITIES		
LPG Treater, TMTPA	*****	210
LPG Treater (Cracked LPG), TMTPA		1850
LPG Treater (Coker LPG), TMTPA		165
ATF (Merox), TMTPA		1200
SWS-I + SWS-II, M^3/hr		227+398 = 625
ARU - Rich Amine Circulation Rate, M^3/hr		1 x 454.6 + 1 x 898.5 =1353

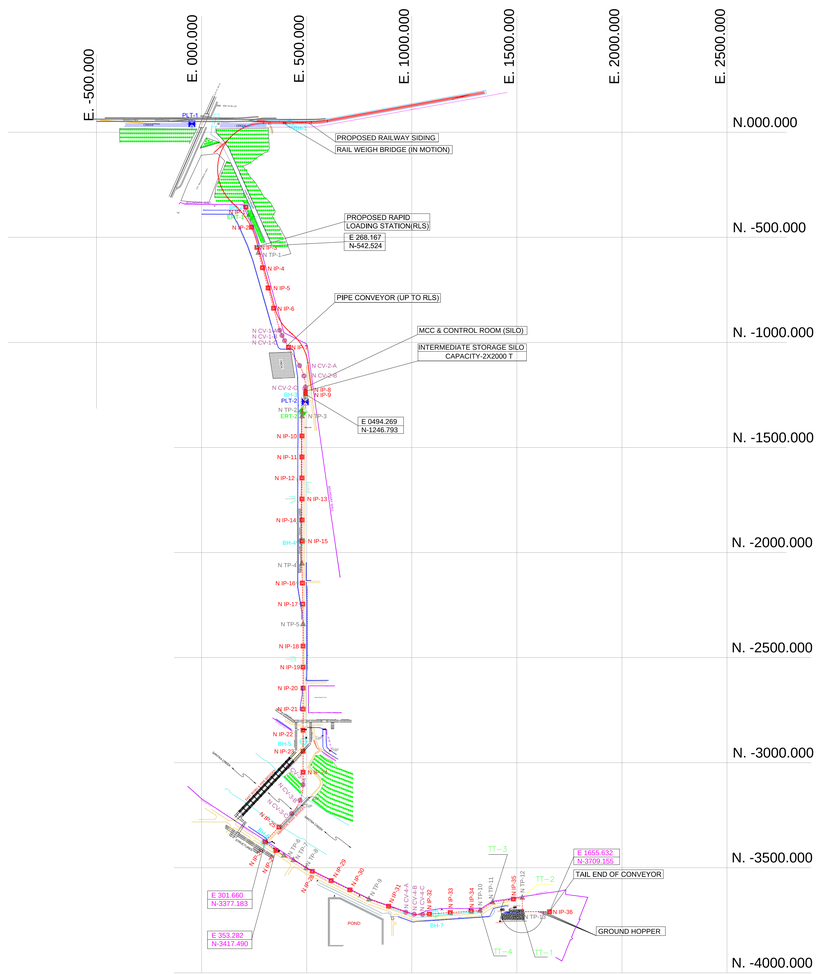
Para-Xylene Unit, TMTPA	1200	1200
- Naphtha Hydrotreating Unit, TMTPA		3941
- Continuous Catalytic Reformer, TMTPA		2990
- Reformate Splitter Unit(I&II), TMTPA		Part of Reformer
- Xylene Isomerization Unit (2 Trains), TMTPA	*	4246(Isomerate)
- Parex Unit capacity (2 Trains), TMTPA		1200 PX
- Sulfolane Extraction Unit, TMTPA		963
- Benzene/Toluene Factionation Unit, TMTPA		Part of Sulfolane Unit
- Tatoray Unit, TMTPA		2183
PROPOSED FACILITY		
Pet Coke evacuation through Rapid Railway Loading System (RRLS), MMTPA	**--**	**1.3**

*Unit capacities not mentioned in the earlier EC

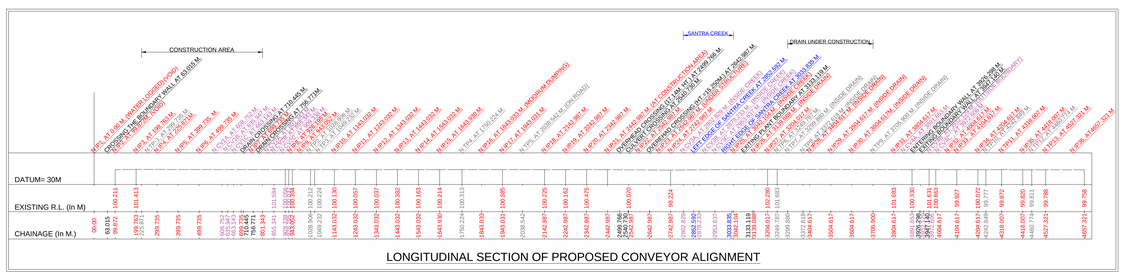
Attachment-II

TITLE: FIELD SURVEY AND SOIL INVESTIGATION DRAWING FOR PROPOSED PET COKE HANDLING SYSTEM

DWG NO TCE.7222A-670-GA-1010



PLAN OF PROPOSED CONVEYOR ALIGNMENT
FROM STOCKPILE TO RLS



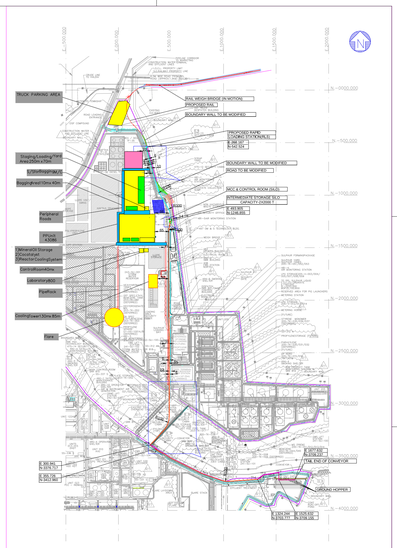
LONGITUDINAL SECTION OF PROPOSED CONVEYOR ALIGNMENT

LOCATION OF FIELD TESTS

BORE HOLES	CO-ORDINATES		
LOCATIONS	EAST	NORTH	LEVEL
BH-1	E 420	N 39	99.018
BH-2	E 220	N -355	97.669
BH-3	E 495	N -1240	100.709
BH-4	E 480	N -1950	100.584
BH-5	E 485	N -2900	99.462
BH-6	E 300	N -3380	101.539
BH-7	E 1112	N -3718	100.00
PLATE LOAD	CO-ORDINATES		
LOCATIONS	EAST	NORTH	LEVEL
PLT-1	E -46	N 40	101.002
PLT-2	E 495	N -1255	100.092
RESISTIVITY	CO-ORDINATES		
LOCATIONS	EAST	NORTH	LEVEL
ERT-1	E 225	N - 360	98.621
ERT-2	E 495	N -1250	100.565

TABLE OF CO-ORDINATES :-

SL.	CODE	EASTING	NORTHING	LEVEL
1	N CV1A	371.851	-942.549	
2	N CV1B	382.651	-967.503	
3	N CV1C	395.013	-991.721	
4	N CV2A	466.063	-1110.259	
5	N CV2B	487.274	-1159.738	101.584
6	N CV2C	494.519	-1213.081	100.056
7	N CV3A	482.804	-3105.063	
8	N CV3B	468.757	-3178.693	
9	N CV3C	428.590	-3241.981	
10	N CV4A	971.956	-3711.607	100.330
11	N CV4B	1011.249	-3721.034	
12	N CV4C	1051.634	-3722.371	101.631
13	N TP-1	270.448	-573.340	
14	N TP-2	479.971	-1331.178	100.212
15	N TP-3	477.490	-1351.515	100.224
16	N TP-4	477.498	-2052.506	100.313
17	N TP-5	482.795	-2340.776	
18	N TP-6	391.477	-3441.582	101.135
19	N TP-7	436.653	-3463.185	
20	N TP-8	497.970	-3502.283	
21	N TP-9	796.762	-3649.895	
22	N TP-10	1324.244	-3703.777	99.777
23	N TP-11	1384.485	-3664.056	99.872
24	N TP-12	1525.632	-3642.608	99.811
25	N TP-13	1525.632	-3709.155	99.788
26	N IP-1	VOID	VOID	
27	N IP-2	VOID	VOID	
28	N IP-3	263.581	-548.151	100.413
29	N IP-4	290.010	-644.566	
30	N IP-5	316.494	-740.995	
31	N IP-6	342.979	-837.424	
32	N IP-7	413.825	-1023.107	
33	N IP-8	494.519	-1229.938	100.037
34	N IP-9	494.269	-1246.793	100.304
35	N IP-10	477.490	-1445.315	100.130
36	N IP-11	477.490	-1545.315	100.057
37	N IP-12	477.490	-1645.315	100.037
38	N IP-13	477.490	-1745.315	100.382
39	N IP-14	477.490	-1845.315	100.163
40	N IP-15	477.490	-1945.315	100.214
41	N IP-16	479.200	-2145.300	
42	N IP-17	481.043	-2245.280	100.385
43	N IP-18	482.804	-2445.221	100.225
44	N IP-19	482.804	-2545.221	100.162
45	N IP-20	482.804	-2645.221	100.475
46	N IP-21	482.804	-2745.221	
47	N IP-22	482.804	-2845.221	100.070
48	N IP-23	482.804	-2945.221	
49	N IP-24	482.804	-3045.221	98.224
50	N IP-25	368.026	-3306.467	
51	N IP-26	301.632	-3377.161	
52	N IP-27	353.282	-3417.490	102.280
53	N IP-28	526.484	-3516.790	
54	N IP-29	616.141	-3561.081	
55	N IP-30	705.797	-3561.081	
56	N IP-31	889.807	-3682.855	101.683
57	N IP-32	1083.571	-3720.193	100.863
58	N IP-33	1183.339	-3713.388	99.927
59	N IP-34	1283.107	-3706.583	100.072
60	N IP-35	1483.350	-3649.033	99.820
61	N IP-36	1655.632	-3709.155	99.758



KEY PLAN

LEGEND :-

SL. NO.	DESCRIPTION OF ITEMS	SYMBOL
01	BOUNDARY	
02	FENCING	
03	PIPE LINE	
04	SHED / BUILDING	
05	DRAIN	
06	POWER LINE	
07	WATER BODY/CREEK	
08	POND	
09	MORUM ROAD-BITUMIN ROAD	
10	GREEN PATCH/TREE	
11	CULVERT	
12	STRUCTURES (STEEL)	
13	RAILWAY LINE	
14	CONVEYOR ALIGNMENT	

NOTE :

1. ALL CO-ORDINATES ARE IN METRE.
2. BORE HOLES SHOWN AS : BH-
3. PLATE LOAD TEST SHOWN AS : PLT-
4. ELECTRICAL RESISTIVITY TEST SHOWN AS : ERT-
5. BORE HOLES TO BE TERMINATED AT 30 M BELOW GL OR 2.0 M INTO HARD ROCK WHICHEVER MET EARLIER.
6. PLATE LOAD TESTS TO BE CONDUCTED AT 2.0 – 2.5 M BELOW GL.
7. EXACT CO-ORDINATES & RL OF ALL TESTS LOCATIONS TO BE RECORDED.
8. PRIORITY OF FIELD TESTS TO BE DECIDED AT SITE BY THE ENGINEER.
9. ALL LEVELS AND DIMENSIONS ARE IN METER.
10. SURVEY CONDUCTED WITH REFERENCE TO TEMPORARY BENCH MARK PILLARS (K-7 & K-9)

ABBREVIATIONS :

1. NIP – NEW INTERMEDIATE POINT
2. NTP – NEW TURNING POINTS
3. NCV – NEW CURVE POINTS

SURVEY & SOIL INVESTIGATION BY:–
M/S GEO DESIGNER
BHUBANESWAR

DO NOT SCALE

INDIAN OIL CORPORATION LTD.
PARADEEP

FIELD SURVEY AND SOIL INVESTIGATION DRAWING FOR PROPOSED PET COKE HANDLING SYSTEM

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

FOR R0 ISSUE ONLY			ISSUE	REVISIONS	DRN	CLEARED					APPD	DATE
	CLEARED					CHEM	CIVIL	ELEC	I&C	MECH		
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TCE FORM NO. 042 R4

Attachment-III

A) Petcoke Evacuation through Rapid Rail Loading System (RRLS)

Brief Description:

Indian Oil Corporation Limted (IOCL) has set up its 10th Refinery i.e Paradip Refinery Project (PDRP) which is the most modern coastal Refinery in Eastern India. This Refinery will process 15 MMTPA crude to get the desired petroleum products (LPG, Gasoline, Naphtha, Kerosene, ATF etc.) and by-products such as Sulphur, petroleum coke (Pet coke) etc.

A Mechanized system has been envisaged to convey about 1.3 million metric tonnes per annum (MMTPA) pet coke produced from refinery's Delayed Coking unit and coke storage area to Railway Wagon Loading System from where PetCoke shall be dispatched to different location through Railways.

The above system shall comprise the following facilities:

1. Pet coke evacuation and Transportation through a combination of Pipe conveyor & troughed belt Conveyor
2. Intermediate storage silos (2 Nos@2000T each)
3. Rapid Loading System for Railway Rake Loading.

For railway loading, a dedicated railway siding from Paradip railway station to Refinery with Wagon loading facility & required nos. of in-motion weighing system has also been envisaged for the system.

Transportation Detail:

Pipe conveyor has been envisaged as transportation media for Petcoke from refinery to Railway wagon Loading System. Also provision of Intermediate storage Silos (2 nos.) each of 2000T capacity has been envisaged for the system.

Capacity of Pipe conveyor has been envisaged 750 TPH (rated). Length of the conveyor system shall be approximately 4.0 Km upto Railway Loading System.(RLS) within refinery. Railway alignment with the provision of Y-junction has been envisaged in this Railway loading system.

Utility:

Electrical power and water requirement shall be met through the existing facility.

Impact on Environment:

Air Environment:
The proposed site is free from any protected/reserve forest and bio-sphere reserve. As far as emission in air is concerned, there will be no process emission as the proposed system involves only transportation of pet coke through conveyor system. But, minor fugitive emission may be anticipated.

So, to ensure a better environment management, adequate measure shall be taken to control the fugitive emission by water sprinkling and greenery development.

Water Environment:

The storm water drain shall be provided with sedimentation pits and oil-water interceptors.

Noise Environment:

For containing noise pollution following measures shall be taken:

1. Movements of vehicles would be properly scheduled
2. Sound absorbing material would be provided in the room
3. Ear plugs would be given to works working in noisy area

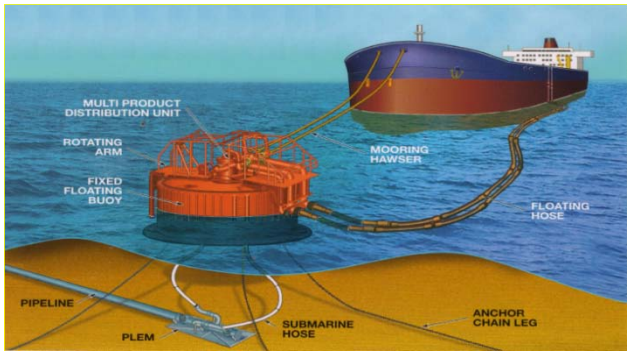
B) Brief Description of Paradip Refinery

IndianOil's Paradip Refinery Project is the most modern coastal Refinery of IndianOil with petrochemicals units. The designed capacity of 15 Million Metric Tonnes per Annum will contribute significantly towards the growth of IndianOil, Odisha and India. Located nearly 145 kms from Bhubaneswar, the capital of Odisha, Paradip Refinery is well connected by National Highway No-5A and State Highway No-12 along with rail links.

It is the most modern coastal Refinery in the Eastern Region of India. The processing scheme has combinations of catalytic cracking Unit and Delayed Coker Unit to maximize distillate yield like Motor spirit, Jet fuel/kerosene and Diesel. The major products will be Liquified Petroleum Gas, Propylene, Naptha, Motor Spirit, Diesel, Sulphur and Petcoke. State-of-The-Art Global process technologies are being employed. Entire range of products will be high value distillates.

Crude and Product Movement

Paradip Refinery will process imported High Sulfur Heavy Crudes and shall produce Petroleum and Petrochemical products like Propylene, LPG, Naphtha, Motor Spirit, SKO, ATF, HSD, Paraxylene, Polypropylene, Coke & Sulfur. The crude will be imported in Very Large Crude Container (VLCC) and unloaded through Single Point Mooring (SPM), which is about 23 km away from the refinery in deep sea. The products will be evacuated by road, rail, pipelines and sea route through existing North Jetty and up-coming South Jetty. Solid products viz Poly-Propylene will be moved through sea route as-well-as feasibility of PetCoke evacuation. The North Jetty and South Jetty have crude unloading facilities also. The pipelines for crude, products between Refinery and upcoming South Jetty run adjacent to the South Coastal Road.



Process Description

Crude Oil is processed in Crude and Vacuum Distillation unit (CDU / VDU). In CDU, crude oil is first heated in heat exchanger train. It is then heated in a furnace and fractionated in Crude Distillation Column where physical separation takes place based on boiling point difference. The top product is LPG (Liquified Petroleum Gas) which is splitted in C3 and C4 components. C4 component is firther processed in Alkylation unit for production of Alkylate which is used for boosting octane value of Motor Spririt (MS)

The 2nd fraction from CDU is Naphtha which is splitted into Light and Heavy Naphtha. The Heavy Naphtha along with Coker Heavy Naphtha and FCC Heavy Naphtha is hydrotreated and sent to Vatalytic Reforming Unit (CRU) for MS production. The Light Naphtha is sent as feed to Hydrogen Generation Unit for production of Hydrogen for hydrogenation of products in downstream units.

The 3rd fraction from CDU is Kerosene cut, which is treated in ATF treatment Unit to remove undesirable sulphorous compounds to produce superior Kesorene and ATF.

The 4th fraction from CDU is Dieseel cut which is hydrotreated in DHDT (Diesel Hydrotreatment) Unit to produce 10 ppm 'S' HSD (BS-V) and 50 ppm 'S' HSD (BS-IV).

The Reduced Crude Oil (RCO) from CDU is processed in Vacuum Distillation Unit (VDU). The Vacuum Gas Oil (VGO) from VDU is hydrotreated in VGOHDT Unit and then processed in FCC (Fluidised Catalytic Cracker). The VGOHDT unit processed VGO feed and produces low sulphur and low Conradson carbon Residue (CCR) feed for FCC through hydrotreatment. FCC produces feedstock for Propylene Recovery Unit (PRU) and also FCC Gasoline, Light Cycle Oil (Diesel component) and Clarified Oil. Clarified Oil is routed to Delayed coking Unit or blended in Internal Fuel Oil (IFO). The hydrogen requirement of DHDT and VGO HDT unit is met through Hydrogen generation in HGU and CRU.

Gases from cracking unit and hydrotreatment units are amine treated and H2S rich gas is processed in SRU (Sulphur Recovery Unit) to produce sulphur.

The Reformate is splitted in Reformate splitter and used for producing Paraxylene and also as MS blend.
The ethylene produced in FCCU is used for making Ethyl Benzene reacting with Benzene produced in Paraxylene units. Ethyl Benzene is further used to produce styrene monomer.

C) StorageTank Details

LIST OF STORAGE TANKS (NORTH SITE)			
S.No.	**Service**	**Total No. of Tanks**	**Nominal capacity each, M^3**
FINISHED PRODUCT STORAGE TANKS (Phase-I, Stage-I)			
1	Propylene Mounded Storage Bullet	6	3134
2	LPG Mounded Storage Bullet	9	3134
3	Naphtha	4	38284
4	MS (Regular)	1	18207
5	MS (Premium)	4	29023
6	DPK	4	26913
7	SKO	1	26942
8	HSD (Domestic)	1	24303
9	HSD (Export)	6	31150
10	Sulphur	3	2197
INTERMEDIATE PRODUCT STORAGE TANKS (Phase-I, Stage-I)			
1	LCN	1	7188
2	Lt. HDT Naphtha	1	4807
3	Alkylate	1	13222
4	Reformate/ Ref. Splitter Feed	1	14432
5	HDT HSD	1	13215

LIST OF STORAGE TANKS (SOUTH SITE)			
S.No.	**Service**	**Total No. of Tanks**	**Nominal capacity each, M^3**
INTERMEDIATE PRODUCT STORAGE TANKS (Phase-I, Stage-I)			
1	Hydrogen Bullet	3	284
2	Internal Fuel Oil	2	10574
3	NHT Feed	2	28866
4	HGU Feed	1	4807
5	Alkylation Feed	3	2870
6	DHDT Feed	2	28866
7	Wet Slop	1	4808
8	Lt. Dry Slop	1	4808
9	Hy. Dry Slop	1	11988
10	CCR Feed Tank	1	4807
11	HS Fuel Oil	3	10840
12	Flushing Oil	1	6786
13	Wet Slop Tank in ETP	2	2243
14	Ultr-filtered Water	1	3860
15	Gas Turbine Naphtha	2	6017
16	Gas Turbine Diesel	2	6017
17	CPP HSFO	2	1350
18	CPP Naphtha	2	1350
19	CPP HSD	4	1350
20	VGO HDT Feed Tank	2	72043
21	Crude Tank	11	59555