

1999 = 1

MTC / REPORT / 01

**IFFCO**  
**KALOL UNIT**

PLANNING SECTION  
MAINTENANCE DEPTT.  
REPORT NO.19 / 1999

**REPORT**  
**ON**  
**PLANT TURNAROUND**  
**( APRIL - 1999 )**

**INDIAN FARMERS FERTILISER CO - OPERATIVE LIMITED**

I N D E X

PLANT		PAGE NO.
PREFACE		I TO II
GENERAL DETAILS		III TO IX
AMMONIA	- Mechanical	A-01 TO A-22
	- Inspection	A-23 TO A-38
	- Civil	A-39 TO A-40
	- Electrical	A-41
	- Instrument	A-42 TO A-48
	- Technical & Project	A-49 TO A-51
UREA	- Mechanical	U-01 TO U-19
	- Inspection	U-20 TO U-39
	- Civil	U-40
	- Electrical	U-41
	- Instrument	U-42 TO U-45
	- Technical & Project	U-46 TO U-47
OFFSITE & UTILITY	- Mechanical	0-01 TO 0-07
	- Inspection	0-08 TO 0-09
	- Civil	0-10
	- Electrical	0-11 TO 0-12
	- Instrument	0-13 TO 0-17
	- Technical	0-18 TO 0-19
B&MH	- Mechanical	B-01 TO B-04
	- Inspection	-
	- Civil	B-05
	- Electrical	B-06
	- Instrument	B-07
	- Technical	B-08

## P R E F A C E

3

Plant Turnaround for the year 1999 was planned during April, 99, accordingly Urea plant and Ammonia plant were stopped on 11th and 12th April '99 respectively. Rotating and static equipments were taken for routine overhaul and some critical modifications were carried out.

In Ammonia plant, the back pressure turbine 103-JAT nozzle ring was replaced with modified one. This will enhance the output horse power of turbine from 15400 to 18500 HP. This modification was carried out under supervision of M/s. Demag Delaval, USA. Front wall of Auxiliary Boiler was completely replaced by new prefabricated plates and members. This job was done departmentally. Statutory inspection of waste heat boilers were carried out. Preventive maintenance of compressors and turbines including lube oil console were carried out. All Heat Exchangers were cleaned by hydrojetting and finally boxed up after hydrotesting wherever applicable. Some of the critical RV's were also taken for overhauling through M/s. Flotech Engg. Services, Surat. Cold insulation of 106-F, 107-F and 108-F & related Pipings were replaced by PUF insulation.

In Urea plant, Hitachi Compressor, K-1801, H.P. case modified rotor was installed and preventive maintenance of L.P. Case and Turbine Q-1801 were carried out. H.P. Ammonia pump, 4 Nos Prill Tower ID Fans, Scrapper were carried out. Repair jobs as suggested earlier were carried out in autoclave (V-1201). All RV's were overhauled, tested and installed back by M/s. FMC Sanmar Ltd, Vadodara. Inspection of H.P. Vessel and other vessels were carried out.

In Offsites plant BHEL boiler was taken for inspection by CIB. RAH was overhauled departmentally. Major overhauling of cooling water pumps P-4401-B & P-4402 were carried out whereas preventive maintenance of P-4401-A, P-4401/E, P-5111, Q-5111, P-5112, F.D. Fan Turbine Q-5113 were carried out.

In B&MH plant Reclaim machine M-2116 was taken for overhauling and belt conveyors M-2110, M-2112, M-2117, M-2121, M-2122, M-2124 (Slat conveyor) M-2137 were taken for preventive maintenance.

### ELECTRICAL JOBS:

Preventive maintenance of transformers, feeder compartments and ACB's of Ammonia, Urea, Offsites and B&MH plants were carried out. Also certain critical motors were taken for overhauling. Preventive maintenance of 66 KV, 11KV, OCBs, MOCBs and VCBs were carried out.

### INSTRUMENT JOBS

Various critical control valves of Ammonia, Urea and Offsites plants were overhauled and various pressure transmitters were also calibrated. All control room instruments were cleaned and inspected. The old pneumatic control panel was removed from the Urea plant control room.

CIVIL SECTION:

4

Auxiliary boiler front wall Refractory work was carried out under supervision of M/S.A.C.C. The control room of Ammonia and Urea plant were completely renovated including A/C duct line in record time.

TECHNICAL DEPARTMENT JOBS:

In Ammonia plant, 128-C exchanger was replaced by new modified one, Approx 540 meter long existing 3" NB C.S. Naphtha Transfer line was replaced by S.S.304 - 4" NB line from Offsite handling area to Ammonia plant. Old Aluminium 6" and 8" NB piping carrying DM water were replaced by SS 304 - 8" & 10" NB respectively. Underground Cooling Water return header piping were replaced by new one. Various new schemes under EWR were carried out in Ammonia plant as well as Urea plant.

After completion of above jobs, the Ammonia plant was started and production was lined up on 30-04-99 and Urea production was lined up on 28-04-99.

THE PLANT TURNAROUNDS AT A GLANCE

5

SR. NO.	YEAR	A M M O N I A - P L A N T				U R E A - P L A N T				REASON IF ANY
		PERIOD		FROM	PRODUCTION TO	TO	PRODUCTION	DOWNTIME		
		FROM	TO	DOWN DAYS ====	TIME HRS ===	FROM	TO	DAYS ====	HRS ===	
01	1975	06-05-75	21-05-75	16	-	06-05-75	21-05-75	16	-	Planned
02	1976	26-03-76	20-04-76	26	-	26-03-76	26-03-76	26	-	Planned
03	76-77	05-12-76	22-01-77	49	-	05-12-76	24-02-77	51	-	101-JT B/D
04	1978	21-02-78	15-03-78	23	-	21-02-78	25-03-78	31	-	101-BJ B/D
05	1979	21-05-79	30-06-79	41	-	10-05-79	01-08-79	82	-	K-1101/2, 3rd Stg. Cylinder
06	1981	12-04-81	10-05-81	29	-	08-04-81	12-05-81	35	-	101-B (Plnd) Headers
07	1984	01-01-84	25-01-84	25	-	01-01-84	25-01-84	25	-	Planned
08	1986	19-03-86	03-05-86	45	-	04-03-86	01-05-86	59	-	Reformer Revamp./HP Scrubber B/D
09	1987	12-04-87	03-05-87	21	-	12-04-87	02-05-87	20	-	Planned
10	1988	18-04-88	14-05-88	27	-	18-04-88	13-05-88	26	-	Planned
11	1990	05-02-90	05-03-90	29	688.67	31-01-90	07-03-90	35	829.0	Planned
12	1991	24-02-91	13-03-91	18	429.08	23-02-91	14-03-91	20	459.25	Planned
13	1992	03-11-92	03-12-92	30.6	734.91	03-11-92	04-12-92	31	744.75	Planned
14	1993	12-09-93	23-10-93	42	986.50	12-09-93	29-10-93	47	1120.58	Revamp-II
15	1995	14-01-95	27-01-95	14	311.34	11-01-95	26-01-95	16	352.18	Scrubber H-1203-BD
16	1996	14-06-96	13-07-96	30	712.00	13-06-96	13-07-96	30	694.25	Autoclave V-1201 Leakage
17	1997	12-05-97	17-06-97	35.6	875.00	12-05-97	17-06-97	36.2	870.50	Planned
18	1998	22-04-98	19-05-98	27.5	660.00	20-04-98	19-05-98	30.0	720.00	Planned
19	1999	12-04-99	30-04-99	18	434.50	11-04-99	28-04-99	17	409.75	Planned

PLANT TURNAROUND - APRIL - 1999

6

GENERAL - DETAILS

SR.NO.	CATEGORY	QUANTITY
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EQUIPMENTS UTILISED:

01	<u>IFFCO :</u>	
	55 T HM Crane	01
	15 T Coles Crane	01
	18 T Tata Crane	01
	10 T ESCORT LIFT-N-SHIFT	01
	03 T Forklift	03
	07 T Truck	01

HIRED :

	85 T P & H TRUCK MOUNTED MOBILE CRANE	01
--	---------------------------------------	----

02 IFFCO - MANPOWER :

a)	Mechanical	} Existing strength
b)	Mechanical Services	
c)	Electrical	
d)	Instrument	
e)	Trainees in various trade	

OTHER IFFCO UNITS MANPOWER:

a)	Maint. Supervisor	: 05
b)	Maint. Technician	: 05
c)	Inspection Technician	: 04
d)	Electrician	: 04
e)	Machinist	: 04
f)	MEO	: 02

QUANTITY

SR.NO. CATEGORY

**HIRED - CONTRACT MANPOWER**

<u>Sr.No.</u>	<u>Category</u>	<u>Mandays</u>
01	Mill Wright Fitter	69
02	General Fitter	663
03	Rigger	1051
04	S.S.Rigger	2790
05	Fabricator	230
06	Grinder	214
07	IBR Welder	32
08	Non-IBR Welder	254
09	Carpenter	34
10	Mason	16

**HIRED - IFFCO TIME OFFICE**

Labour unskilled

900 Mandays

MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

2

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
01	INSTALLATION OF NOZZLE RING IN 103-JAT	M/S.DEMAG DELAVAL TURBINE CO.U.S.A.	3294 19/01/98
02	OVERHAULING OF ROTATING MACHINE	M/S.GANGOTRI TURBOTEC HYDERABAD	5052 04/12/98
03	OVERHAULING OF ROTATING MACHINE	M/S.TURBOMACHINERY HYDERABAD	5052 04/12/98
04	AUXILIARY BOILER JOB	M/S.A.C.C., AHMEDABAD	5271 15/01/99
05	OVERHAULING OF RELIEF VALVES	M/S.FLOTEC ENGG. SURAT	5155 24/12/98
06	COMMISSIONING OF AG COMPRESSOR	M/S.BHEL, HYDERABAD	5476 24/02/99
07	COMMISSIONING OF AG COMPRESSOR	M/S.BHEL, HYDERABAD	5476 24/02/99
08	O/H & TESTING OF RELIEF VALVES	M/S.FMC SANMAR, VADODARA	4829 06/11/98
09	OVERHAULING OF HP CASE CO2 CENTRI.COMPR. K-1801.	M/S.HITACHI LTD, JAPAN	5056 07/12/98
10	OVERHAULING OF HP CASE CO2 CENTRI.COMPR. K-1801.	M/S.HITACHI LTD, JAPAN	5056 07/12/98
11	OVERHAULING AND TESTING OF RELIEF VALVES.	M/S.FMC SANMAR LTD VADODARA/TRICHI	4829 06/11/98
12	OVERHAULING OF RECLAIM MACHINE.	M/S.EMTCI ENGR.LTD V.V.NAGAR	4849 11/11/98
13	OVERHAULING OF RAH OF BHEL BOILER	M/S.BHEL, TRICHI	5479 24/02/99
14	RELOCATION OF VIBRATION PROBE & TRIP LEVEL ELLIOT TURBINE Q-4411	M/S.CICB, BANGLORE	PROJECT
15	REPLACEMENT OF C.W.PIPE LINES	M/S.TECHNOCON PROJECT & ENGG., VADODARA	3324 27/01/98

MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES 9

SR. NO.	JOB CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
16	FIBERSCOPIC INSPECTION	M/S.VORTEX ELECTRONICS SURAT.	5087 15/12/98
17	DEPUTATION OF ENGINEERS/ TECHNICIANS	M/S.CHAMBAL FERTILISERS, KOTA	4997 08/12/98
18	INSITU METALLOGRAPHY EXAMINATION	M/S.PDIL, SINDRI	4996 25/11/98
19	AUTOMATIC ULTRASONIC SCANNING	M/S.PDIL, SINDRI	4995 25/11/98
20	RADIOGRAPHY WORK	M/S.NDT SERVICES, AHMEDABAD	3729 01/04/98
21	SERVICES OF NDT THICKNESS MEASURE	M/S.S.R.TECHNICAL SERVICES, MUMBAI	4998 25/11/98
22	D.P.TESTING	M/S.S.R.TECHNICAL SERVICES, MUMBAI	4998 25/11/98
23	ULTRASONIC FLAW DETECTION	M/S.S.R.TECHNICAL SERVICES, MUMBAI	4998 25/11/98
24	MAGNETIC PARTICLE INSPECTION	M/S.S.R.TECHNICAL SERVICES, MUMBAI	4998 25/11/98
25	OVERALL SERVICING OF PLC IN AMMONIA PLANT	M/S.HIMA, GERMANY	FREE OF CHARGE
26	DCS SERVICES FOR AMMONIA PLANT.	M/S.YOKOGAWA BLUE STAR LTD, BANGLORE	4972 24/11/98
27	SERVICING OF UPS	M/S.INSTRUMENTATION LTD, JAIPUR	3688 27/03/98
28	SERVICING OF OMRAN PLC OF CO2 COMPR. K-1801	M/S.ASH AND ALAIN DELHI	3707 30/03/98
29	ANNUAL SERVICE CONTRACT OF LIBRA SCALES	M/S.WELDEAL CORPORATION, VADODARA	4417 10/08/98
30	UPS SERVICING BHEL BOILER	M/S.KELTRON, TRICHY	3177 24/12/97

MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

SR. NO.	JOB CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
31	SERVICING OF AMM. STORAGE LEVEL INDICATOR	M/S.TOSHNIWAL VADODARA	4437 12/08/98
32	PLC LINE UP N.G.BOOSTER COMPRESSOR	M/S.G.E.FANUC, HYDERABAD	19-007580 18/02/99
33	HYDROJET CLEANING OF HEAT EXCHANGERS	M/S.DELUXE HYDRO-BLASTING SERVICES MUMBAI	4714 08/10/98
34	HIRING OF MOBILE CRANE	M/S.J.H.PARABIA (TRANSPORT) PVT. LTD,VADODARA	4838 10/11/98
35	OPENING & BOX-UP OF HEAT EXCHAGERS	M/S.MAHAVIR ENGG. WORKS,VADODARA	5184 31/12/98
36	SUPPLY OF SKILLED MANPOWER	M/S.GENERAL ENGG. WORKS,BHARUCH	3203 01/01/98
37	COLD INSULATION OF FLASH DRUMS AMMONIA PLANT	M/S.LLOYD INSULATION (I) LTD,VADODARA	5383 05/02/99
38	REPAIR OF AUXILIARY BOILER IN AMM.PLANT	M/S.LEAR INSULATION ENGG.MUMBAI	5080 12/12/98
39	PROVIDING & FIXING DUROFLEX ACID/ALKALI PROOF LINING IN W.T.PLANT	M/S.CHEMISIGHT ENGG. VADODARA	4484 21/08/98
40	PROVIDING & APPLYING EPOXY MONOLYTHIC PASTE IN SILO	M/S.ARCOY IND. VADODARA	4919 18/11/98
41	REPAIR OF ACID/ALKALI PROOF LINING IN STRONG & WEAK EFFLUENT	M/S.CHEMISIGHT ENGG. VADODARA	4981 24/11/98
42	F.R.V.LINING ON FLOOR DRAIN IN W.T.PLANT	M/S.CHEMISIGHT ENGG. VADODARA	5033 01/12/98
43	CHEQUERED PAINTING ON OUTSIDE SURFACE OF PRILL TOWERS	M/S.R.K.PAINTS MEHASANA	4942 19/11/98

MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
44	APPLYING EPOXY PAINTING IN HYDROLISER, PRILL COOLING SYSTEM AND BAGGING PLANT.	M/S.B.CHAUHAN & CO KALOL	4935 19/11/98
45	I.P.NET PAINTING IN SILO	M/S.KRISHNA CONCHEM PRODUCT PVT.LTD DELHI	5414 11/02/99

PLANT TURNAROUND - APRIL-1999

12

AMMONIA PLANT

MECHANICAL JOBS

CODE NO                      JOB DESCRIPTION

01 01 01 AIR COMPRESSOR TRAIN - 101-J / 101-JT:

AIR COMPRESSOR DRIVE TURBINE 101-JT:

	<u>Clearance</u>	<u>Interface</u>
Thrust bearing side journal	0.2 MM	0.03 MM
Coupling side journal	0.18MM	0.03 MM
Thrust : 0.20 MM		

101-JLP CASE

	<u>Clearance</u>	<u>Interface</u>
Turbine side journal	0.17MM	
Gear box side	0.18MM	
Thrust	0.28MM	
Coupling float	9.28MM	
Total float	5.33MM	
Oil gland inner	0.09MM	
outer	0.26MM	

Gear box :

Law speed shaft :	HP side	: 0.2 MM
	LP side	: 0.21 MM
High Speed :	HP side	: 0.22 MM
	LP side	: 0.21 MM
Backlash :	0.32 MM	
Thrust (LP Gear):	0.32 MM (0.014")	
Pinon float :	1.10 MM	

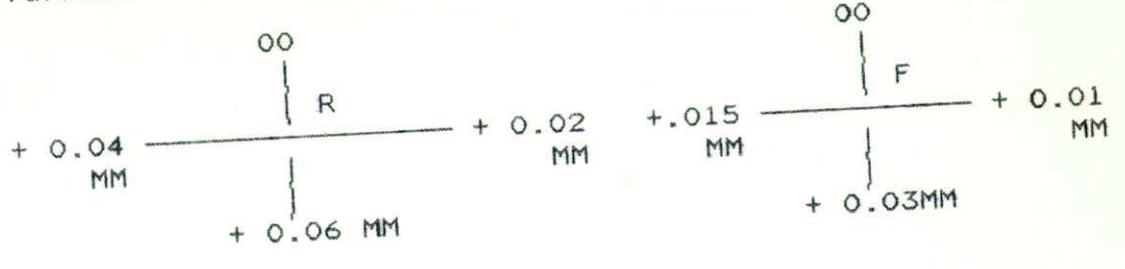
101-JHP CASE:

	<u>Clearance</u>	<u>Interface</u>
Gear box side journal	0.10MM	0.01 MM
T.B.side	0.09MM	0.01 MM
Thrust	0.22MM	
Total float	0.44MM	
Oil gland inner	0.06MM	
outer	0.05MM	

CODE NO                      JOB DESCRIPTION

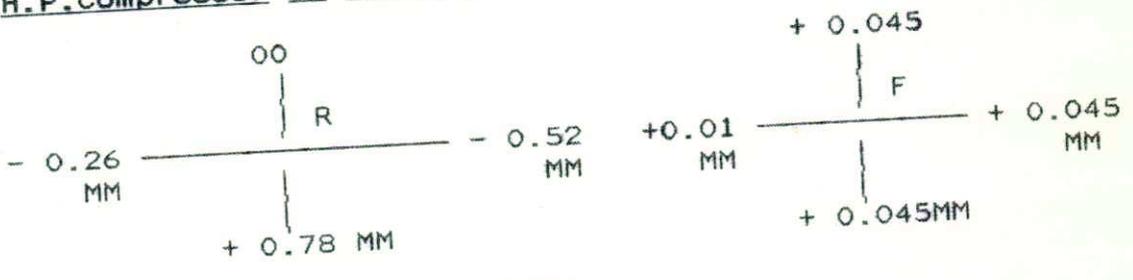
**Final alignment**

Turbine - LP Compressor



Shim provided in LP case

**H.P. Compressor to Gear Box:**



**01 01 02 N.G. COMPRESSOR TRAIN 102-J/JT:**

**N.G. COMPRESSOR DRIVE TURBINE = 102-JI:**

	Clearance	Interface
T.B. Side journal	0.13 MM	0.04 MM
Thrust bearing side	0.17 MM	0.04 MM
Thrust : 0.21 MM		
Float : 3.25 MM		

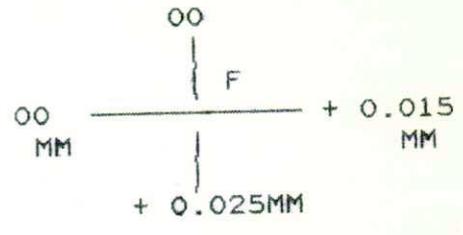
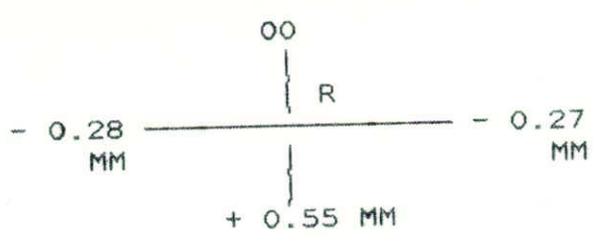
**102-J N.G. COMPRESSOR:**

	Clearance	Interface
Coupling side journal	0.07 MM	0.03 MM
Thrust bearing side	0.095 MM	
Journal bearing changed with new one.		
T.B. side journal	0.10 MM	0.03 MM
Thrust : 0.22 MM		
Float : 3.8 MM		

CODE NO	JOB DESCRIPTION
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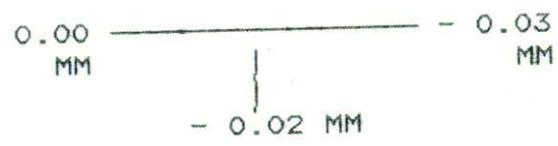
Final alignment reading

Compressor to Turbine

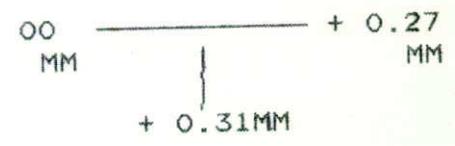


Centering reading

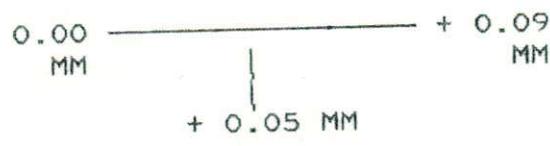
Front in coupling



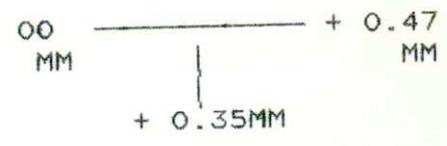
Front in Sealing



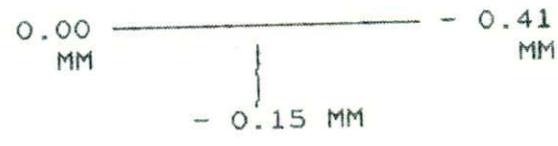
Front gland outer



Rear gland



Rear bearing housing



Coupling float 1.37 MM

01 01 03 SYN.GAS COMPRESSOR TRAIN 103-JAT/JBT,103-JLP/JHP:

103-JAT BACK PRESSURE TURBINE

Major overhauling was carried out in 103-JAT during shutdown. Complete turbine was dismantled for nozzle ring replacement with modified one for 2 stage modification which will enhance the out put horse power of turbine from 15400 to 18500 HP.

The above 103-J train job was awarded to M/s.Gangotri Turbotech, Hyderabad. The compressor train was handed over to maintenance on 12/04/99 11.00 A.M.

CODE NO

JOB DESCRIPTION

SALIENT FEATURES:

Modification carried out to enhance the capacity of the drive turbine to meet the plant capacity of 1100 tons per day ammonia production. To have higher capacity i.e. from 15440 HP to 18500 HP the nozzle ring was replaced with that of modified one. The following jobs carried out in the turbine 103-JAT.

MODIFIED NOZZLE RING:

Modified nozzle ring along with allen screws were procured from M/s. Demag Delaval Corporation, Trenton, USA. In new nozzle ring, nozzle area increased from 10.48in<sup>2</sup> to 11.73in<sup>2</sup>, other than this, the nozzle ring is identical to old one. The increase in area will permit more steam flow i.e. 256 to 257 Tons/hr.

In situ machining was carried out for making sealing fins as per details in the fig.1.

Removed the old ring cleaned and blue matching cheked and found almost 90 % matching. This rings holding allen screw tightened at 350 Ft.lbs torque.

While opening the casing bolts one if the stud got seized and which washed away the body thread and stud threads. New stud manufactured from our workshop out of EN 24 material. The female thread was cleaned with hand tap size 2 1/2 IN x 8 TPI. The stud could be tightened with required torque.

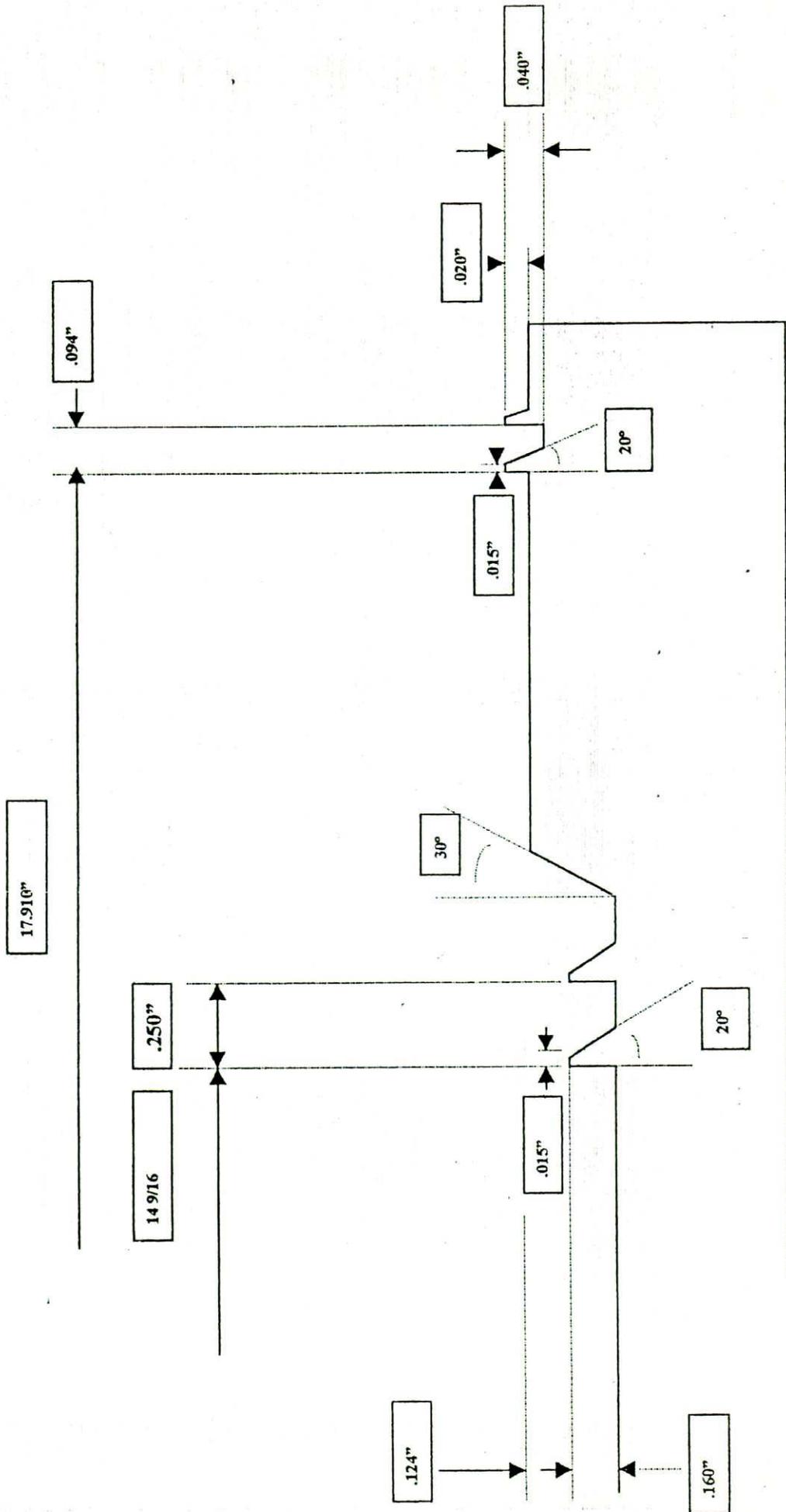
Rotor was having moderately salt deposit on second wheel which was cleaned by fine emery paper. The journal area found brownished and the thrust collar face also brownished and collar outer periphery pitted. Cleaned the brownished deposit. Active thrust pads and journal bearings found to be in good condition. Deep scratches were found on the face of inactive side thrust plain pad. Hence we changed the with new one.

All labyrinth clearances found to be more than maximum permissible and hence changed with new labyrinth. All final clearances noted are given in Annexure - I.

STEAM CHEST VALVE:

Washer part No.3 in the sketch on opposite to steam inlet side found worn away. Lifting bar also found not parralal because of worn out washer. Hardness of worn out washer is 165 BHN where as the steam end washer found to be 230 - 250 BHN. It was checked on new washer issued from store and found 230 - 250 BHN. Spacer of lifting bar also found worn away. Both spindles found to be in good condition. New washer and spacer assembled and final clearances and parrellity of lifting bar is given in Annexure - II.

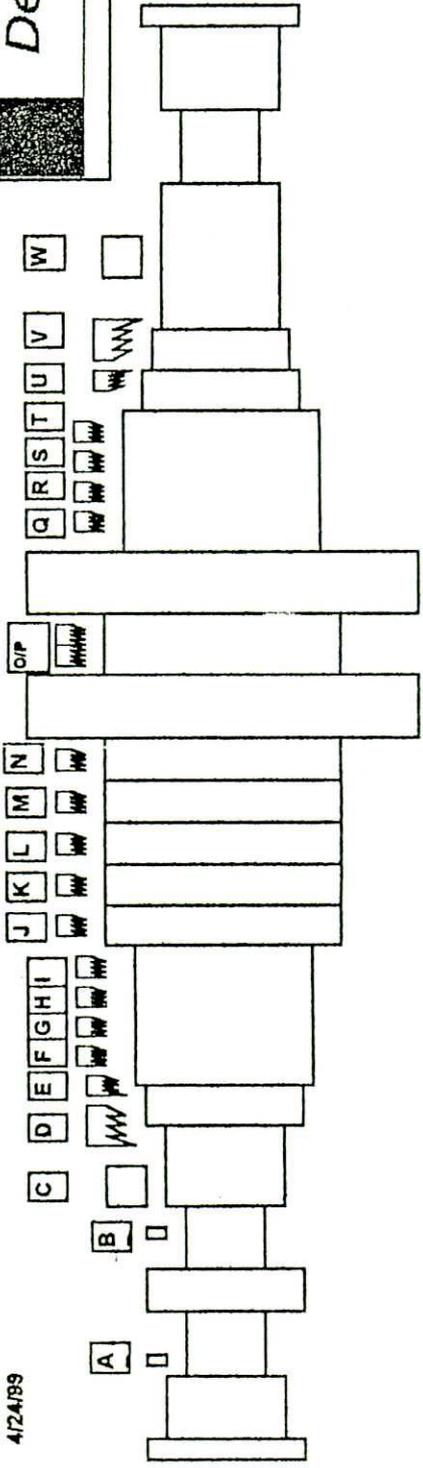
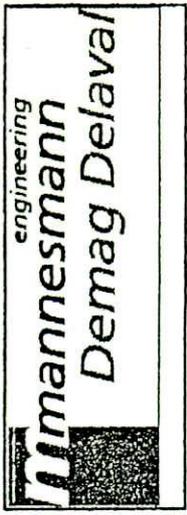
16



IFFCO 103JAT NOZZLE MACHINING  
20 APRIL 99

FIG. - 1

IFFCO KALOL UNIT  
103JAT  
4/24/89



	DESIGN	ACTUAL
A	OIL SEAL .002-.004	0.0078
B	OIL SEAL .002-.004	0.0078
C	BEARING .010-.012	0.0100
D	OIL GUARD .015-.021	0.0118
E	PACKING 1 .010-.022	0.0150
F	PACKING 2 .010-.022	0.0094
G	PACKING 3 .010-.022	0.0080
H	PACKING 4 .010-.022	0.0100
I	PACKING 5 .010-.022	0.0080
J	PACKING 6 .010-.022	0.0185
K	PACKING 7 .015-.018	0.0350
L	PACKING 8 .015-.018	0.0157
M	PACKING 9 .015-.018	0.0189

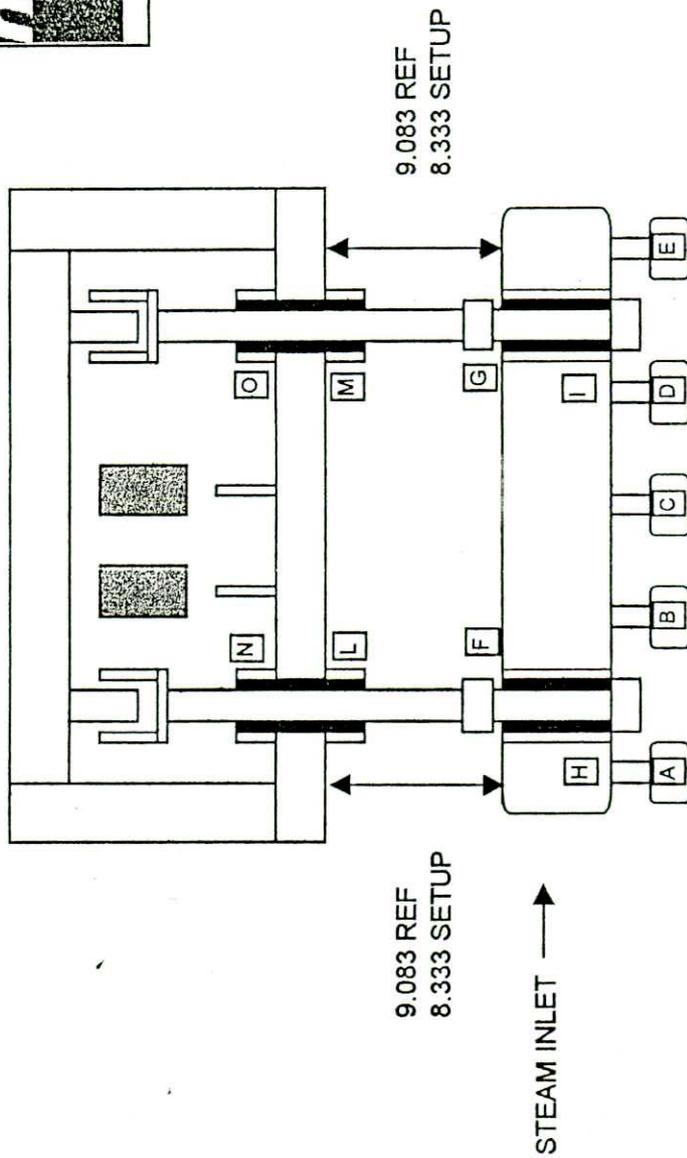
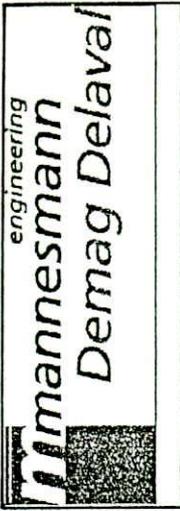
	DESIGN	ACTUAL
N	PACKING 10 .015-.018	0.0150
O	PACKING 11 .015-.018	0.0170
P	PACKING 12 .015-.022	0.0170
Q	PACKING 13 .015-.022	0.0120
R	PACKING 14 .015-.022	0.0090
S	PACKING 15 .015-.022	0.0080
T	PACKING 16 .015-.022	0.0100
U	PACKING 17 .015-.022	0.0150
V	OIL GUARD .015-.021	0.0157
W	BEARING .006-.008	0.0060

NOZZLE CLEARANCE	.035-.045	0.0380
2ND STAGE CLEARANCE	.035-.045	.062/.052
THRUST	.008-.012	0.0090

BEARING CRUSH		
THRUST END	.000-.001	0.0000
EXHAUST END	.000-.001	0.0008

ADDED .001 SHIM

IFFCO - KALOL  
103JAT  
24-Apr-99



VALVE TIMING				
A	B	C	D	E
DESIGN	0.9000	0.4600	0.1000	0.6800
COLD BAR	0.1000	0.1000	0.1000	0.1000
ACTUAL	0.9960	0.5650	0.2200	0.7780

BUSHING CLEARANCE				
	DESIGN	ACTUAL	DESIGN	
F	.003-.010	0.006	M	.006-.0075
G	.003-.010	0.004	N	.006-.0075
H	.002-.008	0.006	O	.006-.0075
I	.064-.094	0.076		
L	.006-.0075	0.006		



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 CODE NO                      JOB DESCRIPTION  
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**PREVENTIVE MAINTENANCE OF 103-JBT, 103-JLP & 103-JHP:**

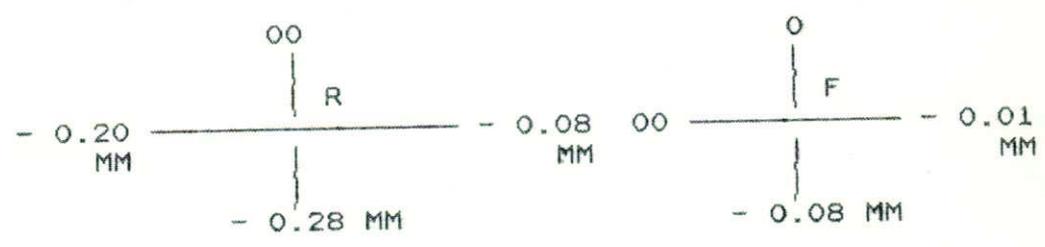
Bearings were opened and checked. Couplings were opened and checked, cleaned and boxed up.

**Clearances**

	Thrust end journal	Opp. Thrust end journal	Thrust	Front
	-----	-----	-----	-----
103-JBT	0.21 MM	0.27 MM	0.24MM	4.18MM
103-JLP	0.14 MM	0.11 MM	0.38MM	3.08MM
103-JHP	0.11 MM	0.15 MM	0.40MM	3.85MM

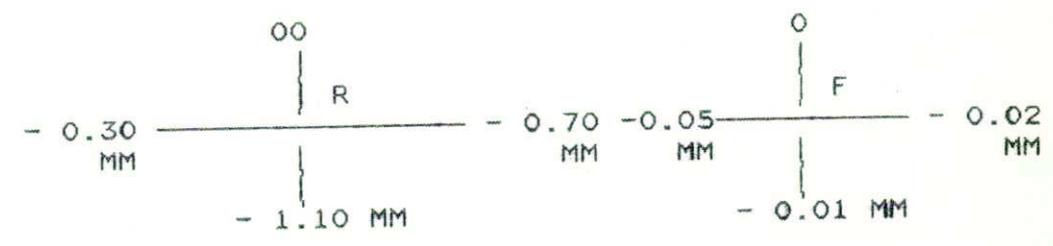
**Alignment Reading:**

103-JBT to 103-JAT



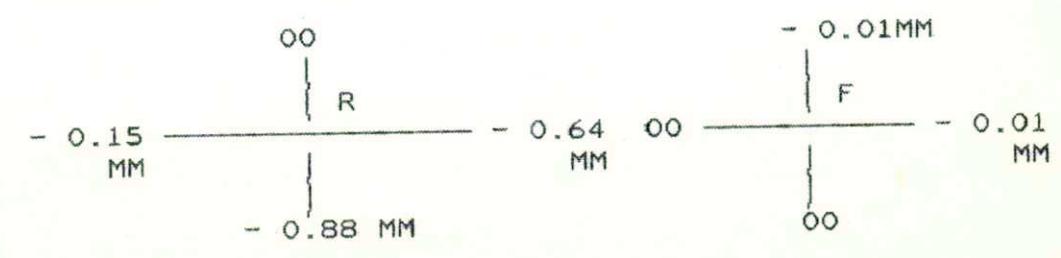
**Alignment Reading:**

103-JAT to 103-JLP



**Alignment Reading:**

103-JLP to 103-JHP



20

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CODE NO                      JOB DESCRIPTION  
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**01 01 04    REFRIGERATION COMPRESSOR TRAIN 105-JLP/JHP/JR,105-JT:**

105-J train job was awarded to M/s.Turbo-machinery Technical Services,Hyderabad. 105-JLP and 105-JHP Compressor taken for majour overhauling to attend seal leakage.

Compressor isolation was given by production on 15/04/99. Alingment bolts were loosened on 14/04/99. Clearance for lifting the top cover was given on 15/04/99 09.00A.M.After lifting of top housing it was noticed , full of oil in casing and impellers. Mechanical seals are also having oil sludge and carbon deposits, carbon faces were found worn out.

L.P.Rotor coupling hubs got damaged during removal. Material pealed off alongwith coupling hub boss. Because of this damaged existing rotor assembly was changed with new spare rotor with new coupling hub. All internals i.e. diaphragms and rotor were cleaned by hydrojetting to remove solid deposits inside. In HP Rotor and diaphragm were cleaned by hydrojetting to remove deposits inside.Gear box overhauling done. Removed pinion and wheel. All journal bearing found ok. cleaned the journal bearings, gear teeth and boxed up.

**PREVENTIVE MAINTENANCE OF TURBINE 105-JT:**

During major overhauling of compressors preventive maintenance of turbine was carried out. Bearings and couplings were opened for inspection.

- Journal bearing clearances and interferences (in mm)

Front side	-	0.22 MM	0.02 MM
Rear side	-	0.22 MM	0.02 MM

- Thrust float - 0.21 MM
- Trip lever clearance - 3.60 MM
- Turbine Pinion shaft thrust float - 0.10 MM
- Governor worm shaft float - 0.32 / 0.33 MM
- Back bush between worm wheel & Pinion shaft - 0.15MM

**SPARES USED IN TURBINE DURING THE PREVENTIVE MAINT.:**

1. Turbine front journal bearing Tilting pads - 5 Nos.
2. Governor worn shaft thrust cum journal Brg. - 5 Nos.
3. Governor worn shaft thrust rings - 2 Nos.
4. Thrust bearing non-active side shims - 2 Nos.

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 CODE NO                      JOB DESCRIPTION  
 -----

**105-J LP CASE (105-JLP):**

- Journal Bearing clearances (in mm)
  - OTB side - 0.175
  - TB side - 0.15
- Thrust float - 0.29 MM
- Total float (without thrust bearing) 4.95 mm
- Oil gland clearances - 0.20 mm
- Shrunk fit clearances - Coupling
  - OTB side - 7.15 mm
  - TB side - 9.26 mm

Labyrinth seal radial clearances (in mm)

Position	Left	Right
1	0.45	0.38
2	0.30	0.35
3	0.45	0.40
4	0.35	0.30
5	0.40	0.45
6	0.35	0.30
7	0.45	0.35
8	0.25	0.25

- Buffer gas seal clearances (in mm)

	Left	Right
Front	0.15	0.15
Rear	0.15	0.15

**SPARES USED DURING THE OVERHAUL (LP COMPRESSOR)**

1. Complete Rotor - 1 No
2. Mechanical Seal - 2 Sets
3. Thrust collar - 1 No
4. Thrust bearing spacer rings - 1 Set
5. Locking sleeves - 3 Nos
6. All "O" Rings
7. Coupling hub end unit - 2 Nos
8. Labyrinths - 2 Nos
9. "O" Rings and Back up washer for coupling hub.

**105-J GEAR BOX (105-JR):**

- Bearing clearances and Interferences (in mm)

	Clearance	Interference
1. Pinion front	0.23/0.25	0.03
2. Pinion Rear	0.22	0.03
3. Gear wheel front	0.27	0.02
4. Gear wheel Rear	0.27	0.03

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 CODE NO                      JOB DESCRIPTION  
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- Gear wheel thrust float - 0.35
- Gear wheel to pinion back lash - 0.35

**105-J HP CASE (105-JHP):**

- Journal bearing clearances
  - OTB side - 0.12
  - TB side - 0.12
- Total float - 4.20 mm
- Thrust float - 0.32 mm
- Oil gland clearance - 0.10 mm
  
- Labyrinth seal clearances (in mm)

Position	Left	Right
	-----	-----
1	0.35	0.40
2	0.30	0.30
3	0.30	0.35
4	0.30	0.30
5	0.35	0.35
6	0.30	0.30
7	0.35	0.35
8	0.30	0.30
9	0.30	0.35
10	0.30	0.30
11	0.35	0.30

- Buffer gas seal clearances (in mm)

	Left	Right
	-----	-----
Front	0.20	0.20
Rear	0.20	0.20

- Coupling
  - OTB side shrink fit - 7.15 mm

**SPARES USED DURING THE OVERHAUL (HP COMPRESSOR)**

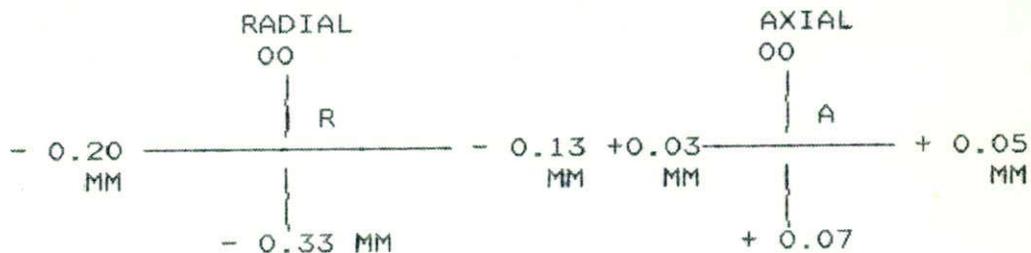
1. Mechanical seals - 2 Nos
2. Labyrinth seals - 7 Nos
3. Wear Rings - 2 Nos
4. All "O" Rings
5. Thrust bearing shims - 1 No

CODE NO

JOB DESCRIPTION

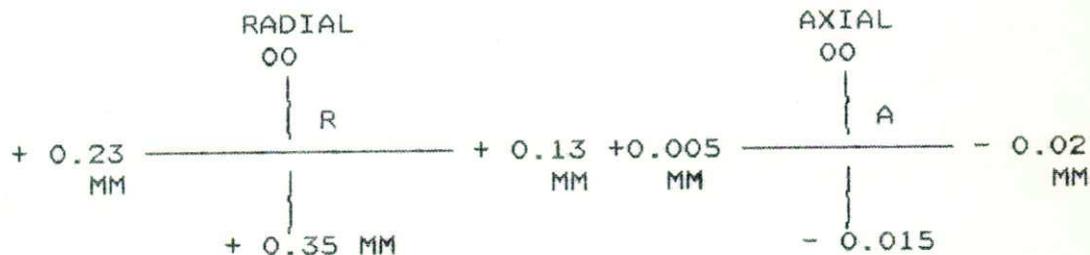
**TURBINE TO LP COMPRESSOR**

NOTE :- Fixture mounted on turbine rotor, Dial on LP Compressor rotor.



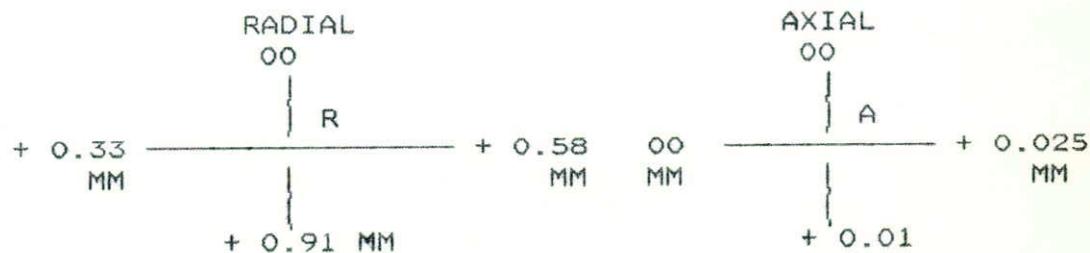
**LP COMPRESSOR TO GEAR BOX**

NOTE :- Fixture on LP Compressor rotor, dial on gear box rotor.



**GEAR BOX TO HP COMPRESSOR**

NOTE :- Fixture mounted on HP Compressor rotor. Dial on Gear Box.



24

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CODE NO                      JOB DESCRIPTION  
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01 01 05 N.G. BOOSTER COMPRESSOR TRAIN - 800-J/800-JT:

Preventive maintenance of N.G. Booster train was carried out.

N.G. BOOSTER COMPRESSOR DRIVE TURBINE 800-JT:

Following jobs were carried out.

- Bearing checking.
- Steam chest valve servo motor overhauling.
- Coupling checking.
- Alignment.

	Clearance -----	Interface -----
Coupling side journal	0.2 MM	0.01 MM
T.B. side journal	0.2 MM	0.01 MM
Thrust	0.16 MM	
Float with thrust bearing	1.67 MM	

800-J N.G. BOOSTER COMPRESSOR

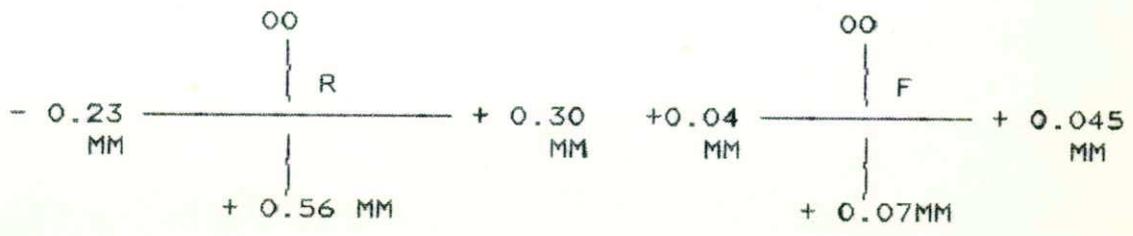
	Clearance -----	Interface -----
Turbine side journal	0.1 MM	0.01 MM
A.G. side journal	0.11MM	0.01 MM
Thrust : 0.30 MM		

A.G. COMPRESSOR :

	Clearance -----	Interface -----
N.G. Side journal	0.1 MM	0.01 MM
Thrust bearing side	0.18MM	0.01 MM
Thrust : 0.22 MM		

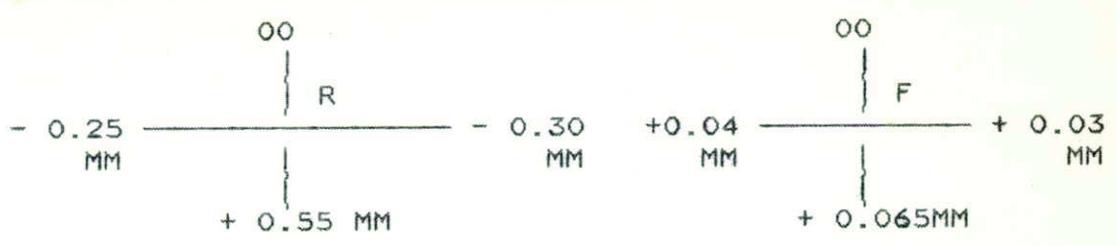
Final Alignment reading

Turbine - N.G. Compressor  
Reading taken on N.G. Compressor



CODE NO	JOB DESCRIPTION
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N.G.Compressor - A.G.Compressor  
Reading taken on A.G.Compressor



A.G.Compressor coupled with N.G.Compressor commissioned by BHEL Engineer Mr.Shrinivas Charula.

01 02 01 BOILER FEED WATER PUMP AND DRIVE TURBINE  
104-J/JA - 104-JT/JAT:

104-JA B.F.W.PUMP

All bearings checked final clearances are as below.

Coupling side journal : .005" to .006" & 0.020" gasket provided between parting plane of bearing housing and 0.004" shim provided on bearing top to maintain interference.

T.N. side journal .006" to .0075" & 0.008" gasket provided on parting plan of journal bearing.

Axial float : 0.34 MM  
Active side pads replaced and 0.004" shim provided.

104-J

All bearing checked and final clearnace are below. Coupling side journal clearance : 006" to 007". Journal bearing charged with that M/s.Kanpur Metals (Indigenous). T.B side journal clearance : 0.008". Axial float 0.34 MM.

104-JAT

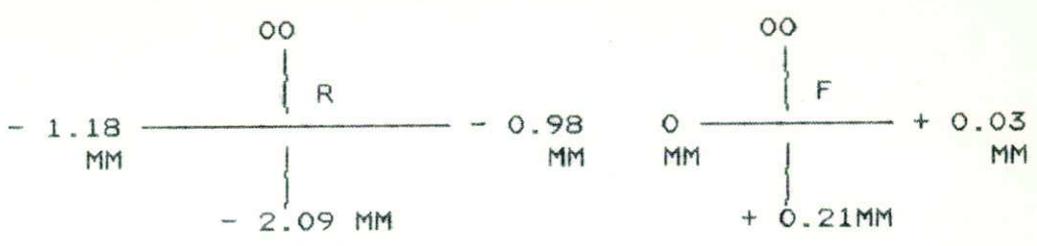
Coupling side journal clearance : 0.006"  
T.B.side journal clearance : 0.008" to 0.0095"  
Axial float : 0.028"  
Base ring changed, Pads also changed  
Coupling float 12.71 MM.

104-JT

Coupling side journal clearance : 0.008" to 0.009"  
T.B.side journal clearance : 0.008" to 0.0085"  
Coupling float : 9.08 MM

CODE NO	JOB DESCRIPTION
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Final alignment readings. 104-JA to 104-JAT



Woodward governor oil cooler procured from M/s.Woodward governor india were installed on both 104-JAT and 104-JT.

01 02 02 101-J LUBE OIL PUMP DRIVE TURBINE-101-JLJT:

OVERHAULING OF TURBINE

Before overhauling turbine rotor float checked and found 0.040" because of damaged bearings. Both side bearings changed. Steam chest clearance with rotor maintained as..

Final float after bearings assembled : 0.003"

- Bearing driven end : 6308 : 1 No Qty.
- Bearing drive end : 7312 : 2 Nos. Qty.

Preventive maintenance of 103-J LOP / SOP drive turbine and 102-J LOP/SOP drive turbine. 800-J LOP drive turbine float checked found okay. Decoupled and alignment checked and rectified wherever required.

01 03 01 I.D.FAN TRAIN - 101-BJ / 101-BJT:

Preventive maintenance of turbine and fan were carried out. Bearings to turbine, gear box, and fan checked, and found Ok. Standby L.O.Pump filter changed with self cleaning type available in our stock. The clearances are as below.

T.B.side journal clearance : 0.006"

Journal bearing replaced with new one because of clearance at maximum limit.

- Coupling side journal clearance : 0.0065"
- : 0.0075"

Oil cooler was procured from M/s.Woodward Governor (I) Ltd.

CODE NO	JOB DESCRIPTION
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**GEAR BOX**

High speed shaft journal clearance

A = 0.006"  
B = 0.0065" to 0.007"

Low speed shaft journal clearances :

A = 0.005" to 0.006"  
B = 0.007" to 0.0085"

**01 04 01 LUBE OIL CONSOLE - 102-J:**

102-J Console oil replaced with new oil Servo Prime-68.

Quantity : 6,000 Ltrs.

**01 04 02 LUBE OIL CONSOLE - 101-J / 105-J:**

Existing lube oil was servo prime-68. We were facing problems of refrigeraion compressor trap chocking due to polimerisation of servo prime-68 oil and ammonia which causes to form pasty solution which obstruct the out let hole in the trap. This traps are provided to collect the sour oil draining from mechanical seal of compressor and outlet goes to degassing tank. The trap level goes high because of outlet chocking. There is sperator provided to seperate out the oil from the gas coming out of the trap. The oil free gas goes to the suction of compressor through piping from seperator. When the trap out let chockes and continuously oil draing to the trap raise the level in the system which attains a point where oil flows to the suction of the compressor through seperator. Ultematly oil is siphoned out to compressor instead of draining to traps. Base on the feed back from Phulpur plant where Servo press T-68 in place of Servo prime-68 is in use in their refrigeration system for seal flushing and lubrication from last 10 years and working satisfactorily.

105/101-J Train console oil change from Servo Prime-68 to Servo Press T-68.

Quantity : 10,000 Ltrs.

**01 04 03 LUBE OIL CONSOLE - 800-J:**

800-J Console oil replaced with new oil Servo Press-46-T.

Quantity : 8,500 Ltrs.

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CODE NO                      JOB DESCRIPTION  
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01 12 01 PRIMARY REFORMER - 101-B:

PENT HOUSE JOB:

Following damaged burner blocks were replaced.

312,314,503 and 508.

01 12 02 AUXILIARY BOILER FRONT WALL REPAIR:

Front wall plate was burned at different location near 3rd,4th and 5th burner due to crack in front wall refractory. Hot flue gas passes to front wall plate through gap formed by refractory wall crack.

During shutdown complete front wall was removed. Pre-fabrication of panels and burner housing was done at our workshop and shifted to the site before shutdown. Material of burner housing ring changed from Carbon steel to SS 310 material. SS 310 plate was rolled at sub vendor shop in Kalol and welded at our workshop.

Fabrication work at site completed by 10 days and refractory work completed in 5 days.

Burner block procured from M/s.ACC,Ahmedabad. Refractory material of burner block is ACCMON LC-90 which has heat resisting capacity upto 1800 Deg.C.

50 MM thick ceramic fibre blanket provided at back of brick layer (MK-26) to take up expansion. All hot face insulating castable are of white heat with 50 MM back up insulating castable of insulite 11. Anchors are to inconol 601.

All front wall fitting like, inspection window and pilot burners are salvaged from existing. All burners were overhauled and fitted back ( Final as built drawing of front wall No.01/BS/03131 sheet 1 of 1 Rev.0)

01 12 03 SECONDARY REFORMER (103-D):

Top dome cover flange joint leak :

The top dome cover was leaking during plant running and it was attended by fastening a clamp around the flange.

During the shutdown dome was removed along with air nozzle for gasket changing. Straightening vanes of nozzle pipe were fouling with liner inside the secondary reformer. Hydraulic jacks used to push up the nozzle. However the nozzle assembly was removed without damaging the liner. New gasket was placed and assembled the dome flange.

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 CODE NO                      JOB DESCRIPTION  
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Bottom cover was opened for inspection of liner condition.  
 Liner was found sheared at one place near transfer line  
 which was repaired by patch work with Incoloy 800 of 6 mm  
 thick plate. Inco weld - A electrodes used for repair.

01 12 04    TRANSFER LINE 107-D:

Transfer line plug opened, minor bulging found.

01 13 01    HEAT EXCHANGERS AND COOLERS HYDROJET CLEANING:

(I)            Following heat exchangers were opened for  
 pulling out the tube bundle and hydrojetting of  
 tubes were carried out. Tube bundle and channel  
 covers were boxed up. Hydrotest was carried  
 out as mentioned below.

Sr. No.	Equip ment.	Qty. Nos.	No.of Tubes	Retu- bing	Tube side		Shell side		Hydro -jet clean -ing
					Design Prss.	Hydro tested	Design Prss.	Hydro tested	
1	109-C1A/ C1B	02	1150	-	30.58	46.0	5.29	08.00	Tube & shell side
2	115-C	01	649"U" Tube	-	29.9	-	10.6	16	- Do -
3	116-C		300"U"	-	73.1	-	10.5	16	- Do -
4	124-C	01	775"U" Tube	-	158	-	17.6	28.0	- Do -
5	131-JC	01	690	-	17.58	-	05.25	08.0	- DO -

30

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CODE NO                      JOB DESCRIPTION  
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(II) Following heat exchangers & coolers were opened & boxed up after hydrojetting from tube side. Exchangers were also hydrotested after assembly.

Sr. No.	Equip ment.	Qty. Nos.	No. of Tubes	Retu- bing	Tube side		Shell side		Hydro -jet clean -ing
					Design Prss.	Hydro tested	Design Prss.	Hydro tested	
01	102-C	01	750	-	730	-	2515	-	-
02	105-CA	01	2790	-	75	115 Psig	440	660	Tube side
03	105-CB	01	-	-	75	-Do-	-Do-	660	-Do-
04	108-CA/ CB	04	1415	-	05.27	08.00	05.27	08.00	-Do-
05	109-C2A /C2B	02	1150	-	435	655	75	115	-Do-
06	110-CA /CB	02	763	-	05.60	-	05.27	-	-Do-
07	111-CA	01	2790	-	05.27	STATIC	05.27	08.00	-Do-
08	111-CB	01	2790	-	05.27	STATIC	05.27	08.00	-Do-
09	127-CA	01	3100	-	05.60	-	21.10	30.00	-Do-
10	127-CB	01	3516	-	05.60	-	21.10	30.00	-DO-
11	128-C	01	1200	-	05.60	8.44	8.09	12.30	-DO-
12	129-JC	01	290(U)	-	1040	1560	120	180	-DO-
13	130-JC	01	-	-	75	115	75	115	-DO-
14	172-C	01	400	-	5.6	8.5	5.3	8.0	-DO-
15	173-C	01	294	-	10.60	-	05.30	80.00	-DO-
16	175-C	01	222	-	3.2	-	-	-	-DO-
17	176-C	01	-	-	-	-	-	-	Tube & shell side

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CODE NO                      JOB DESCRIPTION

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- 111-CB    1 Tube was plug
- 127-B     3 Tubes were plug
- 108-CA    1 Tube was plug

**01 15 01    BOILER INSPECTION:**

IBR validity for boiler 101-F along with 101-C available till May-2000, boiler inspection was carried out for obtaining up to 2001.

All blow down valves were repacked and lapped seats for leaking. 101-C down comer flange leak attended and rectified by changing gasket. Gauge glasses and it's isolation valves overhauled. Steam drum along with down comer and riser insulation replaced with new one.

Hydrotest of 101-F alongwith 101-CA/CB at 145 Kg/cm<sup>2</sup> and 112-C at 15 Kg/cm<sup>2</sup> witnessed by IBR inspector and certified for 2 years upto 23/04/2001.

**(A)    OPEN INSPECTION:**

Open inspection of following boilers were carried out.

- (a) GT-1631 (112-C)    (b) GT-1632 (101-F)

**(B)    HYDROTEST:**

Hydrotest of GT-1631 (112-C) and GT-1632 (101-F) carried out. Test pressure are as under.

- a) GT-1631 (112-C)    :    15 Kg/cm<sup>2</sup>
- b) GT-1632 (101-F)    :    145 Kg/cm<sup>2</sup>

**(C)    BENCH TEST:**

Bench test of 112-C safety valves carried out and readings are as under.

	Popping Pre.	Reset Pre.
	-----	-----
R.V.No.1 (Front)	10.5 Kg/cm <sup>2</sup>	10.0 Kg/cm <sup>2</sup>
R.V.No.2 (Rear)	10.0 Kg/cm <sup>2</sup>	9.5 Kg/cm <sup>2</sup>

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 CODE NO                      JOB DESCRIPTION  
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**(D) R.V.FLOATING:**

Steam test of safety valves of boiler No.GT-1632(101-F) as well as Superheater R.V.were carried out and the readings are as under.

Pressure KG/CM2	S A F E T Y   V A L V E			
	NORTH	MIDDLE	SOUTH	SUPERHEATER
Popping	115	117	119	111.8
Reset	109	110	115	109.6

**01 15 02 L.P.BOILER - 112-C:**

112-C main channel cover gasket joint leak attended by changing the gasket with new one.

**01 17 01 VALVES REPAIR / REPLACEMENT JOBS:**

Following valves repaired / replacement carried out during shutdown.

1. Primary Reformer burner - 1 atomising steam line union replaced.
2. K-1 vent sample line top isolation valve replaced.
3. 102-JLO turbine steam inlet PI isolation valve replaced.
4. 800-JLO turbine inlet trap bypass valve replaced.
5. FT-1018 first I/V H.P.tapping valve removed.
6. Atomising steam line union leak in burner No.405 & 509 attended by replacing the same.
7. FIC-19 bypass valve replaced.
8. 103-JBT steam I/L bottom drain line union replaced.
9. 103-JBT steam I/L trap I/V replaced.
10. FT-1017 HP tapping root valve replaced.
11. Auxiliary Boiler Br.No.2 steam line control valve bypass valve u/s union replaced.

CODE NO	JOB DESCRIPTION
12.	FT-201 (102-JT steam inlet) HP/LP transmitter root valve replaced.
13.	102-JLO turbine trap 1st isolation valve replaced.
14.	103-JBT inlet trap isolation valve replaced.
15.	FI-54, HP tapping root valve to be replaced.
16.	101-F first I/V replaced.
17.	LCV-8 bypass valve replaced.
18.	LCV-10 bypass valve replaced.
19.	109-F drain valve replaced.
20.	111-F drain valve replaced.
21.	112-F drain valve replaced.
22.	C.E.P.Turbine (NGBC) steam inlet drain valve replaced.
23.	851-JT steam inlet PCV U/S block valve u/s drain valve replaced.
24.	126-C shell side drain valve replaced.
25.	38 Kg. steam to pre-reformer header trap bypass valve replaced.
26.	B-4 PGR drain valve replaced.
27.	H S header drain valve near Auxiliary Boiler IInd valve replaced.
28.	LTS PI tapping I/V replaced.

01 17 02 MISCELLANEOUS REPAIR / REPLACEMENT JOBS:

1. 103-JLO Cooler top isolation valve replaced.
2. 103-JBT condensor CW outlet valve replaced.
3. LTS bottom steam inlet block valve u/s flange leak attended by changing gasket.
4. PRC-25 block valve d/s flange leak attended by changing gasket.
5. R-112 O/L to 180-J suction N2 circuit block valve d/s flange gasket changed.

CODE NO	JOB DESCRIPTION
6.	800-JT turbine inlet flange leak attended by changing gasket.
7.	11-K steam valve above PIC-13A/B, bonnet gasket changed
8.	Auxiliary Boiler Br.No.1 steam inlet control valve bypass valve u/s flange gasket changed.
9.	101-L inlet valve replaced.
10.	C.G.circulator discharge d/s to LTS flange gasket changed.
11.	108-J suction drain valve replaced.
12.	107-JT hand nozzle Gland repacked.
13.	800-JTLS inlet to hogging jet isolation valve u/s and d/s flange leak attended.
14.	104-J C.W.inlet and outlet drain valve replaced.
15.	101-B row No.6 north side steam header I/V gland repacked.
16.	38 ata steam to prereformer trap isolation valve gland repacked.
17.	101-B atomising steam header trap R.No.4 north side trap u/s elbow replaced.
18.	MIC-61 u/s drain valve Gland repacked.
19.	MIC-61 u/s trap isolation valve Gland replaced.
20.	Trap isolation valve gland leak near MIC-10 repacked.
21.	Trap isolation valve Gland near R-112 repacked.
22.	Trap isolation valve Gland near 112 repacked.
23.	Trap isolation valve Gland near P-110/B repacked.
24.	L.S.trap isolation valve Gland near E-110/B repacked.
25.	TRC-10 sealing steam isolation valve Gland repacked.
26.	PCV-860 u/s isolation valve Gland repacked.
27.	PCV-860 bypass valve Gland repacked.
28.	101-F South side L.G.isolation valve Gland repacked.
29.	PIC-5 Snuffing steam valve (ground level) gland repacked.

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CODE NO                      JOB DESCRIPTION  
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**01 17 03    RV'S OVERHAULING AND TESTING:**

Following RV's were removed, overhauled and tested at our test bench and installed back in it's position.

SR. NO.	TAG NO.	DESCRIPTION	SET VALUE KG/CM2g	ACTUAL SET PRES. KG/CM2g	RESET PRESSURE KG/CM2g
01	RV-LS-1	LS Steam Header	12.5	12.5	11.7
02	RV-101-BJ	I.D.Fan turbine exhaust	5.3	5.3	4.9
03	RV-MS-9	38 K Steam Header	42.2	42.2	42.5
04	RV-102-D	102-D inlet	43.9	43.9	43.5
05	RV-105-F	Syn.Gas Comp.1st stage Seperator	73.8	73.8	73.4
06	RV-104-D-1	Inlet line to HTs	35	35	28
07	RV-101-E	101-E Gas exit	30.6	30.6	30.4
08	RV-109-F	105-J Discharge	19	19	18
09	RV-110-F	110-F	7	7.2	6.5
10	RV-111-F	111-F	6.3	6.3	5.8
11	RV-112-F	112-F	6.3	6.3	6
12	RV-106-J	106-J Discharge	30.9	31	27.5
13	RV-105-D	103-J Recycle	152.9	152.9	152
14	RV-103-J	124-C Outlet	158.9	158.9	159
15		Utility BFW coil RV	92	90	90
16	RV-101-F1	South side steam drum RV	120	115	115
17	RV-101-F2	Middle side steam drum RV	117	110	110
18	RV-101-F3	North side steam drum RV	115	109	109
19	RV-101-B	Superheater coil RV	110	109.6	109.6
20	RV-112-C-1	112-C	10.5	9.3	9.3
21	RV-112-C-2	112-C	10	9	9
22	RV-123-C	123-C	123	120	112

**01 19 01    CO2 STRIPPER 102-EA/EB:**

102-EA distributor found to be damaged. Both were sheared and dislocated the distributor pipe. Reclarified and boxed up.

Welding cracks obsorved in 102-EB which was repaired by welding. 101-E manhole opened for inspection found okey.

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CODE NO	JOB DESCRIPTION
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01 19 02 VESSEL JOBS:

Following vessels were also opened for internal inspection.  
Internals found okey.

- |          |             |
|----------|-------------|
| 1. 101-F | 7. 110-F    |
| 2. 102-F | 8. 111-F    |
| 3. 103-F | 9. 112-F    |
| 4. 104-F | 10. H-110   |
| 5. 105-F | 11. H-111   |
| 6. 107-F | 12. R1 & R2 |

01 20 01 FABRICATION JOBS:

Following jobs of piping fabrication carried out.

1. 104-J NRV and isolation valve replaced.
2. 108-F, HP Ammonia liquid outlet line 1" R.O.furmanite box removed and new line fabricated.
3. MP steam header loop to C.W.turbine drain line 3/4" replaced.
4. 36" check valve and isolation valve installed in cooling water line to new cooling tower.
5. 106-J fittings replaced along with line.
6. 170-CA/CB corroded nozzle with flange (north side) replaced.

PLANT TURNAROUND - APRIL-1999

AMMONIA PLANT

INSPECTION JOBS

CODE NO	JOB DESCRIPTION
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01 41 01 INSPECTION JOBS:

During April, 99 Shutdown from 12.4.99 to 28.4.99, the following major inspection activities were performed in Ammonia Plant.

1. Automatic ultrasonic scanning of all the catalyst and Riser tubes of Primary Reformer Furnace.
2. Insitu metallography of selected equipments and pipelines.
3. Thickness measurement on equipments and pipelines.
4. Ultrasonic flaw detection on selected weld joints of critical pipelines.
5. Magnetic Particle inspection of weld joints of selected pressure vessels of low temperature service.
6. Inspection of newly fabricated pipelines for replacement which mainly include naphtha line, DM Water line, 101-F Steam Drum blow down lines and underground cooling water pipelines.
7. Other miscellaneous jobs like qualification tests of welders employed by contractors, visual inspection of equipments, magnetic field measurement on rotors of 103-JAT, 105-J LP and HP case etc.

The detailed observations and recommendations for individual equipments are given below. All the observations were recorded during inspection and were handed over to concerned Maintenance and Operation group for necessary corrective action based on the observations made.

(A) PRIMARY REFORMER 101-B:

RADIANT ZONE AND CONVECTION ZONE:

1. VISUAL INSPECTION:

Visual inspection of the entire furnace radiant zone, including harp assemblies, refractory and insulation, burner-blocks, and HT-LT convection zones etc. was carried out. The following important observations called for rectifications:-

CODE NO

JOB DESCRIPTION

- a) The brick lining on East wall of the Primary Reformer radiant zone was found to have got bulged-inward causing gap between lining and metallic wall. Scattered areas were also seen on North wall where refractory lining was damaged. The temperature of the radiant walls from outside was measured using Infra-red Thermal Imaging

System prior to shutdown and it was found to be ranging from 143 deg.C to 172 deg.C in majority area of East wall with isolated spots showing temperature of 290 deg.C.

It is recommended to reline the LT convection zone south wall also as the temperature on outside wall had "hot-spots" ranging from 253 deg.C to 425 deg.C. These areas were inaccessible for repairs from inside as these were beneath the LT steam Superheater Coil and BFW Coil.

- b) The Reformer outlet Collector header insulation was found badly damaged causing direct exposure of outlet header to flue gases. The insulation of all the eight headers was recommended for replacement, which was done by Ammonia maintenance.
- c) The fiber blankets in the HT convection zone are covered by thin sheet of SS-310. This sheet has got badly buckled and burnt off losing its strength. The exposed fiber blankets have got the erosion effect due to high velocity of flue gases and therefore it is recommended to replace the protective sheet with incolloy sheet particularly in the wall area below Mixed Feed Coil.
- d) The LT steam superheater coil has got sagged as has been observed in the past. The intermediate supports of this coil have got badly damaged. Also, at three different locations, the fins of the top row of tubes have got detached. Metallographic examination on the bare tube portion indicated deterioration of micro structure of the tube material. It is recommended to replace this Coil.
- e) Aux. boiler furnace front wall replacement was done during this Shutdown.

CODE NO

JOB DESCRIPTION

**2. NDT ACTIVITIES:**

- a) Automatic ultrasonic scanning of all the 336 Catalyst tubes and 8 Risers tubes was carried out during this Shutdown. In all, 59 tubes were observed to be in 'C' category i.e more deteriorated tube condition indicating voids, micro and macro fissures in the tubewall. 277 tubes were detected to be in 'B' category and no tubes were found to be in 'A' grade. The summary of tube conditions is enclosed herewith at Annexure-1. One riser tube was in 'C' category whereas remaining seven risers are in 'B' category. 'B' category indicates the presence of some defect free areas and some micro-voids and macro fissures.
- b) Insitu metallography of Riser tubes no.1 and 8 was carried out. No abnormalities were detected in the micro structure.
- c) DP test of all the 16 Nos. header field weld joints was carried out. No defects were observed in them.
- d) At random, DP test of catalyst tube to weldolet and weldolet to header weld-joints for the following catalyst tubes was carried out. No defects were observed.
- 121, 122, 221, 222, 321, 322, 421, 422, 521, 522, 621, 622, 706, 713, 726, 732, 738, 807, 813, 820, 827, 834, 840.
- e) Creep measurement of all the catalyst tubes in appx. upto 7 feet length above tunnel slab level was carried out using GO-NOGO Gauge. Creep was found to be less than 0.73 percent. On tubes No. 828 to 842, Creep was checked at mid length also which was also found to be less than 0.73%.
- f) Creep measurement of Riser Tubes was also carried out. Max. Riser O.D. was measured to be 4.959" which corresponds to 0.4 percent creep.
- g) Creep measurement of outlet headers was carried out. Max. header O.D. was measured to be 5.615" which corresponds to 0.3 percent creep.
- h) Bottom header clearance was taken (without insulation). The clearance was found to be adequate.
- i) Spring hanger readings of catalyst tubes, transferline and collector header drain readings in cold condition were taken.

40

CODE NO

JOB DESCRIPTION

- j) Ultrasonic flaw detection of dissimilar metal weld joint of catalyst tube No.112 (G-4852 to T-11 material) was carried out. No defect was observed in this weld joint. Weld joints of other tubes could not be made accessible to avoid damage to roof insulation as it was taking place while exposing this weld joint.
- k) West wall header box panel segment was opened for thickness measurement on Ammonia BFW Coil tubes. Thickness measurement revealed that considerable reduction has taken place on tube no.1 and tube no.2 connected to inlet header. Min. thickness was observed to be 3.6 mm and 3.8 mm on tube no.1 and tube no.2 against design thickness of 5.54 mm. Both the tube segments were replaced with new one. Radiography and DP test were carried out for tube to tube weld joint and found satisfactory. Tube to Header branch weld was only DP tested after root and final welding.
- l) Thickness measurement of HT Steam Superheater Coil and LT Steam Superheater Coil was carried out. Min. thickness was found to be 8.2 mm on HT Coil and 5.9 mm on LT Coil for the top row of tubes, which were accessible for thickness measurement.

01 41 02 VESSELS AND OTHER EQUIPMENTS:

1) 102-C. SECONDARY WASTE HEAT EXCHANGER:

Visual inspection of the top and bottom Channel domes, Dye penetrant test of all the tube to tubesheet seal welds for top and bottom tubesheets, Ultrasonic thickness measurement of the tubes at the periphery through inspection windows were carried out. No abnormality was detected during Visual examination. No defects were observed in D.P. test also except a few superficial indications on bottom tubesheet which were acceptable and did not require repairs.

Minimum thickness of 69.1 mm was found on shell against the design thickness of 66.6 mm. Minimum thickness of 4.6 mm was observed on tubes against design value of 4.06 mm.

2) 103-D. SECONDARY REFORMER:

SECONDARY REFORMER BOTTOM :

Visual inspection of Secondary Reformer Bottom zone was carried out after removal of plug of bottom manhole. The following observations were made.

41

CODE NO	JOB DESCRIPTION
	<p>a) The gas distributor of 101-CB waste heat boiler had got opened up by appx. 4 inches along its length. This may result in improper distribution of gases and uneven heating of 101-CB tubes bundle.</p> <p>b) The skirt lines below the dome was observed to have got bulged inwards in appx. 40% circumference particularly on East side and the refractory lining behind the same had got spallen away. The repairs of refractory work was recommended.</p> <p>c) The liner of 101-CB line from 103-D was found distorted and bulged at different locations. The inward bulging/distortion had appx. 2" protrusion all around the circumference causing some restriction of gas flow.</p> <p>d) The liner segment of 101-CA nozzle liner had got displaced axially by appx. 4 inches causing exposure of backing refractory all around the circumference.</p> <p>e) Minor cracks and erosion were observed on dome bricks.</p>
3)	<p><b><u>107-D, TRANSFER LINE:.</u></b></p> <p>Visual inspection of Transfer line (107-D) was carried out. The following observations were made.</p> <p>a) Inward bulging by about 1 to 2 inch of liner was observed around all the riser stub ends except riser No.3.</p> <p>b) Around riser no.5,6,7 and 8 castable refractory found loose in the opening between riser stubend and liner.</p> <p>c) Top portion of riser no.7 and 8 found projected outside the liner by about 5 to 7 mm and the same found deformed in shape.</p>
4)	<p><b><u>102-EA, CO2 STRIPPER:</u></b></p> <p>a) All the bolts of distribution header flange were found sheared and distribution header inlet pipe was also found sheared and got detached from its weldjoints with distribution pipe I-piece. About 6 Nos. of transverse cracks were also observed @ 1" to 5" in length) on the horizontal piece of distribution header.</p> <p>b) 1" dia stiffner pipe provided on west side leg of distribution header pipe piece was found sheared on its south end alongwith base plate.</p>

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CODE NO	JOB DESCRIPTION
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- c) 5 Nos. of fastening bolts were found missing on deflector plate provided on east side.
- d) Fastening bolts provided for supporting I-beam were found loose at both of its ends. Two Nos. of @ 4" long cracks were observed at the centre of I-beam support.
- e) All the three stitch welds at north end on 8" wide deflector plate provided below the west leg of distribution header were found cracked.

5) 102-EB, CO2 STRIPPER:

1. All the bolts of distribution header inlet flange were found sheared, and inlet pipe was found resting on sheared bolts.
2. Two nos. of cracks, one of @ 12" length and another of @ 5" length were observed on liquid inlet pipe weld joint with distribution header.
3. Fastening bolts provided at both the sides of cross supporting I-beam were found sheared and I-beam also was found to have a crack in about 75% of its cross sectional area at the centre.
4. Tack welding of both the U-clamps provided at the centre of I-beam was found sheared.
5. 8" wide vertical deflector plate provided below both the distribution legs of distribution header were found detached completely from welding.
6. On the top tray, One no. of perforated tray segment and one No. of plane tray segment were found torn at north end just below the east side leg of distribution header.
7. 1" dia stiffner pipe provided at east leg of distribution header was found detached from its supporting plate at its south end.

6) 101-F, STEAM DRUM:

Visual inspection of Steam Drum was carried out. The following observations were made:-

1. The Drum had greyish black colouration from inside.
2. 5 Nos. of fastening bolts of west side separator plates were missing, and one bolt was found to be sheared off.

43

CODE NO

JOB DESCRIPTION

3. 4 nos. of fastening bolts of east side separator plates were found to be sheared off.
4. Between 4th and 5th downcomer (counting from south to north) there is a nozzle of 1" NB size which was found choked.
5. One loose nut and one bolt were found inside the drum which were taken out.
6. Pinhole of appx. 3 mm dia was observed on the welding of 6" BFW distributor pipe near flange joint.
7. Ultrasonic thickness measurement was carried out. Minimum thickness of 111.02 mm on shell and 108.16 mm on dished end was observed against design value of 106.4 mm on shell and 106.4 mm on dished end.

7) 102-F, RAW GAS SEPARATOR:

Visual inspection of Raw Gas Separator was carried out. The following observations were made:-

1. Liquid outlet nozzle at bottom was found to have severe corrosion channeling and loss of wall thickness of appx. 2 to 5 mm. Corrosion attack was also seen on the nozzle weld. In view of the above, repairs of nozzle was recommended.
2. Epoxy paint had got peeled off at scattered location. At some locations, previous coat was seen, however at about 7 different locations, shell metal had got exposed.
3. Epoxy lining on the face of nozzle (from 106-C) had also got peeled off.
4. Demister pad at top was found intact in position.
5. On southwall of the shell, appx. 8-10" above bottom circumferential weld seam, 3 Nos. of corrosion cavities with appx. 10 mm dia and 2-3 mm depth were observed. These needed to be filled with some protective coating to prevent further corrosion.
6. Manhole nozzle welding (at bottom) inside the shell had got corrosion attack resulting in about 3-5 mm deep cavities. Same attack had been observed on the stub end of this nozzle.

h4

CODE NO

JOB DESCRIPTION

7. Ultrasonic thickness measurement was carried out. Minimum thickness of 36.50 mm on shell and 35.70 mm on dished end was observed against design value of 34.92 mm on shell and 33.34 mm on dished end.

8) 103-F. REFLUX DRUM:

Visual inspection of the drum was carried out. The following observations were made:-

1. Demister pad was found dislocated at three locations towards control room side.
2. Condition of paint was found to be ok.
3. Thickness measurement was carried out. Minimum thickness of 10.9 mm on shell and 12.6 mm on dished end was observed against design value of 11.11 mm on shell and 11.11 mm on dished end.

9) 104-F. SYN. GAS COMP. SUCTION DRUM:

Visual inspection of the drum was carried out. The following observations were made:-

1. Scaling was observed at bottom dished end.
2. Brownish black colouration was observed at 1 metre from bottom in about 1 sq. metre area.
3. Demister pad was in good condition.
4. All the weld joints of shell and nozzle joints were found in good condition.
5. Thickness was taken. Min. thickness was observed to be 26.1 mm on shell and 29.0 mm on top dished end against design value of 24.60 mm on shell.

10) 105-F. SYN. GAS COMP. 1ST STAGE SEPARATOR :

Visual inspection of the vessel was carried out. The following observations were made:-

1. Minor scaling was observed at bottom dish end.
2. Scattered pittings of 1 to 1.5 mm deep were observed throughout the shell.
3. Demister pad fasteners were loose. One bolt of circular holding ring of demister pad was missing.

CODE NO

JOB DESCRIPTION

**11) 107-F PRIMARY AMMONIA SEPARATOR:**

The vessel was offered for inspection of its internal after necessary purging. The observation were as under:-

1. Colouration of vessel internals found to be greyish black.
2. Scattered thin scales were observed on the shell and dished end.
3. All the weld joints were found free from any corrosion attack.
4. Magnetic particle examination of all the weldjoints from the inside of vessel was performed. No defects were revealed during the test.
5. Ultrasonic thickness measurement of the vessel was carried out. Minimum thickness of 14.5 mm on shell and 17.5 mm on dished end was observed against design value of 14.28 mm on shell and 14.28 mm on dished end.
6. The overall condition of the vessel was found to be satisfactory.

**12) 110-F, FIRST STAGE REFRIGERANT FLASH DRUM:**

Visual inspection of the drum was carried out. The following observations were made:-

1. The shell had assumed brownish black colouration.
2. Oil layer was found on the surface of shell.
3. The Demister pad was found intact in position.
4. All the weldjoints were found free from any sign of corrosion.
5. Scattered mill scales were observed on dishends and shell.

**13) 111-F, SECOND STAGE REFRIGERANT FLASH DRUM:**

The following observations were made during visual examination.

1. The shell had assumed blackish colouration.
2. All the weld joints were found to be free from any corrosion.

46

CODE NO	JOB DESCRIPTION
	3. Thin layer of oil was observed on the complete inside surface.
	4. The demister pads were intact in position and in good condition.
	5. Ultrasonic thickness measurement was carried out. Minimum thickness of 10.3 mm on shell and 22.7 mm on dished end was observed against design value of 10.31 mm on shell and 19.05 mm on dished end.

14) 112-F, THIRD STAGE REFRIGERANT FLASH DRUM:

The following observations were made during visual examination.

1. The demister pads were in good condition.
2. The colouration of the shell was blackish.
3. Oil was found sticking to the vessel shell.
4. All the weld joints and shell internals were found to be free from corrosion.
5. Overall condition of the vessel was satisfactory.
6. Ultrasonic thickness measurement was carried out. Minimum thickness of 10.4 mm on shell and 22.6 mm on East side dished end and 12.6 mm on West side dished end was observed against design value of 10.31 mm on shell and 19.05mm on East and 9.525 mm on West dished end respectively.

15) H-110 NAPHTHA PREHEATER:

Visual inspection was carried out and observations were as under:-

1. Loose insulation material of convection zone was found lying on two burners.
2. Floor cleaning was recommended as debris were lying on the floor.
3. On Refractory lining of shell, minor cracks were observed at several places mainly in vertical plane.
4. Coil support bolts were found loose at some places.
5. Convection zone was inspected from outside only through manhole and found ok.

CODE NO

JOB DESCRIPTION

**16) H-111, NAPHTHA SUPER HEATER:**

Visual inspection observations were as under:-

1. Convection zone insulation material was found lying on two burners.
2. Refractory pieces, which got eroded was found accumulated on the floor. The same was cleaned.
3. Several shallow cracks were observed on shell refractory.
4. One of the big gun of one side burner got dislocated and loose from the joints which was recommended to be rectified.
5. Floor refractory was slightly damaged near central burner of appx. 6" dia.
6. A layer of refractory of shell had eroded at several places.
7. Coil support bolts were found loose at several places.
8. Convection zone was inspected through manhole only and found okay.

**17) R-1, PGR PLANT DRYING VESSEL:**

The vessel was offered for its internal inspection after removal of Alumina balls and molecular sieve. The observations of visual inspection are as under:-

1. The colouration of vessel inside surface was observed to be brownish.
2. Rusting and minor scattered loose scaling was observed on the shell surface.
3. Bottom and top grill found intact in position.
4. Wire mesh fixed on top and bottom grill found intact in position except both having 4 to 5 cut marks of about 3 to 4 inch length.
5. The overall condition of the vessel found satisfactory on visual inspection.
6. Ultrasonic thickness measurement was carried out. Minimum thickness of 36.30 mm on shell and 36.10 mm on dished end was observed against design value of 36 mm on shell and 36 mm on dished end.

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CODE NO                      JOB DESCRIPTION  
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**18) R2. PGR PLANT DRYING VESSEL:**

The vessel was offered for its internal inspection after removal of Allumina balls and molecular sieve. The observations of visual inspection are as under:-

1. The shell had assumed brownish colouration.
2. Rusting and thin loose scales were observed on the inside surface of shell.
3. The overall condition of the vessel was found to be satisfactory.
4. Ultrasonic thickness measurement was carried out. Minimum thickness of 36.20 mm on shell and 35.90 mm on dished end was observed against design value of 36 mm on shell and 36 mm on dished end.

**19.) 106-F. SECONDARY AMMONIA SEPERATOR:**

Ultrasonic thickness measurement was carried out. Minimum thickness of 108.7 mm on shell and 61.20 mm on dished end was observed against design value of 105.0 mm on shell and 54.0 mm on dished end.

**01 41 03 MISCELLANEOUS JOBS:**

**1. WELDER QUALIFICATION TESTS:**

- a) Performance qualification tests of 14 Nos. non-IBR and 2 Nos. IBR welders offered by M/s General Engg. Bharuch was carried out. 10 Welders in non-IBR and 2 welders in IBR category were qualified during the test. These welders were allowed to perform non-critical welding jobs in the plant.
- b) Performance qualification test for 13 Nos. welders was carried out for M/s Shri Ganesh Engg. Co., Ahmedabad. Out of 13 welders, 5 welders were qualified based on visual test, bend test and radiography results. The fabrication of naphtha line (4"NB) from Offsites to Ammonia plant and DM water line in Ammonia Plant were carried out by this agency.
- c) Welder qualification test of 13 Nos. welders of m/s Technocon, Baroda, was carried out. Six welders were qualified for performing welding jobs on CW and HW return pipelines in Ammonia plant.

49

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CODE NO	JOB DESCRIPTION
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- d) Welder performance qualification test for 15 Nos. welders was carried out for the fabrication of Blow down lines, urea plant carbamate line Tee joint and other pipelines fabrication jobs ordered on M/s Jacobs H&G Ltd. Four welders were qualified for these fabrication jobs.
- e) Two welders were offered by M/s J&J Engrs for performance qualification for fabrication work of NG bypass line in Ammonia plant. Both the welders failed during the test. The work was performed by the existing qualified welder available with the party.

## 2. CRANE LOAD TEST:

One No. Crane was hired from M/s J.H. Parabia, Baroda. Load test of this Crane was carried out at 12 tonnes test load with 150 feet boom length and 15 meters radius. The crane was found fit for use during load testing and on subsequent visual inspection of components.

## 3. D.P. TEST:

Dye penetrant examination of weld joints of all the pipelines fabricated by M/s Shri Ganesh Engrs., Ahmedabad, M/s Technocon, Baroda, M/s Jacobs H&G Ltd., Mumbai, and our Workshop group was carried out after root run welding and after final welding. Any defects observed during the tests were rectified in the presence of inspector followed by DP test for acceptance. Services of four Nos. of qualified Dye Penetrant examination Teams were availed from M/s S.R. Technical Services, Mumbai.

## 4. RADIOGRAPHY:

In order to ensure immediate radiography work and urgent reports on observations, teams from M/s NDT Services, Ahmedabad, were hired on round the clock basis during entire shutdown period. Radiography was performed on miscellaneous weld joints like LS-17 and LS-19 low pressure steam lines to 102-EA/EB in Ammonia plant, Urea and utility plants. Also, Radiography of few weld joints of Naphtha (pre-reformer area), Hot Ammonia line from Ammonia to Urea plant were carried out on chargeable basis to avoid delay as they were falling in the purview of the contractor.

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 CODE NO                      JOB DESCRIPTION
 

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5. INSITU METALLOGRAPHY EXAMINATION:

In order to evaluate the condition of certain critical plant equipments and pipelines, insitu metallographic examination was carried out. The details of spots examined on individual equipments are given in the attached site report submitted by M/s PDIL, Sindri, from whom the services of metallurgist were availed. No major abnormality in the micro structure or further deterioration on the spots examined earlier was found. The site report is attached herewith at Annexure-2.

6. HARDNESS MEASUREMENT:

In view of the damage to the fins observed at few locations on top row of LT steam superheater coil, hardness measurement was carried out on tubes in bare portion. Similarly, hardness was also measured on HT steam superheater coil tubes. Hardness measurement was done using Telebrineller Hardness Tester. Hardness was observed to be 185 to 187 BHN on HT steam superheater coil and 182 to 185 BHN on LT Steam Superheater coil. These readings does not indicate any abnormality in the coil materials.

7. ULTRASONIC FLAW DETECTION OF WELDS:

Weld joints (selected only) of the following pipe lines were ultrasonically examined for assessing any development of service defects/growth of the acceptable defects. No abnormalities were observed in any of the weld joints inspected. Discontinuities detected during Ultrasonic Flaw Detection were counter checked with spot radiography for finding out their nature and deciding the further course of action. No discontinuity was required to be repaired.

SL NO.	LINE NO.	FROM	TO	NO. OF JOINTS EXAMINED
1.	SG-33-14"	105-D	123-C	8
2.	SG-25- 8"	SG-23	105-D	7
3.	PG-6-18"	104-D	103-C	9
4.	PG- 7-12"	PG -6	104-C	11
5.	PG-24-10"	PG-17	PG-18	8
6.	HS-3H-12"	HTSC COIL	OUTLET	6

51

CODE NO.	JOB DESCRIPTION			
SL NO.	LINE NO.	FROM	TO	NO. OF JOINTS EXAMINED
7.	BW-30H-12"	101-F	COIL-E	5
8.	BW-31H-10"	101-F	COIL-D	6
9.	BW-32H-12"	101-F	COIL-C	5
10.	BW-9H-8"	103-C	BW-8H	1
11.	BW-10H-8"	103-C	BW-8H	1
12.	BW-8H-12"	HEADER	103-C	3
13.	BW-14H-10"	HEADER	103-C	3
14.	BW-11H-8"	BW14H	103-C	2
15.	BW-12H-8"	BW14H	103-C	2
16.	MS-12-6"/10"	MIC-22	MS-9	3
17.	MS-13-8"/6"	PIC-13B	MS-9	3
18.	MS-14-8"/6"	PIC-13A	MS-9	3
19.	PG-2-18"	102-C	PG-4C	4
20.	PG-4-24"	PG-5D	PG-3C	2
21.	PG-3-18"	PG-4	104-D TOP	1
22.	PG-5-14"	102-C	PG-4	1

#### 8. ULTRASONIC THICKNESS MEASUREMENT:

During the shutdown, ultrasonic thickness measurement was carried out on various pipelines and equipments in the plant. The detailed results of inspection are attached herewith at Annexure-3 (for equipments) and Annexure-4 (for pipelines)

#### 9. SPARK TESTING :

Spark testing of coating and wrapping applied on underground cooling water/hot water lines was carried out. These lines were replaced by Technical department.

52

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CODE NO                      JOB DESCRIPTION  
-----**10. MAGNETIC PARTICLE INSPECTION:**

Weld joints of the following equipments were examined by Magnetic Particle Test after necessary surface preparation. No defects were observed during the test.

SL. NO.	EQUIPMENT NO.	DESCRIPTION	REMARK
1.	111-F	2nd Stage Refrigerent Flash Drum.	Done from inside.
2.	112-F	3rd Stage Refrigerent Flash Drum.	-do-
3.	104-F	Syn.Gas Compressor Suction Drum.	-do-
4.	105-F	Syn.Gas Compressor 1st Stage Seperator.	-do-
5.	107-F	Primary Ammonia Seperator	-do-
6.	108-F	Purge Gas Seperator	Done from outside.

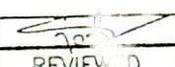
 PDIL 	<b>N.D.T. &amp; S. DEPARTMENT</b> <b>INSPECTION REPORT OF AUS</b>	9126-PSMD-AUS-17
		REPORT NO.
		SHEET 08 OF 19

ANNEXTURE - 1

TABLE - 1

INTERPRETATION OF AUS GRADES

GRADE	CONDITION OF TUBE
A	New tubes or tubes having least deterioration indicating large defect free area and presence of small random voids beyond the limit of detection.
B	Deteriorated tube condition indicating some defect free areas and presence of micro-voids and micro-fissures.
C	More deteriorated tube condition indicating voids, micro-fissures and macro-fissures.
D	Most deteriorated tube condition with large defective areas containing micro-fissure and mid-wall cracks.

0	22.07.98	ISSUED FOR IMPLEMENTATION	L. PANDIT		
RFV	DATE	PURPOSE	PREPARED	REVIEWED	APPROVED

 PDIL pdl	<b>N.D.T. &amp; S. DEPARTMENT</b> <b>INSPECTION REPORT OF AUS</b>	9126-PSND-AUS-17 REPORT NO. SHEET 18 OF 19
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TABLE-11  
GRADATION OF TUBES BY AUS

GRADE	ROW NO.	TUBE NOS.	NO. OF TUBES	TOTAL TUBES
A				NIL
B	1	01,03,05 to 08,11 to 14,16 to 27 31,34 to 36,41 & 42	28	
	2	01 to 8,14,16,20,22 to 24,26,30, 31,33,35 to 40	24	
	3	01 to 36,39 & 40,	38	
	4	02 to 05,10,12 to 21,23 to 29,31 to 41	33	
	5	01 to 42	42	
	6	01 to 23,26,27,29 to 38,41 & 42	37	
	7	01 to 33,35 to 41	40	
	8	02 to 25,27,29,34 to 42	35	277
C	1	02,04,09,10,15,28 to 30,32,33, 37 to 40	14	
	2	09 to 13,15,17 to 19,21,25,27 to 29,32,34,41 & 42	18	
	3	37,38,41 & 42	04	
	4	01,06 to 09,11,22,30 & 42	09	
	5	Nil	00	
	6	24,25,28,39 & 40	05	
	7	34 & 42	02	
	8	01,26,28, 30 to 33	07	59
TOTAL NO. OF TUBES				336

RISER TUBES

		B R-1 to R-4,R6 to R8	7	
		C R5	1	

TOTAL NO. OF RESER TUBES 8

0	22.07.98	ISSUED FOR IMPLEMENTATION	L. PANDIT	702	702
RFV	DATE	PURPOSE	PREPARED	RFVIFWD	APPROVED



# प्रोजेक्ट्स एण्ड डेवलपमेंट इण्डिया लिमिटेड

(भारत सरकार का उपक्रम)

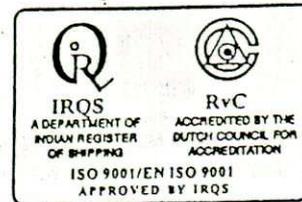
## PROJECTS & DEVELOPMENT INDIA LIMITED

(A GOVT. OF INDIA UNDERTAKING)

REGD. OFFICE : P. O. SINDRI, PIN-828122, DHANBAD, BIHAR, INDIA

TELEX : 06201-201 & 202 PDIL IN • PHONE : 0326-51250

FAX : 0326-51272 • E-MAIL : pdil.sindri@smv.sprintrpg.ems.vsnl.net.in



ANNEXTURE - 2

### PRELIMINARY SITE REPORT

SUB : PRELIMINARY SITE REPORT OF IN-SITU METALLOGRAPHY EXAMINATION OF DIFFERENT VESSELS, PIPELINES AND TUBES OF AMMONIA & UREA PLANTS OF IFFCO - KALOL.

The In-situ metallographic examination of different equipments in Ammonia and Urea Plants of IFFCO Kalol Unit, were carried out by M/s PDIL, Sindri, headed by Dr. K.C. Patnaik, Dy. Supdt., CRW, from 13.4.99 to 26.4.99 vide Work Order No. 04997/AMS dt. 15.3.99. The In-Situ metallography examination was carried out as per the advice of Co-ordinator of IFFCO Kalol Unit and the selection of spots were also done by the co-ordinator. Altogether 51 points were examined on different equipments and their results were discussed with Mr. S.C. Mallick, Sr. Manager(Insp). The following equipments were examined during Shutdown period.

<u>Sl. No.</u>	<u>Items</u>	<u>Spot taken</u>
1	RISER TUBE NO 1 & 8	2
2	PROCESS GAS KNOCKOUT DRUM (157-F)	2
3	104 C METHANATOR FEED PRE HEATER	3
4	(103 C) PRIMARY WASTE HEAT BOILER	3
5	LT SUPER HEATER COIL	5
6	HT SUPER HEATER COIL	2
7	PG 5 - 14" (102 C OUTLET LINE)	1
8	PG 2 - 18" (MIXXING TEE)	1
9	PG 4- 24 " (MIXXING TEE)	1
10	101 F (STEAM DRUM)	2
11	FUEL PREHEATER (151 C)	1
12	NG FEED PREHEATER (150 C)	1
13	HYDROGEN FROM PGR TO 103 J (PIPE LINE)	1
14	CONVERTER INLET NOZZLE AT BOTTOM (105 D)	1
15	CO2 ABSORBER	1
16	NAPHTHA SUPERHEATER (H-111) COIL	2
17	NAPHTHA PREHEATER (H-110) COIL	2
18	AUXILIARY BOILER DOWN COMER TUBES	2
19	START UP HEATER (102 B) COIL	4
20	FROM 108 - F TO E-3, 4" LINE	1
21	104 C INLET & OUTLET NOZZLE	2
22	102 C OUTLET NOZZLE (NEAR MIXING TEE)	1
23	102 C OUTLET NOZZLE (BELOW MIXING TEE)	1
24	HTS OUTLET PIPE BEND (OUTSIDE THE VESSEL)	1
25	LTS INLET BOILER (112 C)	6
26	HP STRIPPER GAS OUTLET PIPE AT THE BEND	1
27	AUTOCLAVE OUTLET (OFF GAS) TO SCRUBBER	1



प्रोजेक्ट्स एण्ड डेवलपमेंट इण्डिया लिमिटेड

(भारत सरकार का उपक्रम)

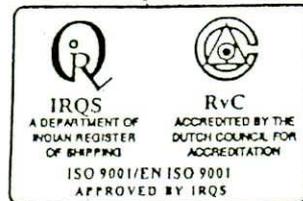
PROJECTS & DEVELOPMENT INDIA LIMITED

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### RESULTS & DISCUSSIONS:

Altogether 51 points were examined on different equipments as mentioned above. All the equipments showed normal metallurgical microstructural deterioration due to long service except LT Super Heat Coil No.3 at the middle zone which showed complete decomposition of pearlitic areas. Still then it is in serviceable condition but vigilance should be made to check during service. All other equipments are in serviceable condition.

This is a Site Report and the final Report will be sent from M/s PDIL, Sindri.

We are very much thankful to Mr. S.C. Mallick, Sr.Manager(Inspection), and their Staff for the co-operation extended to us to execute this job during Shutdown period. We are also thankful to the management of IFFCO for providing us all the facilities required during our stay.



( Dr.K.C. Patnaik )  
Dy.Suptd-CRW,  
PDIL, Sindri

Camp : IFFCO - KALOL

Date : 26.4.99

N.B.: Report submitted to Mr. S.C. Mallick,  
Sr.Manager(Inspection), IFFCO - KALOL.

ANNEX. 3

THICKNESS MEASUREMENT OF THE FOLLOWING VESSELS WAS CARRIED OUT IN S/D APRIL 99:

AMMONIA PLANT											
SL NO.	#REPORT NO.	VESSEL NO.	DESCRIPTION OF VESSEL	DESIGN THICK. IN MM		MIN. MEASURED THICK. IN MM		% REDUCTION		REMARK	
				SHELL	D.E.	SHELL	D.E.	SHELL	D.E.		
1	1197	101-CA	PRIMARY WASTE HEAT EXCHANGER	60.325	22.225	61.6	-	-	-		
2	1198	101-CB	PRIMARY WASTE HEAT EXCHANGER	60.325	22.225	61.4	-	-	-		
3	1248	101-D	DESULPHURISER NO. 1	60.325	60.325	61.9	64.9	-	-		
4	1215	101-U	DEARATOR	9.525	N.A.	10.5	12.9	-	-		
5	1191	102-C	SECONDARY WASTE HEAT EXCHANGER	66.675	N.A.	69.1	-	-	-		
6	1249	102-D	DESULPHURISER NO. 2	60.325	60.325	62	65.8	-	-		
7	1202	102-EA	CO2 STRIPPER	N.A.	N.A.	16.3	20.2	-	-		
8	1203	102-EB	CO2 STRIPPER	N.A.	N.A.	16.2	19.9	-	-		
9	1195/1211	102-F	RAW GAS SEPARATOR	34.925	33.375	36.3	35.7	-	-		
11	1192	103-C	PRI. SHIFT EFFL. WASTE HEAT EXCHANGER	55.5625	20.6375	58	27.4	-	-		
12	1199	103-D	SECONDARY REFORMER	6.35	34.925	6.4	37.9	-	-		
				JACKET		JACKET					
13	1186/1170	103-F	CO2 STRIPPER REFLUX DRUM	11.1125	11.1125	10.9	12.6	1.9123	-		
15	1179	104-C	METHANATOR FEED HEATER	17.4625	19.05	17.4	23.1	0.3579	-		
16	1182	105-CB	CO2 STRIPPER GAS EXCHANGER	28.575	26.9875	29.3	-	-	-		
17	1253	105-D	SYNTHESIS CONVERTER	N.A.	N.A.	7.7	93.3	-	-		
18	1223	106-C	SHIFT EFFLUENT FEED WATER HEATER	6.35	15.08125	6.8	15.9	-	-		
19	1174	106-F	SECONDARY AMMONIA SEPARATOR	104.775	53.975	108.7	61.2	-	-		
20	1173	107-F	PRIMARY AMMONIA SEPARATOR	14.2875	14.2875	14.5	17.5	-	-		
21	1221	108-C1A	MEA SOLUTION COOLER	12.7	12.7	12.8	16	-	-		
22	1219	108-C1B	MEA SOLUTION COOLER	12.7	12.7	12.5	15.6	1.5748	-		
23	1222	108-C2A	MEA SOLUTION COOLER	12.7	12.7	10.5	15.6	17.323	-		
24	1220	108-C2B	MEA SOLUTION COOLER	12.7	12.7	12.8	15.6	-	-		
25	1172	108-F	PURGE GAS SEPARATOR	28.575	28.575	31.7	32.2	-	-		
26	1188	109-C1A	MEA SOLUTION EXCHANGER	12.7	12.7	12.6	14.4	0.7874	-		
29	1187	109-C1B	MEA SOLUTION EXCHANGER	12.7	12.7	14	14	-	-		
30	1189	109-C2A	MEA SOLUTION EXCHANGER	12.7	12.7	12.6	14.6	0.7874	-		
31	1190	109-C2B	MEA SOLUTION EXCHANGER	12.7	12.7	14	14.6	-	-		
32	1226	110-CA	CO2 STRIPPER CONDENSER	12.7	12.7	15.2	-	-	-		
33	1225	110-CB	CO2 STRIPPER CONDENSER	12.7	12.7	11.5	-	-	-		
34	1181	111-CB	CO2 STRIPPER EXCHANGER	12.7	12.7	13.5	-	-	-		
35	1201	111-F	II STAGE REFRIGERENT FLASH DRUM	10.31875	19.05	10.3	22.7	0.1817	-		
36	1178	112-C	LT SHIFT CONVERTER INLET BOILER	12.7	26.9875	13.4	30.4	-	-		
37	1200	112-F	III STAGE REFRIGERENT FLASH DRUM	10.31875	19.05	10.4	22.6	-	-		
					9.525		12.6				
38	1180	114-C	METHANATOR EFFLUENT FEED WATER HEATER	58	N.A.	59.6	17.1	-	-		
39	1212	114-F	MEA STORAGE TANK	4.7625	4.7625	4.5	4.8	5.5118	-		
40	1207	115-C	METHANATOR EFFLUENT COOLER	12.5	12.5	12.6	14.3	-	-		
41	1206	116-C	SYN. GAS COMPRESSOR INTERSTAGE COOLER	11.1125	11.1125	9.9	10.7	10.911	3.8551		
				10	10	10	-	-	-		

THICKNESS MEASUREMENT OF THE FOLLOWING VESSELS WAS CARRIED OUT IN S/D APRIL 99: ANNEX 3

AMMONIA PLANT

SL. # NO.	REPORT NO.	VESSEL NO.	DESCRIPTION OF VESSEL	DESIGN THICK.		MIN. MEASURED THICK. IN MM		% REDUCTION		REMARK
				SHELL IN MM	D.E.	SHELL	D.E.	SHELL	D.E.	
44	1224	118-F	AGITATOR FOR TANK 118-F	6	N.A.	5.1	4.3	15	-	
45	1205	124-C	SYN. GAS COMPRESSOR AFTERCOOLER	20	16	22.6	20	-	-	
46	1246	127-CA	REFRIGERENT CONDENSER	18	16	18.5	15.8	-	-	
47	1247	127-CB	REFRIGERENT CONDENSER	18	CHANNEL	18.2	CHANNEL	-	-	
48	1218	128-C	REFRIGERENT COMPRESSOR INTERCOOLER	N.A.	CHANNEL	11.7	14.2	-	-	
49	1250	129-JC	AIR COMP. INTERSTAGE COOLER NO-I	12	12	12.7	9.2	-	-	
50	1251	130-JC	AIR COMP. INTERSTAGE COOLER NO-II	N.A.	N.A.	12.4	9.2	-	-	
54	1213	142-F	NEW INSTRUMENT AIR RECEIVER	N.A.	N.A.	13.9	12.2	-	-	
55	1184	150-C	FEED PREHEAT EXCHANGER	8.38	12.7	9.8	12.5	-	1.6	
56	1171/1183	151-C	FUEL PREHEAT EXCHANGER	8.382	9.525	8.1	8.2	-	16.159	
58	1169	157-F	PROCESS GAS KNOCKOUT DRUM	19.84375	17.4625	22.6	25.6	-	-	
59	1216	158-F	NATURAL GAS SEPARATOR (SOUTH)	24	N.A.	23.4	22.7	2.5	-	
60	1235	170-CA	CONDENSATE STRIPPER FEED BOTTOM EXCHANG	9.5	N.A.	9.5	15.7	-	-	
61	1227	170-CB	CONDENSATE STRIPPER FEED BOTTOM EXCHANG	9.5	N.A.	9.3	14.3	2.1053	-	
62	1236	171-C	CONDENSATE STRIPPER EXCHANGER	9.525	9.525	9.2	-	3.4121	-	
63	1242	172-F		12	N.A.	11.8	12	-	-	
64	1214	173-F	N.G. COMP. SUCTION KNOCKOUT DRUM	20	N.A.	15.7	15	-	-	
65	1232	174-C	BOILER BLOW DOWN COOLER	N.A.	N.A.	10.2	-	-	-	
66	1209	174-F	NG COMP DISCHARGE SEPARATOR	N.A.	N.A.	19.5	20.6	-	-	
67	1252	175-C	MEA SOLUTION COOLER NO. II	N.A.	N.A.	10.2	-	-	-	
68	1208	176-C	STRIPPER CONDENSOR COOLER	N.A.	N.A.	11.9	9.6	-	-	
69	1210	2005-F	INSTRUMENT AIR RECEIVER	8	8	8.2	6	-	-	
70	1175	2005-U	CONDENSATE POLISHER	N.A.	N.A.	14.8	24.4	-	-	
71	1244	800-F	NG SUCTION KNOCK OUT DRUM	14	14	14	14.8	-	-	
72	1243	801-F	NG DIS. KNOCK OUT DRUM	16	16	16.4	17.9	-	-	
73	1241	802-C	NG AFTER COOLER	16	12	15.6	12.2	2.5	-	
74	1245	802-F	AG SUCTION KNOCK OUT DRUM	10	10	9.9	12.5	1	-	
75	1240	803-C	AG BYPASS COOLER	12.7	12	13	11.8	-	1.6	
76	1234	2002LF	PO2 TANK	N.A.	N.A.	2.4	3.8	-	-	
77	1217	802F	NATURAL GAS SEPARATOR (NORTH)	N.A.	N.A.	24.1	22.2	-	-	
78	1231	E3	GAS EXCHANGER	5	5	5	4.2	-	16	
79	1233	E4	GENERATION HEATER	5	8	3.4	7.7	32	3.75	
80	1230	K1	WASHING TOWER	18	N.A.	18.7	18.6	-	-	
81	1238	R1	DRYING VESSEL	N.A.	N.A.	36.3	36.1	-	-	
82	1239	R2	DRYING VESSEL	N.A.	N.A.	36.2	35.9	-	-	

ANNEX. 4  
**THICKNESS MEASUREMENT OF PIPELINES OF AMMONIA PLANT CARRIED OUT IN S/D APRIL 99**

SR NO	# REPORT NO.	LINE NO.	N.E SCH./MM (In.)	MA LINE DESCRIPTION FROM TO	LAST MEASUR	MIN THK. OBSERVED	% RED.	REMARK
1	1091	—	4 6.02	E-4(PGR)	APRIL99	3.7	38.5	HEAVY EXTERNAL CORROSION, REPLACEMENT OF TWO BENDS RECOMMENDED
2	1075	—	4 6.02	HYDROGEN LINE (PGR)	APRIL99	4.5	25.24	REPLACEMENT OF TWO BENDS RECOMMENDED
3	1074	—	4 6.02	B-4 (PGR)	APRIL99	5.3	11.96	
4	1042	BF-9	2 80/5.5	CS 104-JA	APRIL99	5.2	5.45	HEAVY EXTERNAL CORROSION, REPLACEMENT RECOMMENDED
5	1042	BF-9	2 160/8.7	CS BF-7	APRIL99	6.8	20.5	-DO-
6	1062	BF-10	2 160/8.7	CS 104-JA MIN.FL	APRIL99	9.0	—	-DO-
7	1062	BF-10	2 80/5.5		APRIL99	3.2	41.8	-DO-
8	1143	BF-17	3 80/7.62	CS 114-C	APRIL99	6.2	18.6	
9	1043	BF-18	3 80/7.62	CS BF-22	APRIL99	6.7(APRIL98)	12.97	
10	1070	BF-22	8 100/15.06	CS HEADER	APRIL99	14.2	5.7	
11	1070	BF-22	8 100/15.06	CS HEADER	APRIL99	14.2	5.71	
12	1040	BF-30	2 80/5.5	CS 104-J	APRIL99	5.1	7.9	
13	1030	BF-31	2 80/5.5	CS 104-JA	APRIL99	4.5	18.7	
14	1041	BF-35	4 40/6.02	CS 123-J	APRIL99	5.5	8.6	
15	1041	BF-35	4 80/8.56	CS SPEC.BRK	APRIL99	7.6	11.21	
16	1137	BW-1H	14 100/23.80	CS 101-CA	APRIL99	21.1	11.34	
17	1136	BW-4H	10 100/18.24	CS 101-F	APRIL99	16.0	12.28	
18	1115	BW-6H	18 100/29.36	CS 101-F	APRIL99	28.9	1.5	
19	1130	BW-8H	12 100/21.41	CS HEADER	APRIL99	17.9(JUNE97)	16.39	
20	1131	BW-9H	8 100/15.06	CS 103-C	APRIL99	14.5	3.7	
21	1132	BW-10H	8 100/15.06	CS 103-C	APRIL99	14.9(JUNE97)	1.06	
22	1133	BW-11H	8 100/15.06	CS BW-14H	APRIL99	14.9(JUNE97)	1.06	
23	1134	BW-12H	8 100/15.06	CS BW-14H	APRIL99	14.1	6.3	
24	1135	BW-14H	10 100/18.24	CS HEADER	APRIL99	17.2(JUNE97)	5.70	
25	1116	BW-21H	18 100/29.36	CS 101-F	APRIL99	28.6	2.5	
26	1048	CO-2A	18 30/11.13	CS 101-CA	APRIL99	10.9(JUNE97)	2.06	
27	1047	CO-2B	18 30/11.13	CS 101-CA	APRIL99	11.0(JUNE97)		
28	1048	CO-3A	18 30/11.13	CS 101-CA	APRIL99	9.8	11.19	
29	1047	CO-3B	18 30/11.13	CS 101-CA	APRIL99	9.0	19.13	
30	1046,1053	CO-11	16 20/7.92	CS CO-8	APRIL99	6.3	20.4	
31	1053	CO-12	30 20/12.7	CS CO-11	APRIL99	12.6	—	
32	1053	CO-13	24 20/9.5	CS CO-12	APRIL99	9.7	—	

ANNEX 4

**THICKNESS MEASUREMENT OF PIPELINES OF AMMONIA PLANT CARRIED OUT IN S/D APRIL 99**

SR NO	# REPORT NO.	LINE NO.	N.E.SCH./MM (In.)	MA LINE DESCRIPTION FROM TO	LAST MEASUR	MIN THK. OBSERVED	% RED.	REMARK
33	1049	CO-15	25 15.88	103-F UREA PLANT	APRIL99	6.9(SS) 14.2(CS)	10.57	
34	1047	CO-16	20 30/12.7	HEADER CO2-B & CO3-B	APRIL99	12.4	2.3	
35	1048	CO-17	20 30/12.7	HEADER CO3A & CO2A	APRIL99	12.4	2.3	
36	1145	CW-4	10 30/7.8	CS CW-5 124-C	APRIL99	8.4	-	
37	1147	CW-9	10 30/7.8	CS CW-23 115-C	APRIL99	6.8	12.8	
38	1159	CW-30	6 40/7.11	CS CW-9 131-JC	APRIL99	6.2	12.7	
39	1165	CW-48	6 40/7.11	CS CW-5 173-C	APRIL99	6.3	9.9	
40	1140	HS-2H	12 100/21.41	CS 101-F HS-2	APRIL99	20.0	6.5	
41	1138	HS-3H	12 100/21.41	CS PRCa-18	APRIL99	20.1	4.7	
42	1151	HW-6	4 40/6.02	CS 101-J/105-J HW-10	APRIL99	4.5	25.24	REPLACEMENT RECOMMENDED
43	1152	HW-10	6 40/7.11	CS HW-36 HW-15	APRIL99	6.3	11.39	REPAINTING REQUIRED
44	1144	HW-11	8 20/6.35	CS 116-C HW-5	APRIL99	5.9	7.0	
45	1147	HW-17	10 30/7.8	CS 115-C HW-27	APRIL99	6.8	12.8	
46	1145	HW-25	10 30/7.8	CS 124-C HW-5	APRIL99	5.9	24.3	
47	1156	HW-28	4 40/6.02	CS JET COND HW-13	APRIL99	5.4	10.29	
48	1155	HW-34	6 40/7.11	CS 130-JC HW-15	APRIL99	5.5	22.64	
49	1154	HW-35	8 40/8.2	CS 129-JC HW-15	APRIL99	4.8	41.46	REPLACEMENT RECOMMENDED
50	1158	HW-35	6 40/7.11	CS 131-JC HW-27	APRIL99	6.2	12.7	
51	1153	HW-36	4 40/6.02	CS LO CONSOLE HW-10	APRIL99	5.2	13.62	REPAINTING REQUIRED
52	1165	HW-48	6 40/7.11	CS 173-C HW-5	APRIL99	7.4	-	
53	1094	LS-11	4 40/6.02	CS 103-J LS-12	APRIL99	5.3	11.96	
54	1094,1096	LS-12	6 40/7.11	CS LS-96	APRIL99	5.9	17.0	
55	1090	LS-15	4 40/6.02	CS 112-JA LS-12	APRIL99	5.6	6.97	
56	1113	LS-18	12 20/6.35	CS LS-1 PIC-20	APRIL99	5.4	14.9	
57	1067	LS-20	10 20/6.35	CS 104-J LS-3A	APRIL99	5.9	7.08	
58	1092	LS-23	12 20/6.35	CS LS-20 101-U	APRIL99	5.6	11.8	HEAVY RUSTING/SCALES
59	1092	LS-23	6 40/7.11	CS PIC-16 101-U	APRIL99	6.8	4.3	
60	1050	LS-28	4 40/6.02	CS 2004-A-JA LS-20	APRIL99	5.3	11.96	
61	1066	LS-31	4 40/6.02	CS 156-F LS-3	APRIL99	5.4	10.29	
62	1098	LS-35	4 40/6.02	CS LS-49 JETS	APRIL99	5.8	3.65	
63	1099	LS-38	1.5 80/5.1	CS LS-48 105-J LO CONSOLE	APRIL99	5.2	-	
64	1100	LS-39	1.5 80/5.1	CS LS-48	APRIL99	5.2	-	
65	1094	LS-46	4 40/6.02	CS LS-75 1S-77/78	APRIL99	5.8	3.65	

ANNEX 4

**THICKNESS MEASUREMENT OF PIPELINES OF AMMONIA PLANT CARRIED OUT IN S/D APRIL 99**

SR NO	# REPORT NO.	LINE NO.	N.E.SCH./MM (In.)	MA LINE DESCRIPTION FROM TO	LAST MEASUR	MIN THK. OBSERVED	% RED.	REMARK
67	1109	LS-76	4 40/6.02	CS LS-75A 171-C	APRIL99	6.6	-	d
68	1045,1052	LS-77	3 40/5.49	CS LS-75A 151-C	APRIL99	5.4	1.6	
69	1044	LS-78	3 40/5.49	CS LS-75 150-C	APRIL99	5.6	-	
70	1055	MEA-1	12 30/8.38	SS-101-E MEA-4B	APRIL99	8.0(JUN96)	-	
71	1055	MEA-4A	10 30/7.8	SS- MEA-1 109C2A	APRIL99	8.4	-	
72	1055	MEA-4B	10 30/7.8	SS- MEA-1 109C2B	APRIL99	8.5	-	
73	1059	MEA-5	4 40/6.02	CS 101-E STAND PIPE	APRIL99	9.8	-	
74	1057	MEA-19A	8 30/7.04	CS 107-JA MEA-B	APRIL99	6.5	7.6	
75	1057,1102	MEA-19B	8 30/7.04	CS 107-JB MEA-C	APRIL99	6.3	10.51	
76	1058	MEA-19C	8 30/7.04	CS 107-JC MEA-21	APRIL99	6.0(SEP93)	-	
77	1058	MEA-19D	8 30/7.04	CS 107-JD MEA-21	APRIL99	6.0(SEP93)	14.77	
78	1095	MEA-24A	3 40/5.5	CS 108-J MEA-25	APRIL99	5.1	7.1	
79	1095	MEA-24B	3 40/5.5	CS 108-JA MEA-25	APRIL99	5.2	3.0	
80	1083,1084,1093	MEA-25	3 40/5.5	CS MEA-24 A,B MEA-24A,B	APRIL99	4.5	18.18	
81	1081	MEA-25	2 80/5.5	CS CONT. VALVE ASSEMBLY	APRIL99	2.2	60.0	REPLACED IN APRIL99
82	1083	MEA-26B	2.5 40/5.2	CS MEA-25 SPEC.BRK.	APRIL99	3.0(SS)4.5	13.4	
83	1054	MEA-28A	12 20/6.35	CS MEA-33A 105-CA	APRIL99	5.8(SEP93)	8.0	
84	1056	MEA-28B	12 20/6.35	CS MEA-33B 105-CB	APRIL99	6.2	2.3	
85	1054	MEA-29A	12 20/6.35	CS MEA-33A 111-CA	APRIL99	6.1(SEP93)	3.9	
86	1056	MEA-29B	12 20/6.35	CS MEA-33B 111-CA	APRIL99	6.5	-	
87	1060	MEA-43	2 80/5.5	CS 114-F VENT	APRIL99	5.4	1.8	
88	1055	MEA-70	3 40/5.5	SS MEA-1 SEWER	APRIL99	5.5	-	
89	1061	MEA-97	2 80/5.5	CS 114-F SEWER	APRIL99	5.4	1.8	
90	1097	MS-16	2 80/5.5	CS MS-40 112-JAT	APRIL99	5.0	16.9	
91	1126	MS-41	1.5 80/5.1	CS CMS-40 102-JLO CONSOLE	APRIL99	4.1	19.6	
92	1127	MS-49	2 80/5.5	CS MS-2 NG-6	APRIL99	4.0	27.2	REPLACEMENT RECOMMENDED
93	1065	NH-13	2 80/5.5	CS 109-F 126-C	APRIL99	5.4	2.5	
94	1128	NH-45	6 40/7.11	CS NH-70 NH-46	APRIL99	6.4(JUNE97)	7.1	
95	1120,1168	NH-50	4	CS NH-87 107-F	APRIL99	5.6	6.97	
96	1121	NH-56	2	CS 107-F NH-58	APRIL99	4.2	18.6	
97	1142	NH-66	2.5	CS NH-15 NH-67, NH-71	APRIL99	5.0	3.84	REPLACEMENT OF SPOOL PIECE RECOMMENDED
98	1167	NH-87	3 80/7.6	CS 106-F NH-50	APRIL99	5.9	22.3	
99	1123	PG-2	18 9.53/29.36	P11 102-C PG-4	APRIL99	13.8/32.4	-	
100	1124	PG-4	24 38.89	P11 MIXING TEE*	APRIL99	37.1	4.6	

ANNEX 4

**THICKNESS MEASUREMENT OF PIPELINES OF AMMONIA PLANT CARRIED OUT IN SID APRIL 99**

SR NO.	# REPORT NO.	LINE NO.	N.E SCH./MM (In.)	MA LINE DESCRIPTION FROM TO	LAST MEASUR	MIN THK. OBSERVED	% RED.	REMARK
102	1118	PG-6	18	0.3125/7.93 CS 104-D TOP	APRIL99	13.6	-	
103	1118	PG-7	12	30/8.38 CS PG-6	APRIL99	8.0	4.5	
104	1129	PG	2	80/5.54 CS BYPASS LINE SP4(PG-8-18")	APRIL99	4.8	13.35	
105	1114	PG	1	80/4.55 CS BYPASS LINE SP5(PG-20-8")	APRIL99	3.5	23.07	REPLACEMENT RECOMMENDED
106	1146	PW-5	2	160/8.7 CS 106-J	APRIL99	3.1	64.36	
107	1166	PW-17	4	120/11.13 CS PW-1	APRIL99	2.4	78.43	TWO PIECES REPL. IN APRIL99 & COMPLETE LINE TO BE REPL.
108	1119	SG-12	14	100/23.8 CS 103-J	APRIL99	22.8	4.2	
109	1064,1106	SG-14	10	80/15.06 CS SG-13	APRIL99	17.6	-	
110	1087	SG-18	14	100/23.8 CS 119-C	APRIL99	23.0	3.36	
111	1072	SG-21	14	120/27.76 CS 121-C	APRIL99	23.8	-	
112	1073	SG-22	12	120/25.4 CS SG-21	APRIL99	24.4	3.9	
113	1071	SG-23	12	120/25.4 CS SG-21	APRIL99	22.3	12.2	
114	1080	SG-25	8	120/18.24 CS SG-23	APRIL99	11.10	39.14	
115	1077	SG-26	6	120/14.27 CS SG-23	APRIL99	12.3	13.98	
116	1078	SG-27	6	120/14.27 CS SG-23	APRIL99	13.9	4.0	
117	1079	SG-28	4	120/11.13 CS SG-23	APRIL99	10.4	6.55	
118	1088	SG-29	4	120/11.13 CS SG-21	APRIL99	10.7	3.86	
119	1076	SG-33	14	140/31.75 P-2 122-C(105-D)	APRIL99	30.1	5.1	
120	1117	SG-36	2.5	80/7.01 CS SG-35	APRIL99	6.4	8.7	
121	1089	SG-39	4	40/6.02 CS 121-C	APRIL99	5.6	6.97	
122	1063	SG-40	10	100/18.24 CS SG-3	APRIL99	17.2	5.7	
123	1105	SG-40	10	100/18.24 CS CONTR.VALVE HCV10	APRIL99	17.2	5.7	
124	1086	SG-49	2	160/8.7 CS 108-F	APRIL99	8.1	7.32	
125	1108	SG-52	3	160/11.13 CS SG-22	APRIL99	10.8(JUNE97)	2.96	
126	1072	SG-53	3	160/11.13 CS SG-22	APRIL99	10.9	2.3	
127	1088	SG-76A	4	120/11.1 CS SG-25	APRIL99	11.1(JUNE97)		
128	1088	SG-76B	4	120/11.1 CS SG-21	APRIL99	11.0	1.0	
129	1164	WA-1	36	7.93 CS 127-CA	APRIL99	6.4	19.2	
130	1150	WA-1	30	6.35 CS 101-JCA	APRIL99	5.5	13.38	
131	1150	WA-15	30	6.35 CS WA-3	APRIL99	5.9	7.0	
132	1144	WA-17	8	30/7.04 CS WA-15	APRIL99	8.5	-	
133	1157	WA-19	4	40/6.02 CS WA-23	APRIL99	5.5	8.6	
134	1164	WA-2	36	7.93 CS 127-CB	APRIL99	7.3	7.9	
135	1160	WA-34	6	40/7.11 CS WA-23	APRIL99	5.5	22.6	
136	1161	WA-37	4	40/6.02 CS WA-34	APRIL99	5.3	11.96	
137	1162	WA-38	4	40/6.02 CS WA-34	APRIL99	5.2	13.62	

63

PLANT TURNAROUND - APRIL-1999AMMONIA PLANTC I V I L - J O B S

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CODE NO	JOB DESCRIPTION
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01 51 01 CIVIL JOBS:(A) AUXILIARY BOILER:

Replacement of burner face, refractory lining including removal of damaged refractory with following specification.

- 1) Fixing of new C.S.plate.
- 2) Welding of hooks / lugs fixing "C" hold fast of SS 310 materials.
- 3) Fixing of 2" thick HYSIL board.
- 4) 9" thick MK 26 insulating bricks.
- 5) Casting of burner with insulite - 11, whytheat & burner blocks.
- 6) Repairs of header wall
- 7) Casting of front side header
- 8) Making target wall (Baffle wall) and repairs of refractory on East and West side.

(B) PRIMARY REFORMER:

- 1) Replacement of insulating bricks (Detriks) on Easter face at 1.5 M to 3.5 M level.
- 2) Replacement of tunnel slab.
- 3) Repairs of cracks on North & West side of wall.
- 4) Cleaning of debries.

(C) H.T. / L.T.ZONE:

- 1) Refractory patch work by Insulite - 11.
- 2) Refractory casting in pannel (fours nos.) being fabricated by Mech.Maint.with Insulite-11.

64

CODE NO	JOB DESCRIPTION
(D)	<b><u>CONTROL ROOM:</u></b> <ul style="list-style-type: none"><li>- False ceiling / False flooring and interior work in control room.</li></ul>
(E)	<b><u>A/C PLANT:</u></b> <ul style="list-style-type: none"><li>- Construction of room for package unit A/C plant, breaking of wall, concrete for A/C ducting.</li></ul>

65

PLANT TURNAROUND - APRIL-1999AMMONIA PLANTELECTRICAL JOB

CODE NO	JOB DESCRIPTION
01 61 01	<u>ELECTRICAL JOBS:</u> <ol style="list-style-type: none"><li>1) Preventive maintenance carried out on TR-6 for....<ol style="list-style-type: none"><li>a) Inspection of Primary and Secondary cable boxes and termination, checking and tightening of connections.</li><li>b) Testing of oil in marshaling boxes on primary and secondary transformers and cleaning of chamber.</li><li>c) Replacement / Reactivating of silicagel in dehydrating breather of above transformer.</li><li>d) Checking of trip alarm circuit and cleaning of all emergency trip boxes.</li><li>e) Checking of IR value primary and secondary windings of the above transformer.</li></ol></li><li>2) Preventive maintenance of TMG, L&amp;T make LT, ACBs installed at MCC and replacement of damaged parts and worn out contacts.</li><li>3) Preventive maintenance carried out on all feeder compartments mounted on the following MCCs. MCC5, MCC-5A, MCC-5B and MCC-16</li><li>4) Overhauling of critical Motors. 107-JT, 102-J(SOP), 118-JA, 104-JA, 102-JLOP, 101-BJT</li><li>5) Preventive maintenance, cleaning and checking of all motor operated valve's control panels.</li><li>6) Testing and calibration of various types of EE make Relays installed.</li></ol>

66

PLANT TURNAROUND - APRIL-1999AMMONIA PLANTINSTRUMENTATION JOB

CODE NO	JOB DESCRIPTION
01 71 01 (A)	<b><u>CONTROL VALVE:</u></b> Following Control valve maintenance carried out. <ol style="list-style-type: none"><li>1) FRCV-2 : Replaced the old actuator, positioner, air regulator by new one. General cleaning, gland packing and overhauling were carried out and checked the stroke. Old removed broken actuator was got reconditioned and returned to store.</li><li>2) TRCV-10 : Removed old gland packings, General cleaning, gland packing and overhauling were carried out and checked the stroke. Changed the diaphragm of control valve. made it free by greasing for smooth operation.</li><li>3) TRCV-11 : Removed old gland from front and back end. General cleaning, provided gland packings and overhauling were carried out and checked the stroke.</li><li>4) FRCV-3 : All the connected instrument for old instruments were removed and necessary tubing were carried out and checked the stroke. Replaced air volume booster and quick exhaust and required tubing carried out.</li><li>5) FICV-10 : Opened seat and plug from control valve. Required machining job was carried out and box up the control valve as it was reported for passing. Gland packing and overhauling were carried out and checked the stroke.</li><li>6) FICV-9 &amp; 11 : General cleaning, gland packing and overhauling were carried out and checked the stroke.</li><li>7) FICV-1006 : Opened the control valve from bonnet and inspected plug and seat found ok.</li><li>8) FICV-12 &amp; 14 : General cleaning, gland packing and overhauling were carried out and checked the stroke. Tightened all fittings and actuator accessories.</li><li>9) KV-120-3,4,5 &amp; 6 : Opened the ball valves and replaced the seat ring by new one as passing problem was reported.</li></ol>

CODE NO

JOB DESCRIPTION

- 10) PV-1027 : Provided greasing and general cleaning carried out. Checked stroke of valve found ok.
- 11) MIC-22 : Removed all tubing to facilitate to production people for flushing and reconnected the same.
- 12) LCV-5 : Control valve was dropped to facilitate process people job as Process line replacement jobs.
- 13) USV-1117-A : It was jammed, opened the valve, overhauled it and checked the operation. Found ok.
- 14) FICV-1019 : Opened the control valve from bonnet and inspected plug and seat found ok.
- 15) PICV-24 : Control valve acuator moved to 90 degree for easy maintenance and general overhauling done, finally checked and stroke found ok.

(B) GENERAL CLEANING, OVERHAULING AND STROKE CHECKING WERE CARRIED OUT FOR FOLLOWING CONTROL VALVE:

FRCV-1, PRICV-4, FICV-7, FICV-8, PRICV-25, MICV-25, PICV-13A/B, PRICV-23, PIC-20, THIC-60, LC-5, PIC-13A, PIC-13B, PCV-181, PRCV-18, THICV-13, PRCV-2, ARCV-3, TRCV-12, PICV-5 and Pent house valves.

(C) FOLLOWING CONTROL VALVES WERE PAINTED:

PICV-1006A/B, PICV-1022A/B, LCV-1007, LCV-1003, USV-1119, FV-1019, LCV-1001, PV-1029-2, PICV-1001-1, PV-1029, PV-1002, FV-1006, PV-1137, PV-1031, PV-1027, PV-1011, USV-1110, USV-1109, USV-1108, USV-1122, PV-1009, FV-1004, FV-1017, FV-1016, PICV-14, LC-13, LC-3B, FICV-9, FICV-10, FICV-11, FICV-13, LCV-14, FICV-12, 14, PICV-15, V-18, FRCV-18, FICV-15.

01 71 02 COMPRESSOR HOUSE JOBS:

(A) TDM

1. Bently Nevada Vibration Monitor Panel of 101-J, 102-J, 103-J and 105-J were calibrated and checked the same on TDM2 display monitor. Found ok.
2. Replaced two nos. flexible ribbon cable connectors of Vib. Monitors.

68

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CODE NO	JOB DESCRIPTION
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**(B) 101-J:**

1. General cleaning,overhauling of governor positioner was carried out and checked stroke.
2. All probes were opened to facilitate Mechanical maintenance job and refixed after physical inspection and set gap voltage.
3. EA axial probe was replaced by new one.
4. 101-J / 105-J lube oil console PCV nipple was replaced by new one as it was broken.
5. Removed all TI/PI to facilitate Mechanical maintenance job and refixed after physical inspection.

**(C) 102-J:**

1. All probes were opened to facilitate Mechanical maintenance job and refixed after physical inspection and set gap voltage.
2. Bearing thermocouples of turbine and compressor were removed and refixed.
3. 2H radial probe was replaced by new one.
4. Removed all TI/PI to facilitate Mechanical maintenance job and refixed after physical inspection.

**(D) 103-J:**

1. General cleaning,overhauling of governor positioner PRC-12 and MIC-23 were carried out and checked stroke. Changed the I/P convertor of MIC-23 as it was functioning properly.
2. All probes were opened to facilitate Mechanical maintenance job and refixed after physical inspection and set gap voltage.
3. 4v & 4H radial probes and extension cable were replaced by new one. Also replaced 7H probe. Extension cable of AA & AB were replaced by new one.
4. Removed all TI/PI to facilitate Mechanical maintenance job and refixed after physical inspection.

69

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CODE NO	JOB DESCRIPTION
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**(E) 105-J:**

1. General cleaning,overhauling of governor positioner (PRCV-9) was carried out and checked stroke.
2. All probes were opened to facilitate Mechanical maintenance job and refixed after physcial inspection and set gap voltage.
3. EA & EB axial and 7V radial probes were replaced by new one.
4. Removed all TI/PI to facilitate Mechanical maintenance job and refixed after physcial inspection.

**(F) COMMISSIONING OF A.G.COMPRESSOR 800-J:**

1. All instruments of AG Compressor were checked in field. Loop checking were carried out for trip switches as well as panel instruments.
2. Separate logic was implemented for antisurge control valve and reset button of antisurge control valve was provided in control room. Checked the trip circuits.
3. Controller (FIC-802) for antisurge valve was provided in control room console panel.
4. Y2K compliance software was loade for GE Fanuc PLC.
5. Solenoid of (AG bypass valve) PV-807 & PV-805 were replaced by new one.
6. Reset Push Button for antisurge control valve was provided in control room.
7. Provided new 7200 series proximitors and extension cables in A.G.Compressor.
8. All probes were opened to facilitate Mechanical maintenance job and refixed after physical inspection and set gap voltage.
9. Removed all the RTD elements and fixed back after completion of Mech. works.
10. Cleaned all the instruments on local panel and in compressor house.

70

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CODE NO                      JOB DESCRIPTION  
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01 71 03 FUJI UPSS:

1. General cleaning and service were done I/L Engr.as per AMC.
2. Synchronisation problem was solved and checked the same, found Ok.
3. Plant load was diverted on batteries and checked for one hour and found performance of batteries were satisfactory.

01 71 04 CONTROL ROOM JOBS:

(A) DCS:

1. All the cards of EFCD, EOPS and EFMS were removed from panel and cleaned all the cards and panel.
2. Y2K software for YBL Centum-XL DCS was loaded by YBL Engineer.

(B) HIMA PLC:

1. Operator station PC was not working due to dust problem it was removed from console and replaced by Engineering station PC. Operator station PC was cleaned and kept at the place of engineering station PC. Loaded ELOP software on that PC and checked, found Ok.
2. Loaded upgraded software of wizcon in operator station and event recorder PC.

(C) OTHERS CONTROL ROOM JOBS:

1. Old control room panel removing job was carried out.
2. Provided new power supply from upss power supply distribution box for (1) Eye Hye (2) vibration monitor panel 101-J, 103-J, 105-J, 102-J (3) 173-C outlet pH meter.
3. Shifted the Eye Hye relay box and upss power D.B. from front to back side of control room.
4. Laid new 12 pairs cable from steam drum to control room for Eye Hye and new terminations were done.
5. Provided new cables racks in control room and all the cables laid down in cable trench from wall cable rack.

71

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CODE NO	JOB DESCRIPTION
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6. PGR : PGR Drum Programmer was shifted to back to back side of the control room.
7. Shifted Air mask system to its new location as per requirement of production people for that necessary tubing was done.
8. Removed instrument air header from control room and provided blind outside of C/R.

**01 71 05 FILED INSTRUMENTS JOBS:**

1. Removed four nos. of T/C with head from 103-D top, and fixed back after completion of mech.work.
2. Provided temporary manual loder to check the I.D.Fan turbine in field.
3. Removed sol.valves and instruments from 104-J and 107-J and fixed back, to facilitate Mech.work.
4. Removed T/C from 112-C and fixed back.
5. TE-102A RTD element in PGR plant was replaced by new one.
6. All the jobs related with boiler inspection (101-F & 112-C) were carried out.
7. Flushed instrument air headers.
8. FIC-200,PIC-300 controller (in 102-J) seal leak was attended.
9. LCV-23 Control valve was replaced by new one through Technical department.
10. FIC-15 & LIC-2001 Tx., provided 1/4" S.S.tubing for flushing purpose. Also provided new manifold in FIC-15 Tx.
11. Aux.Boiler instruments were removed from location and refixed after completion of refractories work.
12. Tunnel thermowells with t/c elements were inspected, replaced one nos. of t/w and two nos. t/cs. (TI-0071,74) Also laid all the T/C cables on new rack and reterminations were carried out.
13. TI-85 (101-CA) T/W with T/C was replaced by new one.
14. TI-0042 & TIAH-84 Thermocouples terminations were tightened on T/C head.

72

- | CODE NO | JOB DESCRIPTION   |
|---------|---|
| 15.     | FT-54 Transmitter impulse tubing leakage was attended.  |
| 16.     | FIC-1014,1016,1018 all the three transmitters were connected with single orifice tapping so retubing were done. |
| 17.     | Start-up heater 110-V AC supply new cable was laid from power supply J.B. to ignitor J.B.                       |
| 18.     | H-110 Test button of annunciator was replaced by new one.   |
| 19.     | 800-J main steam line flange type thermowells (3 Nos) leakage was attended.                                     |
| 20.     | 102-J all the trip swtiches located on compressor plateform were supported with extra channels support.         |
| 21.     | H-111 pilot burner-C solenoid valve was chocked opened and attended it.   |
| 23.     | FRC-2 Tx impulse line isolation valves were replaced by new one.  |
| 24.     | Checked trips circuits of all compressors and attended all the start-up activities.                             |
| 25.     | Provided isolation valve for I.D.fan lube oil line pressure gauge.  |
| 26.     | FR-33 Tx. Manifold was replaced by new one.   |

01 71 06 RENOVATION OF CONTROL ROOM:

All printer, DCS panel, engineering station, MIS PC, TDM PC were lifted and kept on wooden blocks for false flooring job, also covered everything by polythene sheet for false ceiling and central air condition job. Everything were made proper after completion of all jobs.

73

PLANT TURNAROUND - APRIL-1999

AMMONIA PLANT

TECHNICAL DEPARTMENT JOB

CODE NO	JOB DESCRIPTION
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01 81 01 TECHNICAL DEPTT. JOBS:

(A) MECHANICAL JOBS:

- 1) Installed new heat exchanger 128-C after replacing the old one. Also increased the size of C.W INLET / OUTLET nozzle piping connection to 10" NB from existing INLET / OUTLET sizes of 6" NB. Heat Exchanger was also hydrojetted and boxed up.

M/s Technocon Project & Engineers was the agency for carrying out the above job under W.O.No.3319 dt 13/4/98.

- 2) Replaced existing 3" NB C.S. Naphtha transfer piping from offsite handling area to Ammonia plant by S.S.304, 4" NB Sch 40 S piping. Total length of pipe replaced is 540 mtrs. approx. The line was hydrotested at 30 kg/cm2(g) with DM water.

M/s Ganesh Engg, A'bad was the agency for carrying out the above job vide W.O.No.4982 dt 8/3/99.

- 3) A bypass provision of N.G. Compressor (102J) was installed through 6" x Sch 40 C.S. line of approx 12 mtrs. length for early start up of plant in case of any problem of N.G. compressor. 3 Tappings for Desulphuriser was also provided in this line. Complete joints of the line was TIG welded and 100% radiographed.

M/s J & J Engineers was the agency for laying out the line and M/s Jacob H&G, Bombay was the party for taking the tappings.

- 4) The following underground C.W. return header pipings were replaced by new ones including coating and wrapping of M/s IWL 4 mm thick materials.

a) 30"C.W. (W-8-30") piping from 131-JC area to 108-JA pump area = 30 Mtrs.

b) 6"/8"/18" C.W. Return piping from 131-JC to main C.W. return header of 36" dia near 136-C = 100 Mtrs

74

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CODE NO                      JOB DESCRIPTION  
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- c) Main 36" C.W. return header near 136-C. = 5 Mtrs.
- d) C.W. return lines of sizes 12"/8"/6" NB starting from return header of 36" size near 127 CA/CB to 129 JC/130-JC. = 35 Mtrs

The above job was carried out through M/S Technocon Projects & Engineers vide W.O NO 5141 dt 5/3/99.

- 5) a) The Aluminium line of 6" size carrying DM water from 2004JA/B pumps discharge to 106- C heat Exchanger was replaced by S.S. 304, 8" Sch 10S pipings alongwith valves & fittings. This line joints were TIG welded and 10 % Radiographed. Line was also hydrottested at 10 kg/cm2(g) pressure with DM water.
- b) Also old Aluminium 8" NB DM water line from Heat Exchanger 106-C to Deareator 101-U was replaced by 10" Sch 10S S.S. piping. The joints were TIG welded and 10% radiographed. Hydrottested the line with DM water at 10 kg/cm2(g).

The above jobs were carried out through M/S GANESH ENGINEERS, A'bad vide W.O NO 5005 dt. 8/3/99.

- 6) The old blowdown lines of steamdrum 101-F, Waste Heat Exchanger 102-C as well as Aux. boiler were replaced by new ones as per the details given below.
  - a) Steam drum 101 F  
Sizes: 3/4", 1", 1-1/2", 2" & 3" = 235.5 Inch Mtr.
  - b) W.H. Exchanger 102C  
Sizes: 1", 1-1/2" NB = 30.0 Inch Mtr.
  - c) Aux. Noiler  
Size : 1 1/2" NB = 15 Inch Mtr.

The above work was carried out through M/S JACOB H&G B'bay Vide W.O No.0 5288.

- 7) **aMDEA line:**  
A total of Six Numbers of additional supports were provided at various locations on aMDEA line going to strippers 102EA/EB for arresting the resonating vibration frequencies.

75

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CODE NO	JOB DESCRIPTION
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8) EWR jobs / Schemes:

- a) A drain line provision of 1 1/2" NB size (appro.35 mtrs) was laid from vessels in PGR plant to facilitate oil draining to the common oil pit near ONGC metering station.
- b) 6" NB Sch.40 piping loop removed alongwith PCV-26 as per EWR No. A-174, Sr. No.2 and a distance pipe piece provided.
- c) Minimum flow line (40 NB Sch 80, C.S.) of approx 5 mtrs was removed from Naphtha pump of Naphtha Pre-Reformer and motor lifting arrangement also provided as per EWR-X-169.
- d) Existing 4" NB sch 40 CS pipe carrying hot ammonia from 121-J A/B discharge to UREA plant was replaced with 6" NB, Sch. 40 piping to a length of 150 MTRS as a part of reducing overall pressure drop of the system.

The above jobs at (b), (c) & (d) were carried out through M/S JACOB H&G vide W.O No.5288.

- 9) Re-routing of PG & SOUR OIL OFFGAS pipe lines (8" NB / 4" - 3" NB, Sch 40) to existing FUEL GAS header at PRC-2 was also carried out.
- 10) New 3"NB tapping/piping for Steam Ejector of 101-JCB from exhaust steam line of 112-JT was carried out for obtaining higher inlet steam pressure to Ejectors.

(B) INSTRUMENT JOBS:

- 1) Installed LCV-23 Control valve of higher capacity on deareator. Stroke was checked & found OK.
- 2) Provided two nos. of thermowell with temperature gauges and pressure gauges on 106-C heat exchanger.
- 3) Provided new thermowell with temperature gauge on 128-C Outlet line.
- 4) PCV-26 control valve removed as per EWR No. A-174 dtd.23.12.97.

PLANT TURNAROUND - APRIL-1999

UREA PLANT

MECHANICAL JOBS

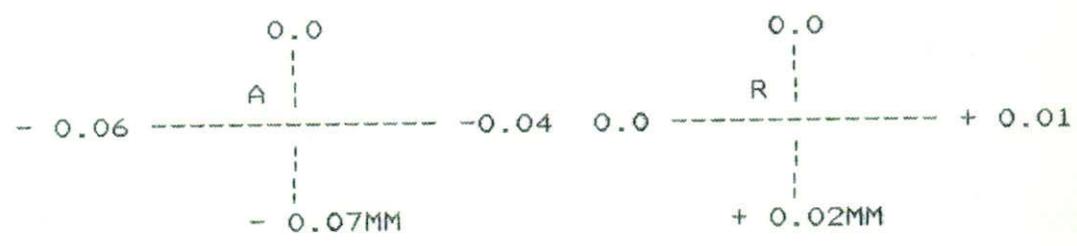
CODE NO	JOB DESCRIPTION
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02 01 01 CO2 CENTRIFUGAL COMPRESSOR TRAIN K-1801 HP/LP CASE AND Q-1801:

OVERHAULING OF HITACHI COMPRESSOR K-1801 H.P.CASE:

All instrumentation and L/O piping were removed and H.P.Case was decoupled from gear box. The following readings were recorded before removing the inner casing with rotor from main casing.

1) Alignment Readings - H.P.Case to Gear box.



Dial on H.P.case cpl half      Dial on H.P.case cpl half

- 2) Thrust : 0.30 MM
- 3) Bearing clearance (Radial) : 0.125 MM
  - cpl side : 0.12 MM
  - Thrust Brg.side : 5.4 MM
- 4) Rotor Float : 5.4 MM

The Inner casing assembly with rotor was removed in presence of M/s.Hitachi representative. The inner casing was dismantled and rotor was removed. The 4th interstage labyrinth PT No.562-10 was found badly corroded and milky white in colour and the same was handedover to M/s.Hitachi representative for failure analysis at their end. The other parts were also cleaned properly checked and found to be in good condition.

REASSEMBLY OF H.P.CASE:

- The modified spare rotor was cleaned. The OD of labyrinth area of rotor and ID of related labyrinth were measured to calculate labyrinth clearance and the same were recorded.
- The diaphragms were put back in position with rotor and related labyrinth. The inner casing was boxed up with new teflon gasket PT No.530.01.

77

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CODE NO                      JOB DESCRIPTION  
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- The inner casing assembly was reinstalled in main casing with new set of "O" rings and back up rings.
- Head flange (thrust bearing side) boxed up.
- Reassembled gas seal labyrinth.
- Reassembled journal bearings.
- Coupling hub fixed back in position.
- Alignment of H.P. Case with gear box checked and alignment readings were recorded.
- Boxed up coupling assembly, bearing cover and piping.

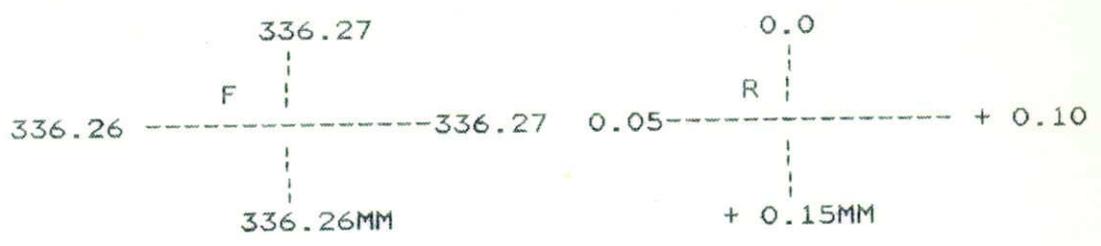
The following readings were recorded after / during reassembly.

- 1) Bearing clearance (Radial)
  - Coupling side                      : 0.13 MM
  - Thrust side                         : 0.12 MM
- 2) Thrust                                 : 0.25 MM
- 3) Rotor float                         : 5.24 MM
- 4) Labyrinth clearance                :

Symbol	Denomination	I.D.	O.D.	CLR	Remarks
A	1st stg.Imp. eye	210.72	209.87	0.85	
		218.71	217.97	0.74	
B	2nd stg.Imp. eye	184.71	183.90	0.81	
		192.71	191.98	0.73	
C	3rd stg.Imp. eye	178.68	177.92	0.76	
		186.84	186.00	0.84	
D	4th stg.Imp. eye	178.70	177.90	0.80	New
		186.90	186.00	0.90	
E	5th stg.Imp. eye	153.15	152.00	1.15	
		161.15	160.06	1.09	
F	6th stg.Imp. eye	149.11	147.92	1.19	
		157.11	156.00	1.11	
G	1st inter stage	195.78	195.35	0.43	
H	2nd inter stage	184.70	184.31	0.39	
I	3rd inter stage	175.54	175.25	0.29	
J	4th inter stage	167.47	167.25	0.22	
K	5th inter stage	157.69	157.19	0.50	
L	Balance Lby.	185.50	185.04	0.46	
		187.50	187.07	0.43	
		189.50	189.08	0.42	

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CODE NO                      JOB DESCRIPTION  
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5) Alignment Readings H.P. to Gear box.



Dial on H.P.case Cpl.half                      Dial on H.P.case Cpl.half

**Inner casing "O" Ring fixing :**

Inner casing teflon "O" ring PT No.490/3,4 & 5 were heated in condensate both for about 2 minutes before fixing to inner casing. Temperature of both was maintained at 80 - 85 deg.C.

The following spare parts were used.

Sr. No.	Store Code	Description	Qty.
1	218002001	Rotor assly.for 2BCH 306/A	1No
2	218002016	Inter stage laby.4th PT-562-10	1ST
3	218002039	Teflon Gasket PT-530-01	8 Nos
4	218002048	Back up ring PT-490-06	1 No
5	218002048	Back up ring PT-490-07	1 No
6	218002050	Back up ring PT-490-10	1 No
7	218002051	Back up ring PT-490-08	1 No
8	218002052	Back up ring PT-490-09	1 No
9	218002055	"O" ring PT-490-01	1 No
10	218002056	"O" ring PT-490-02	1 No
11	218002057	"O" ring PT-490-03	1 No
12	218002058	"O" ring PT-490-04	1 No
13	218002059	"O" ring PT-490-05	1 No
14	218002060	"O" ring PT-490-19	4 Nos

### MODIFICATION OF H.P. CASE ROTOR

The rotor was modified by M/s.Hitachi Ltd, Japan to reduce 3rd discharge pressure and to increase 4th discharge temperature. The following modifications were carried out in 5th and 6th impeller of the rotor.

- I) Each blad was cut to obtain more steep outlet flow angle to give increased head as show in Fig.-I.
- II) Outlet flow passage width was expanded by slightly grinding the wall by 0.3 MM with 4.0 MM length as shown in Fig. - II.

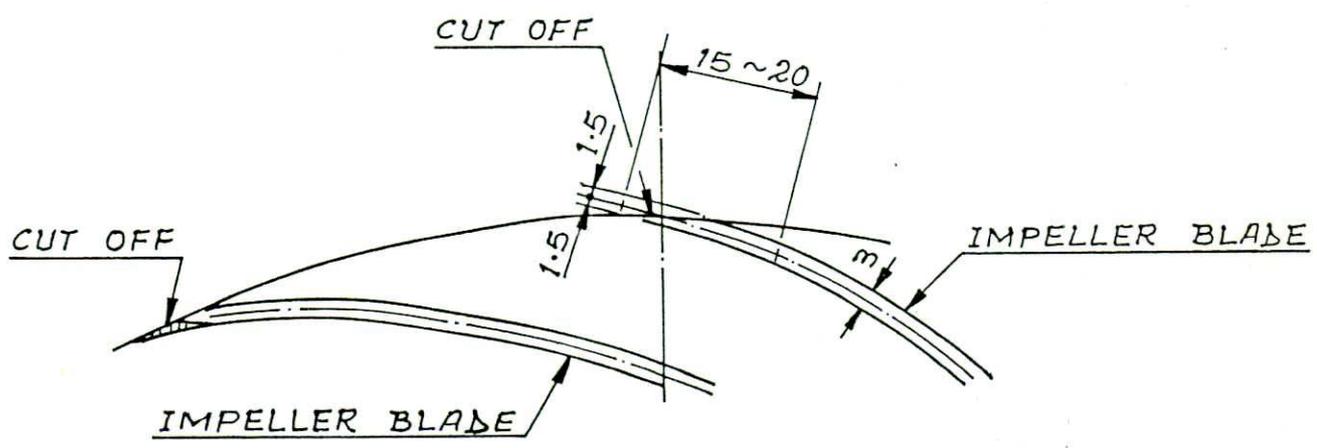


FIG.- I

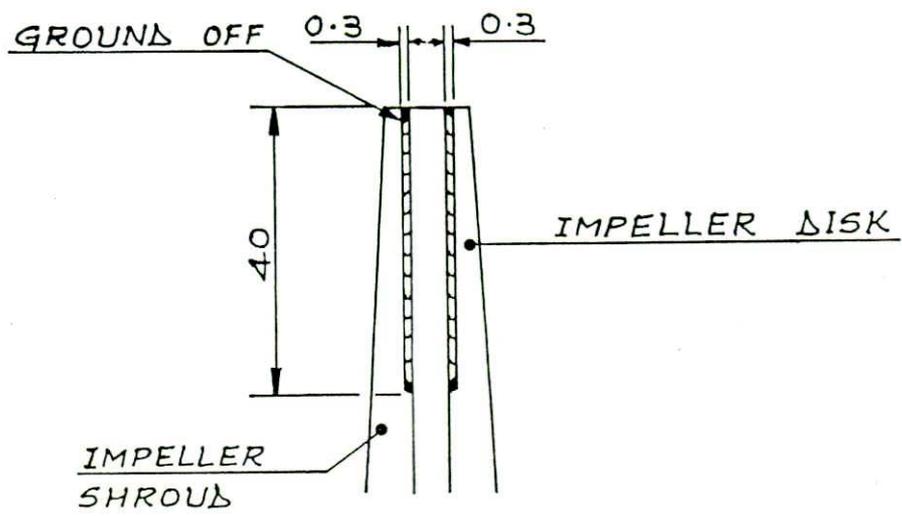


FIG.- II

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 CODE NO                      JOB DESCRIPTION  
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**PREVENTIVE MAINTENANCE OF HITACHI COMPRESSOR K-1801**  
**L.P.CASE**

The following jobs were carried out.

1. Decoupled LP case from Gear box and turbine.
2. Thrust bearing end play measured & recorded.
3. Dis-assembled journal bearings & thrust bearing.
4. Bearing clearance measured & recorded.
5. Journal bearings and thrust bearings were cleaned properly & then fixed back in position. Journal bearing clearance measured and recorded.
6. Thrust bearing end play measured and recorded after thrust bearing boxed up.
7. Bearing cover fixed back in position.
8. LP Case coupled with turbine and gear box. The following readings were recorded.

	Before -----	After -----
a) Journal Bearing clearance		
Turbine side	0.12 MM	0.12 MM
Gear box side	0.12 MM	0.12 MM
b) Thrust	0.40 MM	0.40 MM

**PREVENTIVE MAINT. OF HITACHI COMPRESSOR TURBINE Q-1801:**

The following jobs were carried out as preventive maintenance.

- Decoupled turbine from L.P.Case.
- Thrust bearing end play measured and found more than the allowable readings.
- Top covers of bearings were removed.
- Journal bearing clearance measured & recorded.
- Thrust bearing and journal bearing pads were cleaned properly and checked.
- Thickness of thrust bearing pads were measured. The thickness of active side thrust pads found less and the same were replaced with new set of active side thrust pad.

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CODE NO	JOB DESCRIPTION
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The following readings were recorded.

	Before	After
	-----	-----
1) Journal Bearing clearance		
Front side	0.236 MM	0.236 MM
Rear side	0.34 MM	0.34 MM
2) Thrust bearing end play	0.44 MM	0.295 MM

02 02 01 AMMONIA PUMP (P-1102-B):

Existing drive of ammonia pump (P-1102-B) was replaced by new variable speed motor drive alongwith gear box. The specification of new drive is as under.

Motor :   Manufacturer - Siemens  
          Type           - Squirrel Cage  
          Rated output - 240 KW  
          RPM           - 1500  
          Voltage       - 415 (+ -) 10%  
          No.of phase   - 3  
          Frequency     - 50 Hz (+ -) 3%

Gear Box :   Manufacturer - G.ELLI,Seites,Milano  
              Sr.No.       - 96-10-034/1  
              Type        - C 2-320-C  
              Ratio       - 11.315  
              KW          - 220

02 03 01 PRILL TOWER ID FANS (K-1401/1T04):

Following jobs were carried out as preventive maintenance of Prill Tower fans.

- a) Cleaned fan blades
- b) Removed bearing cover, cleaned bearings and checked. Bearings were found in good condition and boxed up with fresh grease.
- c) Alignment of fan with motor checked/rectified wherever required.
- d) Damaged belts of fan No.3 & 4 replaced with new set of belts.
- e) Fan pulley of fan nos.2 & 4 were replaced by modified pulley.

82

CODE NO

JOB DESCRIPTION

**02 03 02 PRILL COOLING SYSTEM FANS (K-1701 & K-1702):**

Following jobs were carried out as preventive maintenance.

- a) Inspection cover of the fan opened. Cleaned fan rotor and checked, found to be ok.
- b) Bearing oil of the fans flushed.
- c) Fan pulley and motor pulley checked & found ok.

**02 03 03 SCRAPPER (M-1402):**

Following jobs were carried out as preventive maintenance of scrapper.

- a) Opened inspection cover of main gear box. Gear box oil checked and found ok.
- b) Scrapper arm cleaned.
- c) Painting of scrapper arms done.

**02 03 04 BUCKET CHANGEOVER MECHANISM (M-1401):**

The following jobs were carried out in overhauling of bucket changeover mechanism.

- a) Bucket changeover mechanism was cleaned & checked.
- b) One no toothed belt was found damaged and the same was replaced with new one.
- c) Chain was cleaned, checked and found to be Ok. Greasing of chain was done.

**02 13 01 HYDROJET CLEANING OF HEAT EXCHANGER:**

Channel covers / manhole of following heat exchanger were opened and boxed up with new gasket after hydrojet cleaning.

- 1) Main Lube oil cooler (H-1113 A/B)
- 2) Flash tank condenser (H-1421)
- 3) Ist evaporator (H-1422) with DM water
- 4) Ist evaporator condenser (H-1423)
- 5) IInd evaporator 1st condenser (H-1425)
- 6) IInd evaporator IInd condenser (H-1426)
- 7) Recirculation heater H-1204 with DM water
- 8) LO coolers of (P-1102 A/B) & (P-1201 A/B)
- 9) CCS II cooler (H-1207)
- 10) Final condenser (H-1420)
- 11) Pre evaporator condenser (H-1412)
- 12) L.O.Cooler of Hitachi compressor (H-1814 A/B)

83

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 CODE NO                    JOB DESCRIPTION  
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02 14 01    STEAM LEAK JOBS:

Various steam leak jobs were carried out as per list given by Production department.

02 15 01    BOILER INSPECTION ( 4 ATA STEAM DRUM V-1501):

(A)    OPEN INSPECTION:

Open inspection of boiler No.GT-1664 (V-1501) was carried out on 21/04/99.

(B)    HYDROTEST :

Hydrotest of GT-1664 (V-1501) was carried out in presence of IBR inspector on 23/04/99 at the pressure of 10.70 Kg/cm2.

(C)    BENCH TEST:

Bench test of both RV's done and readings are as under.

	Popping pressure -----	Reset pressure -----
RV No.1501	7.0 Kg/cm2	6.5 Kg/cm2
RV No.1502	7.0 Kg/cm2	6.5 Kg/cm2

02 17 01    VALVE REPAIR/INSPECTION/TESTING/REPLACEMENT

SYNTHESIS SECTION / LP SYSTEM :

1.    P-1102-A :

Two nos recycle I/V were replaced by recondition I/V  
- I disch I/V was replaced by recondition I/V

2.    P-1102-B :

I discharge I/V was replaced by recondition I/V

3.    P-1102-C :

I recycle I/V was replaced by recondition I/V  
- One disch I/V was replaced by recondition I/V

4.    P-1201-A/B/C :

Common recycle I/V was replaced by spare I/V as existing I/V was passing.

84

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CODE NO	JOB DESCRIPTION
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**5. P-1201-B :**

I disch I/V was opened. Valve seat machined & bonnet of the valve replaced by spare one, the valve was boxed up.

- II disch valve was hard to operate and passing. It was opened, valve seat was machined & bonnet of the valve replaced by spare one.
- Suction line pin hole leak was repaired by grinding / welding and followed by DP test.

**6. P-1201-C :**

- Both I/V was opened. Valve seats were machined & bonnets were replaced by spare bonnets.
- Booth recycle I/V were opened. Valves seats were machined, bonnet replaced and boxed up.

**7. P-1201 :**

Replaced bonnet of 2 nos of sample point I/V

**8. H-1203 :**

Replaced bonnet of Ist drain I/V by spare bonnet.

**9. H-1102 :**

Roused the cold NH3 inlet Ball valve as it was hard to operate.

**10. P-1211 :**

Replaced DM water I/V by spare valve.

**11. P-1505-A :**

Replaced suction I/V by new valve.

**12. P-1352 :**

Replaced gasket of P-1352 discharge to H-1205 I/V u/s flange.

**13. RV-1201-C :**

Replaced gasket of RV-1201-C d/s flange

85

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CODE NO                      JOB DESCRIPTION  
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EVAPORATION PRILLING :

1. V-1418 : Replaced condensate flushing I/V with new one
2. HICV-1422 : Replaced bypass I/V of HICV-1422
3. Pre-evaporator : Replaced condensate flushing I/V of Pre-evaporator
4. H-1423 : Replace Ist I/V of Condensate to H-1423

HYDROLYSER :

1. V-1351 : Replaced gasket (4" x 300) of feed inlet to V-1351 flange.

02 17 02 RV'S OVERHAULING AND TESTING:

The Following RV's were removed,overhauled and tested at our test bench by M/s.FMC SANMAR LTD,Baroda,and installed back in their position.

Sr. No.	Tag. No.	Size and style	Equipt. No. & Name	Make	Set.Pr. Kg/cm2g	Reset Press. Kg/cm2.
1	RV-1501	8 T 10 HS-25-IBR	V-1501, 4ATA STEAM DRUM	CROSBY	7.12	6.8
2	RV-1502	-- DO --	- DO	- DO -	7.12	6.8
3	RV-1504	4 P 6 HS-36-IBR	V-1503, 9 ATA STEAM DRUM	- DO -	9.97	9.5
4	RV-1503	4 M 6 HS-IBR	V-1502, 23 ATA STEAM DRUM	- DO -	25.0	23.0
5	RV-1130	4 P 6 HS-36-IBR	23 ATA STEAM HEADER	- DO -	25.0	24.0

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CODE NO                      JOB DESCRIPTION  
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Sr. No.	Tag. No.	Size and style	Equipt. No. & Name	Make	Set.Pr. Kg/cm2g	Reset Press. Kg/cm2.
6	RV-1201A	3 J 4 JO-66-S-A -SPL	V-1207 AUTOCLAVE GAS	- DO -	2350 PSIG	2200 PSIG
7	RV-1201B	- DO -	-- Do --	- DO -	2350 PSIG	2200 PSIG
8	RV-1201C	- DO -	-- DO --	- DO -	2350 PSIG	2200 PSIG
9	RV-1201 SPARE	- DO -	-- DO --	- DO -	2350 PSIG	2200 PSIG
10	RV-1202A	6 R 10 JO-36-S5 -SPL-G	L.P.STAGE	- DO -	6.0	5.8
11	RV-1202B	- DO -	-- DO --	- DO -	6.0	5.4
12	RV-1202C	- DO -	-- DO --	- DO -	6.0	5.4
13	RV-1103A	1.5G 2.5 JLT.JOS -32-A	NH3 SUC. VESSEL	- DO -	32.0	30.5
14	RV-1103B	- DO -	-- DO --	MULTI SARASIN	31.0	29.0
15	RV-	0.5 X 1 RELIEF VALVE	NH3 OUT- LET	- DO -	31.0	29.0
16	RV-	- DO -	-- DO --	- DO -	31.0	28.0
17	RV-	- DO -	-- DO --	- DO -	31.0	29.0
18	RV-	- DO -	-- DO --	- DO -	31.0	30.0
19	RV-	- DO -	-- DO --	- DO -	31.0	29.0
20	RV-1927	2 H 3 JOS-35-A	COLD NH3 LINE NEAR H-1201	--	31.0	29.0
21	RV-	0.5 X 1 RELIEF VALVE	NH3 OUT- LET	MULTI- SARASIN	31.0	28.0

CODE NO	JOB DESCRIPTION					
Sr. No.	Tag. No.	Size and style	Equipt. No. & Name	Make	Set.Pr. Kg/cm2g	Reset Press. Kg/cm2.
22	RV-	- DO -	NH3 COLD & HOT	- DO -	31.0	28.0
23	RV-	- DO -	- DO -	- DO -	31.0	28.0
24	RV-	- DO -	NH3 FILTER INLET	DO -	31.0	28.0
25	RV-	- DO -	-- DO --	- DO -	30.0	28.0
26	RV	- DO -	NH3 COLD & HOT	- DO -	31.0	28.0
27	RV-1203	2 H 3 JOS-42-H- JKT-SPL-97- 4149	CARBAMATE SUCTION	CROSBY	8.5	7.5
28	RV-1204	- DO - 97-4150	-- DO --	- DO -	8.5	8.0
29	RV-1201	2 H 3 JOS-JLT TYPE	-- DO --	TECH- NICAL	8.5	6.5

02 17 03 INSPECTION OF CHECK VALVES (NRV'S):

The following check valves were opened, checked, repaired and boxed up.

- 1) CO2 to H-1201
- 2) Carbamate to H-1202
- 3) CO2 to H-1203

02 19 01 AUTOCLAVE (V-1201):

Top cover of autoclave was opened for inspection by inspection section. The following jobs recommended by inspection section were carried out.

A) Compartment - I :

One no. P/H marked by inspection section was repaired by welding / griding by TIG method using 25-22-2 LMn filler wire followed by D.P.test.

CODE NO

JOB DESCRIPTION

**B) Compartment - II:**

Two nos P/H and 1 No undercut marked by inspection section were repaired by welding/grinding by TIG method using 25-22-2 LMn filler wire followed by D.P.test.

**C) Compartment - IV:**

The minimum thickness of insert liner was reduced to 2.5 mm and the same was replaced by new insert liner (material 2 RE 69). The following procedure was adopted for insert liner replacement.

**a) Insert liner replacement procedure:**

1. Removed old insert liner by grinding the welding without damaging the loose liner / back up strip plate kept behind the insert liner.
2. Removed old weld metal deposite from shell liner face by smooth grinding after removal of corroded insert liner.
3. Prepared bevelling of shell liner end face by grinding.
4. Pressurised air at 0.2 Kg/cm<sup>2</sup> from weep hole to ensure clear air passage and found Ok.
5. Inspected bevel face of liner by DP test.
6. The new insert liner of required profile was cut from 2 RE 69 plate of 6 mm thick. DP test and ferrite measurement of the same was carried out and found to be ok.
7. Removed air connection from weep hole.
8. New insert liner put in position and root welding done by TIG welding using 25-22-2 LMn filler wire.
9. DP test of root run carried out.
10. Filled up the bevel using 25-22-2 LMn filler wire. Interpass temperature was maintained below 150 deg.C.
11. DP test of final weld carried out.
12. Air and soap solution test of new insert liner welding was carried out.

89

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CODE NO	JOB DESCRIPTION
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13. New weld joint was passivated with 4% HNO<sub>3</sub> followed by rinsing with plenty of DM water.
14. 5 nos old tray supports of tray No.3 were replaced by new (modified) tray support.

**(b) Tray support replacement procedure:**

1. Old tray support removed by grinding without any damage to liner.
2. Old weld material removed from the shell liner by grinding.
3. DP test of liner surface carried out.
4. The new support put in position and tack welded with shell liner.
5. Root run completed by TIG welding using 25-22-2 LMn filler wire.
6. DP test of root run carried out.
7. Remaining weld pass completed by TIG welding using 25-22-2 LMn filler wire.
8. DPT of final weld carried out & found to be Ok.
9. The new weld cleaned properly and passivated with 4% HNO<sub>3</sub> followed by rinsing with plenty of DM water.

**(D) Compartment No.V:**

1 no. U/C in 6th clit from manway towards ammonia side and 1 No. P/H in 3rd clit from manway towards maint. side were repaired by welding/grinding by TIG welding using 25-22-2 LMn filler wire followed by DP test.

**(E) Compartment No.VII:**

1 no P/H, 2 nos cavity and 2 nos undercut marked for repair were repaired by welding/grinding by TIG welding using 25-22-2 LMn filler wire followed by DP Test.

90

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CODE NO	JOB DESCRIPTION
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**(F) Compartment No.VIII:**

1 no undercut and 2 nos cavity marked for repair were repaired by welding/grinding by TIG welding using 25-22-2 LMn filler wire followed by DP test.

3 nos old tray supports of tray no.7 were replaced by new (modified) tray support as per the above procedure III B.

**(G) Compartment IX:**

3 Nos p/h marked for repair were repaired by welding/grinding by TIG welding using 25-22-2 Lmn filler wire followed by DPT.

- The repaired weld points were passivated by 4% HNO<sub>3</sub> followed by rinsing with plenty of DM water.
- All the tray's inter connecting bolts and tray supports bolts were checked/tightened.
- Autoclave was cleaned properly and washed with DM water after completion of the jobs.
- Autoclave boxed up with new gasket.

**02 19 02 CO2 KNOCK OUT DRUM (V-1101):**

Manhole cover of CO<sub>2</sub> Knock out drum was opened for inspection. Top supporting angle of demister pad found damaged and the same was repaired. Demister pad replaced by a new set of demister pad. Mahole cover boxed up with new gasket.

**02 19 03 H.P.STRIPPER H-1201:**

Top and bottom cover of the stripper were opened. False tubesheet and ferrules were removed after grinding the tack weld between false tube sheet and ferrules. The stripper was handed over to inspection section for inspection. The following observations/ repair were made.

**Tube to tubesheet seal weld:**

1. 8 Nos tube to tubesheet weld was got corroded.
2. 1 No tie rod seal weld had pin hole
3. Tubes located at outer circumference of tubesheet had been observed to have undercut/crevice on tube to tubesheet seal weld.

91

CODE NO

JOB DESCRIPTION

4. At one location cavity of size appx. 5 mm dia x 1.5 deep was seen.

The above defects were not repaired to avoid burn through.

Top channel :

Overlay weld on tubesheet was corroded.

Top cover :

Central nozzle seal weld found corroded and 5 nos pinholes and some cavities were observed. The same were repaired by welding/grinding by TIG welding using 25-22-2 LMn filler wire followed by DPT and ferrite measurement and found to be Ok.

After completion of repairing work the new welds were passivated by 4% HNO<sub>3</sub> rinsed with plenty of DM water. The ferrules were fixed back in position with new sleeve gasket. False tube sheet put back in position and tack welded with ferrules. Precaution was taken to avoid entrance of any foreign particles inside stripper. Delta P measured by production department. Stripper cover boxed up after getting clearance from production department. CO<sub>2</sub> inlet line, Urea solution outlet line and offgas outlet line boxed up, steam tracing line rewelded and the stripper was handedover to production department.

02 19 04 H.P.CARBAMATE CONDENSER (H-1202):

Top and bottom covers of H.P.Carbamate Condenser were opened for inspection by inspection department. After completion of inspection the following repair recommended by inspection section were carried out.

Top Channel:

20 points having p/h and U/C marked for repair were repaired by welding / grinding followed by DPT and ferrite measurement and found to be Ok. The new welds were passivated by 4% HNO<sub>3</sub> and rinsed with plenty of DM water.

Bottom channel:

3 points having pin hole / undercut marked for repair were repaired by welding/grinding followed by DPT, ferrite measurement and passivation by 4% HNO<sub>3</sub>.

Top and bottom covers of the HPCC were boxed up with new gasket. Steam tracing line rewelded and equipment was handedover to production.

92

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CODE NO	JOB DESCRIPTION
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**02 19 05 RECTIFYING COLUMN (V-1202):**

Top cover and bottom manhole of rectifying column were opened for inspection. Top grid of column was found damaged and the same was repaired. Rasching rings which were replaced in 1998 shutdown, were removed and about 30% of Rasching ring were found damaged. The damaged rasching rings were replaced by old rasching rings. Top covers and bottom mahole were boxed up with new gasket.

**02 19 06 L.P.ABSORBER (V-1203):**

Manhole cover of L.P.Absorber was opened for inspection and found to be ok. Manhole cover boxed up with new gasket.

**02 19 07 L.P.VENT SCRUBBER (V-1206):**

Manhole cover of L.P.vent scrubber was opened for inspection. Demister pads were found dislocated from its positions. One no bolt/nut of demister pad was found loose. The demister pads were put in their position and fixed with new holding wire. Loose nut/bolts was tightened and manhhole cover boxed up.

**02 19 08 AMMONIA SCRUBBER (V-1207):**

Top cover and bottom inspection covers of Ammonia Scrubber were opened for inspection. Bottom grid of the vessel was found damaged. The damaged grids were removed from its position and put back in position after repairing. A new hand hole was fabricated near grid. Vessel was boxed up after completion of repairing / fabrication jobs with new gaskets.

**02 19 09 Ist DESORBER (V-1352):**

Manhole cover of Ist desorber was opened for inspection and found to be ok. Manhole cover of vessel was boxed up with new gasket.

**02 19 10 HYDROLYSER (V-1351):**

Top and bottom manhole covers of hydrolyser were opened to check condition of trays. Trays were found in good condition. Some bolts were found loose/missing. New bolts were provided in place of missing bolts and loose bolts were tightened. Manhole covers boxed up with new gasket.

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CODE NO                      JOB DESCRIPTION  
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**02 19 11    FLASH TANK SCRUBBER (V-1421):**

Manhole cover of flash tank scrubber was opened for inspection. Carbamate leakage sign was observed from reinforcement pad of manway nozzle. The repair work could not be carried out because of ammonia smell. Manhole cover boxed up with new gasket.

**02 19 12    Ist EVAPORATOR SCRUBBER (V-1423):**

Manhole cover of Ist evaporator scrubber was opened for inspection. Demister pad to size approx. 550 x 220 x 110 MM was found missing. the missing demister fixed back in position and manhole cover of scrubber was boxed up with new gasket.

**02 19 13    4 ATA STEAM DRUM (V-1501):**

Opened manhole covers of 4 ata steam drum. Cleaned inside of the drum. Handedover to inspection department for inspection. The following jobs were carried out after completion of inspection.

- 1 no. bolt was provided inplace of missing bolt of clamp of distribution pipe.
- Some fastners which were found loosened were tightened.
- Spool piece after 9 ata to 4 ata let down valve was replaced by new fabricated spool piece as existing spool piece had less thickness.
- RV-1501 & RV-1502 removed from its position and fixed back in position after testing.
- Blinds were provided for hydrotesting.
- Hydrotesting of steam drum done in presence of IBR inspector.
- Blinds were removed and manhole cover boxed up.

**02 19 14    23 ATA STEAM SATURATOR V-1502:**

Manhole covers of 23 ata steam saturator were opened for inspection and thickness measurement. All the internals were found in good condition. Overall condition of the vessel was OK. Manhole covers boxed up with gasket.

94

CODE NO	JOB DESCRIPTION
02 19 15	<b><u>9 ATA STEAM SATURATOR V-1503:</u></b>  Opened manhole cover of 9 ata steam saturator for inspection and thickness measurement. Internals were found in good condition except one no. of check nut of "U" clamp of distribution header which was found missing and same was provided and tightened. Manhole cover boxed up with new gasket.
02 19 16	<b><u>1ST EVAPORATOR SEPARATOR H-1422:</u></b>  Manhole cover of 1st evaporator separator was opened for inspection and thickness measurement. Impingement cone, flushing condensate nozzle and baffle found in good condition. Manhole cover boxed up with new gasket.
02 19 17	<b><u>IIND EVAPORATOR SEPARATOR H-1424:</u></b>  Manhole cover of IInd evaporator was opened for inspection and thickness measurement. Condition of longitudinal and circumferential weld joint found in satisfactory condition. Overall condition of evaporator separator found satisfactory. Ultrasonic thickness measurement carried out. Manhole cover boxed up with new gasket.
02 19 18	<b><u>CO2 SPRAY COOLER (H-1104):</u></b>  Manhole cover of spray cooler was opened for inspection and boxed up after visual inspection.
02 19 19	<b><u>L.P.CARBAMATE CONDENSER (H-1205):</u></b>  Channel cover gasket and top cover gasket of L.P.Carbamate condenser were replaced by new gasket.
02 19 20	<b><u>AMMONIA WATER TANK T-1301:</u></b>  Manhole cover of ammonia water tank was opened for visual inspection. One support angle was found broken and the same was repaired. One cavity of approx. 5 MM dia and 2.3 MM deep marked for repair on the bottom plate near about 3 metre distance from manhole towards south was repaired by welding /grinding. Manhole cover boxed up with new gasket.
02 20 01	<b><u>FABRICATION JOB:</u></b>  1. Heat exchanger H-1422-A was removed from its position alongwith its isolated line and new support provided to H-1207-A.

95

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CODE NO                    JOB DESCRIPTION  
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**02 21 01 BELT CONVEYORS:**

**1. M-1402 :**

Opened inspection window of main gear box. Oil of gear box checked and found to be Ok. One no hydraulic coupling replaced. Oil of hydraulic coupling replaced. One No. motor replaced.

**2. M-1403 :**

A portion of skirt rubber replaced. Bearings of gravity pulley were replaced by new one. Oil of gear box replaced. 8 Nos return rollers were replaced. Alignment of gear box done.

**3. M-1419 :**

- Roof modificaton of M-1419 was done by Civil department.
- Gear box oil was replaced.
- Replaced one set coupling pin and bush.

**4. M-1421 :**

- Adjusted skirt rubber.
- Replaced 3 nos return roller
- Replaced coupling bolts and bush
- Replaced oil of gear box and alingment done.

**5. M-1701 :**

- Replaced conveyor belt.
- Gear box oil replaced.

PLANT TURNAROUND - APRIL-1999UREA PLANTINSPECTION JOBS

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CODE NO            JOB DESCRIPTION  
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**02 41 01    INSPECTION JOBS:**

During this Shutdown, the following major Inspection activities were performed.

1. Inspection of HP vessels viz; (1)H-1201 HP Stripper (2) V-1201, Autoclave and (3) H-1202 HP Condenser. H-1203, HP Scrubber was not opened for inspection during this Shutdown.
2. Internal inspection and ultrasonic thickness measurement of other vessels in the Plant.
3. Ultrasonic thickness measurement of various pipelines including HP lines in the Plant.
4. Dye penetrant examination and radiography of modified/replaced pipe lines viz; (1) Autoclave offgas line PR-1208-4" One Tee (2) PW line to spray Cooler (3) 9 ata to 4 ata steam line. These replacement jobs were carried out by M/s Jacobs H&G Ltd.

**HIGH PRESSURE VESSELS:****(1) AUTOCLAVE, V-1201:****(a) VISUAL INSPECTION:**

Thorough visual inspection of the liner and its welds, trays and internals was carried out. The following observations were made.

1. In general, the corrosion attack on liner welds was more as compared to liner parent material as has been observed during previous inspections.
2. The insert liners showed higher corrosion rate during this year as compared to previous examinations. The insert liner in the fourth compartment (between 3rd and 4th tray) showed min. thickness of 2.5 mm. This insert liner was replaced subsequently during this Shutdown.
3. The down comer pipe and trays which were replaced in 1997 did not show any corrosion.

97

CODE NO

JOB DESCRIPTION

4. The tray supports of old design 'C' shaped need replacement due to severe uniform corrosion of support metal and its weld joint with the liner. All these old supports are recommended for replacement at the earliest opportunity.
5. Observations made on individual compartments were recorded and the defects which were to be repaired were marked at position. Repairs were recommended at the following locations:-
- A) Compartment No.1 : One No. pinhole on long seam in South east direction.
- B) Compartment No.2 :
- a) One No. undercut 1.5 mm deep on long seam in south east direction.
- C) Compartment No.5:
- a) One No. undercut in cliticweld no. 6th (counting clockwise from manway).
- b) One No. pinhole on weld of clitic No.3 (counting anticlockwise) from manway.
- c) Minor bulging of main liner observed just above cirseam about half the circumferential length.
- D) Compartment No.7:
- a) One No. crevice/cavity on cliticweld of clitic No.3 (counting clockwise from manway).
- b) One No. pinhole at T junction of long. and cir. seams towards overflow pipe side.
- c) 2 Nos. undercut in cirseam and one No. cavity in same cirseam.
- E) Compartment No.8 :
- a) One No. severe undercut on cliticweld of clitic No.3 (counting from manway in clockwise direction).
- b) One No. undercut/cavity in bottom cirseam of insert liner.
- c) One No. clitic marked for replacement and one No. crevice in clitic weld.

98

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 CODE NO                      JOB DESCRIPTION  
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F)    Compartment No.12 : 2 Nos. pinholes were revealed in fillet weld (seal weld) of HPCC gas inlet nozzle in DP test. DPT of all the 5 nozzles seal weld and cover plate seal weld/fillet weld were carried out. No defects were observed in other four nozzle seal welds.

**(b) LINER THICKNESS MEASUREMENT:**

Ultrasonic thickness measurement was carried out on liner in all the compartments. The readings are summarised as follows:-

	Min.Thk. (MM)	Max.Thk (MM)	%age Red. (max.)
	-----	-----	-----
Compartment - 1			
Top Course	3.9	4.2	22%
Bottom Course	4.6	5.0	8%
Compartment - 2	4.5	4.9	10%
Compartment - 3	4.5	5.0	10%
Compartment - 4	4.5	4.8	10%
Compartment - 5	5.0	5.6	Nil
Compartment - 6	4.8	5.0	4%
Compartment - 7	4.9	4.9	2%
Compartment - 8	4.9	5.0	2%
Compartment - 9	4.9	5.0	2%
Compartment - 10	4.8	4.9	4%
Compartment - 11	4.9	5.3	2%
Top Dome	3.6	3.8	28%
Bottom Dome	6.3	7.0	---
Insert liner Plate in Comp.3 (was replaced in 97 Shutdown)	6.8	7.2	---

Note : (Insert liner plate in compartment no.4 replaced during this April'99 shutdown) The procedure adopted for replacement is enclosed herewith at Annexure-1.

99

CODE NO	JOB DESCRIPTION		
	Min.Thk. (MM)	Max.Thk (MM)	%age Red. (max.)
Before Replacement	2.5	4.8	50%
After Replacement	6.8	7.1	---
Insert liner plate in Comp.8	3.0	3.8	40%
This liner is recommended for replacement during next T/A.			
Insert liner plate in Comp.9	3.7	4.5	26%
Insert liner plate in Comp.10	4.0	5.0	20%

During this Shutdown, 5 Nos. of clits of tray No.3 were replaced with new ones. Three No. clits of tray No.7 in 8th compartment were also replaced due to heavy corrosion on parent metal of clit and its weld. The weld joints were DP tested after first layer welding and final welding which were done using TIG welding process with 25-22-2 LMn filler wire.

2) HP STRIPPER, H-1201:

a) VISUAL INSPECTION:

Visual inspection of top cover, top channel, top and bottom tube sheets, bottom channel and cover was carried out. Heavy oxide layer was observed particularly on top dome overlay welding which was found peeled off from scattered locations. As has been noticed during previous inspections, the top tubesheet overlay welding was observed to have undergone significant corrosion. Also, tube to tubesheet seal welds showed heavy corrosion resulting in loss of weld metal and flattening of fillet bead near the tubes particularly located in South and South East Side. Eight No. tubes which were identified to have undergone heavy corrosion attack were marked for repairs. However, during repairs on tube seal weld, burn through was taking place. It was therefore decided to drop the localised repairs as burn through defects are very serious and can lead to leakage. Thorough visual and Dye penetrant examination was carried out after this trial repair. Localised corrosion cavities observed on tube sheet overlay welds at outer circumference(29 spots), one No., tie rod seal weld pinhole, one No. cavity between tubes were also repaired using 25-22-2 LMn Filler wire. DP test and Ferrite measurement was carried out after welding. Ferrite was found to be NIL.

CODE NO

JOB DESCRIPTION

The Stripper offgas (to condenser) outlet nozzle in the top cover is provided with the liner. The seal weld of this nozzle liner in the cover was found to have five nos deep pinholes (approx. 3 to 4 mm depth). These were marked for repairs. After repairs, the weld layer was examined by Dye Penetrant test and ferrite content was found to be NIL. The nozzle liner was visually inspected and was found to have corrosion cavities of approx. 10 to 15 mm dia x 2.5 mm depth. Thickness measurement was carried out on the liner sound wall and near the corrosion attacked areas to assess the remainder thickness. The following reading were measured.

Sr. No.	Location	Liner Thickness	
		Min. MM	Max. MM
01	4" above bottom face on sound wall.	6.67	8.23
02	Near Corrosion affected areas	7.0	8.24

( effective thickness of liner = 4.5 MM )

Dye pentrant examination of tube to tubesheet seal welds was also carried out on randomly selected tubes. The irregular surface of the weld metal due to corrosion attack posed difficulty in carrying out D.P.test. However, no defects were observed during the test.

The overall condition of bottom tubesheet and overlay welding, tube to tubesheet seal welds etc. was satisfactory.

The liquid inlet nozzle in the top dome was inspected with fiberscope and found satisfactory.

**(b) INTERNAL SCALING IN TUBES:**

During 97 shutdown, chemical cleaning was performed. After 2 years of service the tubes were internally inspected using industrial fiberscope (Brought for on sight demonstration by M/s. J.Mitra, Mumbai and M/s.Vortex, Surat). The scaling in the tubes was observed to be in approx. 1 foot length from the top. The scaling thickness was less than 0.5 MM as had been observed during previous inspection. Below 1 foot depth, there was no scaling seen inside the tubes. ID measurement of 21 Nos tubes was carried out in top 4 inch length. The following readings were observed on tube nos. 658,661 and 756 which were found to have lowest thickness (2.10 MM) as per STAC April-98 report.

101

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CODE NO                      JOB DESCRIPTION  
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Tube No.	ID MM	Design OD MM	Wall thickness (calculated MM)	Remark
658	26.72	32	2.64	These readings corresponds to top 4" length of tubes only.
661	26.69	32	2.65	
756	26.68	32	2.66	

In other 18 tubes, tube thickness was calculated to be between 2.7 MM to 2.9 MM with the help of inside dia. measurement.

**(c) OVERLAY WELD THICKNESS:**

The thickness of the overlay weld metal in the top and bottom domes of the Stripper was carried out using permascope M11D. The following readings were found.

Top Section :	Min.(MM)	Max.(MM)
On manway cover	9.2	14.6
Manway	10.1	15.6
Top dome (Gas phase)	9.7	13.6
Gas phase in Cylindrical Dome.	11.35	16.6
Liquid phase in cylindrical Dome,	7.77	12.3
Tube sheet	10.66	13.92
<b>Bottom Section :</b>		
On Cover	10.4	15.5
Manway	10.2	13.4
Dome	10.6	13.6
Cylindrical area of bottom Dome.	11.3	14.8

102

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 CODE NO                      JOB DESCRIPTION
 

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**(3) H-1202 H.P.CONDENSER :****(a) VISUAL INSPECTION :**

Visual inspection of the top and bottom channel compartments was carried out. In general, the condition of the liner and weld joints were satisfactory. However localised corrosion attack was found on the liner welds and in the heat affected zones on liner to tubesheet corner weld. In all, twenty spots on top channel and two spots on bottom channel compartment were marked for repairs due to deep pinholes, under cuts etc. The defects were removed by grinding and TIG welding followed by DP test and Ferrite measurement tests which were found satisfactory.

**(b) OVERLAY WELD AND LINER THICKNESS MEASUREMENT:**

The liner and overlay weld thickness in the top and bottom channel compartment was carried out. The following readings were measured.

<u>TOP SECTION</u>	Min. (MM)	Max. (MM)
Cover overlay :	Could not be measured	
Manway liner	6.41	7.28
Dome liner	6.73	7.32
Cylindrical area of top Dome.	6.4	7.1
<u>BOTTOM SECTION :</u>		
Cover overlay	18.90	19.20
Manway liner	5.03	6.8
Dome area liner	6.48	7.0
Cylindrical area of liner	6.45	7.0

**02 41 02 OTHER VESSLES:****(1) V-1101 (CO2 KNOCK OUT DRUM) :**

- a) Top supporting angle of demister pad was bent upward and fractured at approx. 450 MM from north end. Fastner bolt of this angle was also found loosened.

103

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CODE NO	JOB DESCRIPTION
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- b) Epoxy paint was damaged and metal exposed at few spots of approx. 5 MM to 10 MM of dia size. (Specially above demister pad).
- c) At some locations paint was peeled off.
- d) Brown colour of rust was observed on the shell which seems to be come out from demister pad support ring and clamping angle.
- e) Demister pad was removed for replacement with new one.
- f) Epoxy paint was recommended to be applied especially at demister pad area and at places where metal was exposed.
- g) Thickness measurement was carried out from outside. Minimum thickness of 10.2 mm and 12.7 mm was found on shell and dished-end respectively against design value of 10.0 mm on shell and 13.0 mm on dished end.

(2) V-1103 (NH3 SUCTION VESSEL):

Visual inspection of the vessel internals was carried out. The observation were as follows :

- a) Colouration of shell was blackish grey.
- b) The condition of longitudinal and circumferential weld joints were satisfactory.
- c) Top (NH3 inlet) and Bottom (NH3 outlet) nozzle as well as recycle nozzles were also in satisfactory condition.
- d) Ultrasonic thickness measurement of the shell and dish end was carried out from outside. Minimum thickness of 21.1 mm and 22.2 mm was found on shell and dished end respectively against design value of 21.0 mm on shell and 23.0 mm on dished end.

(3) V-1202 (RECTIFYING COLUMN):

From Top manhole:

- a) Only one segment of top grid of rasching rings was inside which was damaged and was broken at the end of clamping flat.
- b) Thick and hard scaling was observed in rasching rings filled portion.

104

CODE NO

JOB DESCRIPTION

- c) Brown colouration was observed below the scales of shell.
- d) Broken rasching rings were found inside vessel.
- e) Support (bottom) grid of raching ring was corroded and had red colouration in mid portion and greyish on the end portion.

**From Bottom manhole:**

- a) Sticky brown layer was on the floor.
- b) Scaling was observed on the shell.
- c) On top of dome, shiny silver colour was observed.
- d) Thickness was measured from top manhole. Minimum thickness of 9.5 mm and 11.1 mm was found on shell and dished end respectively against design value of 9.52 mm on shell and 11.0 mm on dished end.

**(4) V-1206 (ATMOSPHERIC SCRUBBER):**

Visual inspection and ultrasonic thickness measurement of shell & Dished end was carried out.

- a) Demister pads were found dislocated from its position i.e. holding wires were broken or unwounded from its supporting ring.
- b) One no. Nut/Bolt of Demister pad holding stripes was found loose just near manhole.
- c) Sieve covering the catalyst bed was found in satisfactory condition.
- d) The shell Colouration was greyish black.
- e) Ultrasonic thickness measurement was carried out from outside. (Thickness reduction was found in bottom course i.e. 4th course from top particularly at North side) Minimum thickness of 1.7 mm and 5.3 mm was found on shell and dished end respectively against design value of 5.0 mm on shell and 8.0 mm on dished end.

The detailed site report on thickness measurement was given to Urea Maintenance and Production for urgent repairs. Thickness measurement report is attached at Annexure - 2.

105

CODE NO

JOB DESCRIPTION

**(5) T-1301 (AMMONIA WATER TANK):**

- a) Brown colouration on bottom of shell was observed.
- b) Bottom plate was found bulged up-side at different locations as has been observed in past.
- c) Old and new tank inter connection pipe welding with shell of top and bottom nozzles was having less welding reinforcement. It was recommended to be filled up with additional layer of welding.
- d) Two nos of cavities of approx. 5 to 7 mm dia and 1.5 mm deep were observed on shell plate which appear to be since fabrication stage.
- e) One cavity of approx. 5 mm dia. and approx. 2 mm deep was observed on the bottom plate at about 3 metre distance from manhole towards south.

**(6) T-1301-A (NEW AMMONIA WATER TANK):**

- a) One angle support / reinforcing structure was found fallen down on floor.
- b) The above structure and other similar structure were there in the tank which were found loose not welded with the shell.
- c) No other defect was observed. In general, the overall condition of the tank was found satisfactory.

**(7) V-1301 (2ND DESORBER) :**

Visual inspection of vessel was carried out from Bottom and Top manhole. The observation are as follows.

**BOTTOM COMPARTMENT:**

- a) The shell had assumed brownish colouration.
- b) Bottom nozzle and nozzle on South side were observed to be in satisfactory condition.
- c) One no. tray clamping bolt on west side and one no bolt on North west side were found loosened.
- d) Thick oily sludge was found adhered to the surface of bottom dished end.

106

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CODE NO                      JOB DESCRIPTION  
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**(TOP COMPARTMENT):**

- a) Shell Colouration was found brownish.
- b) Top nozzle and other nozzle located on North East side were found to be in satisfactory condition.
- c) One no. Nut of Tray clamping bolt in North side was found missing.
- d) Thick oily sludge was found adhered on the trays.

**(8) V-1351 (HYDROLYSER ):**

**Top Manhole:**

Visual inspection of V-1351 from inside was carried out.

- a) One bolt of top tray clamp was found loose.
- b) First and second tray from top 3 bolts of manhole cover were missing and one bolt was loose.
- c) Top dish end and half portion of cylindrical section of top section had blackish colouration.
- d) No other defect was observed.
- e) Thickness was taken from inside. Minimum thickness of 29.8 mm, 29.7 mm and 34.9 mm was found on shell and bottom dished end and top dished end respectively against design value of 28.0 mm on shell, 28 mm on bottom and 33.0 mm on top dished end respectively.

**BOTTOM HALF:**

- a) Clamping bolt of bottom distributor pipe support clamp was missing.
- b) One bolt of distributor flange joint was loose.
- c) Weld joint of distributor flange was having 3 pinholes on distributor pipe side flange weld joint.
- d) Four bolts of bottom tray to tray clamp was missing.
- e) No other defect was observed.

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CODE NO                      JOB DESCRIPTION  
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**(9) V-1352 (FIRST DESORBER) :**

- a) Visual inspection was carried out from top manhole.
- b) Shell and dish end had brownish colouration.
- c) On top tray blue colouration was observed on half tray towards west and north side.
- d) Overall condition of equipment was good.

**(10) T-1401 (UREA SOLUTION TANK):**

- a) Bottom plate is having bulging upside as has been observed in the past.
- b) Old and New tank interconnection pipe welding of shell to pipe of top and bottom are corroded. Layer of welding was recommended to be filled up after grinding.
- c) Dark brown colouration was observed on bottom half of shell.

**(11) T-1401-A (NEW UREA SOLUTION TANK):**

- a) Dark brown colouration was there on bottom half of the vessel.
- b) On South side on shell 1" approx. above the circumferential weld joint, a cavity of 2 mm deep and 5 mm dia approx. was observed. It seems to be from manufacturing stage.
- c) Urea solution inlet pipe bottom support plate with shell was having crack in welding on one side, which was marked for repairs.

**(12) V-1421 (FLASH DRUM SCRUBBER) :**

Visual inspection of shell (vessel) internal was carried out.

- a) Demister pad was slightly distorted and its holding wires were found unwounded at few locations.
- b) Carbamate leakage sign were observed thru tale-tell hole of man-way nozzle reinforcement pad. DPT and Soap solution test were carried out from inside. Soap solution test revealed 10 Nos leaky spots which were located around manway nozzle from inside at locations 1 O'clock to 9 O'clock. These leakages were asked to be repaired.

108

CODE NO	JOB DESCRIPTION
	c) Carbamate leakage sign were also observed in tale tell holes of 3 Nos. saddle support reinforcement pads.
	d) Ultrasonic thickness measurement was also carried out from outside. Minimum thickness of 5.4 mm and 5.4 mm was found on shell and dished end respectively against design value of 5.0 mm on shell and 6.0 mm on dished end.

**(13) H-1422 (1ST STAGE EVAPORATOR):**

Visual inspection and ultrasonic thickness measurement of shell and Dish end were carried out as mentioned below.

- a) The shell and Dish ends colouration was blakish brown.
- b) Impingement cone located at Centre was found intact.
- c) Liquid outlet nozzle on west side of bottom dish end was found in satisfactory condition.
- d) 8 Nos flushing condensate nozzles and Baffles located on top found intact.
- e) Tube to tubesheet seal welds located at centre of bottom Dished ends found in satisfactory condition.

**(14) V-1423 (1ST EVAPARATOR SCRUBBER):**

- a) Dark brown colouration observed.
- b) Demister pad segment of size approx. 550 x 220 x 110 MM was missing on the East side.
- c) Urea particles were found on tray and demister pad.
- d) Thickness measurement was carried out. Minimum thickness of 8.3 mm and 8.3 mm was found on shell and dished end respectively against design value of 8.0 mm on shell and 10.0 mm on dished end.

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CODE NO                      JOB DESCRIPTION  
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**(15) H-1424 (2ND STAGE EVAPORATOR):**

Visual inspection and ultrasonic thickness measurement of shell and Dished ends were carried out. The following were the observations.

- a) Shell and dished ends had assumed shiny white colouration.
- b) Condition of longitudinal and circumferential weld joints were found in satisfactory condition.
- c) Top nozzle and centre cylindrical cone was found intact.
- d) Tubes and tubes to tubesheet seal welds were found in satisfactory condition.
- e) Ultrasonic thickness measurement carried out. Minimum thickness of 12.2 mm and 11.3 mm was found on shell and dished end respectively against design value of 10.0 mm on shell and 12.0 mm on dished end.

**(16) T-1501 (CONDENSATE TANK) :**

Visual inspection of internals as well as ultrasonic thickness measurement was carried out. No abnormality was observed.

- a) Colouration of the internals (shell and dished ends) had assumed brownish.
- b) The weld joints (circumferential and long seams) were found to be in satisfactory condition.
- c) Ultrasonic thickness measurement carried out. Minimum thickness of 9.9 mm and 10.3 mm was found on shell and dished end respectively against design value of 10.0 mm on shell and 10.0 mm on dished end.

**(17) V-1501 (4 ATA STEAM DRUM):**

- a) Colouration of shell was observed to be blackish.
- b) Demister pads were found intact and in good condition.
- c) Minor pittings were observed on both side of dished end.

110

CODE NO	JOB DESCRIPTION
	d) All the baffle plates were found in good condition.
	e) Distribution pipe and its supports were found in satisfactory condition. One no. bolt of its clamp was found missing.
	f) Weld joints of all the nozzles with vessel were found satisfactory visually.
	g) Some fastners (Nuts/bolts) were found loosened and 5 Nos bolts were found missing in West side of riser baffle plate towards North side of manhole and one no. nut/bolt was found missing on East side.
	h) Ultrasonic thickness measurement was carried out. Minimum thickness of 14.5 mm and 17.0 mm was found on shell and dished end respectively against design value of 15.0 mm on shell and 18.0 mm on dished end.

(18) V-1502 (23 ATA STEAM DRUM) :

- a) All the internal fittings were found in good condition.
- b) Overall condition of the vessel was found satisfactory.
- c) Ultrasonic thickness measurement was carried out. Minimum thickness of 30.0 mm and 36.4 mm was found on shell and dished end respectively against design value of 30.0 mm on shell and 37.0 mm on dished end.

(19) V-1503 (9 ATA STEAM DRUM):

Visual inspection and Ultrasonic thickness measurement of vessel was carried out. The observation were as under.

- a) Colouration of Shell and dished end was observed greyish black.
- b) One no. check nut of U-clamp of distribution header was found missing.
- c) Ultrasonic thickness measurement was carried out. Minimum thickness of 12.9 mm and 14.0 mm was found on shell and dished end respectively against design value of 13.0 mm on shell and 15.0 mm on dished end.

111

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CODE NO	JOB DESCRIPTION
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(20) V-1811(Ist stage Separator):

- a) Overall condition of the separator was good.
- b) Ultrasonic thickness measurement was carried out from outside.

Minimum thickness of 6.0 mm was found on shell & dished end respectively against design value of 6.0 mm on shell and 6.0 mm on dished end.

(21) V-1812(IIInd Stage Separator):

- a) Overall condition of the separator was good.
- b) Ultrasonic thickness measurement was carried out from outside.

Minimum thickness of 10.3 mm and 11.6 mm was found on shell and dished end respectively against design value of 10.0 mm on shell and 12.0 mm on dished end.

(22) V-1813(IIIrd Stage Separator):

- a) Overall condition of the separator was good.
- b) Ultrasonic thickness measurement was carried out from outside.

Minimum thickness of 31.0 mm and 29.4 mm was found on shell and dished end respectively against design value of 30.0 mm on shell and 30.0 mm on dished end.

02 41 03 PRESHUTDOWN THICKNESS MEASUREMENT:

In addition to the above, ultrasonic thickness measurement was carried out on such equipments which could be approached from the outside and their service temperature permitted the thickness measurement. The following equipments were inspected visually from outside and the condition was found to be satisfactory. Subsequently, thickness measurement was performed, the results of which are described below.

a) H-1111 Intercooler of K-1101/1 Centrifugal Compressor:

Ultrasonic thickness measurement carried out. Minimum thickness of 13.2 mm, 13.1 mm and 8.3 mm were observed on shell, North and South Channel Covers respectively against design value of 12.0 mm, 13.0 mm and 8.00 mm for shell, North and South Dished Ends respectively.

112

CODE NO	JOB DESCRIPTION
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**b] H-1112 Aftercooler of K-1101/1 Centrifugal Compressor:**

Ultrasonic thickness measurement carried out. Minimum thickness of 9.4 mm, 7.0 mm and 10.1mm were observed on shell, North and South Channel Covers respectively against design value of 9.62 mm, 6.0 mm and 11.00 mm for shell, North and South Dished Ends respectively.

**c] H-1121 First Stage intercooler of PB Compressor:**

Minimum thickness of 7.3 mm was found on shell against design value of 7.93 mm.

**d] H-1122 Second Stage intercooler of PB Compressor:**

Minimum thickness of 8.7 mm was found on shell against design value of 9.525 mm.

**e] H-1204 Recirculation Heater:**

Minimum thickness of 11.7 mm and 9.3 mm was found on shell and dished end respectively against design value of 11.0 mm on shell and 9.0 mm on dished end.

**f] H-1205 LP carbamate Condenser:**

Minimum thickness of 7.20 mm and 12.5 mm was found on shell and dished end respectively against design value of 8.0 mm on shell and 10.0 mm on dished end.

**Note :** During Shutdown, the tube bundle of this heat exchanger was pulled out for the purpose of replacement of top flange gasket. Visual inspection of the tube bundle was carried out and it was observed that the external abrasion has taken place on 18 tubes located at the periphery or in the second and third row from periphery of the bundle. Thickness was measured on the affected area on the tubes. Thickness was found to be 1.0 mm on worst affected tube and 1.9 mm on least affected tube. In the sound area as visible from outside, thickness of the tube was 2.1 to 2.2 mm against the installed thickness of 2.00 mm. Thickness could not be measured on some of the tubes due to lack of approach. It is suggested to pull out the bundle again during next turnaround for inspection. suitable action for replacement of affected tubes or plugging may be taken.

CODE NO	JOB DESCRIPTION
g]	<b><u>H-1207 Circulation System-II Cooler :</u></b> Minimum thickness of 9.9 mm and 8.7 mm was found on shell and dished end respectively against design value of 10.0 mm on shell and 8.0 mm on channel head.
h]	<b><u>H-1421 Flash Tank Condenser:</u></b> Minimum thickness of 7.4 mm and 8.4 mm was found on shell and dished end respectively against design value of 8.0 mm on shell and 7.0 mm on shell head.
i]	<b><u>H-1423 First Stage Evaporator Condenser :</u></b> Minimum thickness of 7.3 mm and 10.5 mm was found on shell and dished end respectively against design value of 8.0 mm on shell and 10.0 mm on dished end.
j]	<b><u>H-1425 Second Stage Evaporator Seperator :</u></b> Minimum thickness of 12.8 mm and 19.0 mm was found on shell and dished end respectively against design value of 8.0 mm on shell and 15.0 mm on dished end.
k]	<b><u>H-1426 Second Stage Evaporator Condenser :</u></b> Minimum thickness of 7.6 mm and 8.8 mm was found on shell and dished end respectively against design value of 7.0 mm on shell and 9.0 mm on dished end.
l]	<b><u>H-1811 First Stage Intercooler of Hitachi compressor K-1801 :</u></b> Minimum thickness of 13.6 mm and 11.9 mm was found on shell and dished end respectively against design value of 12.0 mm on shell and 12.0 mm on dished end.
m]	<b><u>H-1812 Second Stage Intercooler of Hitachi compressor K-1801 :</u></b> Minimum thickness of 11.3 mm and 11.6 mm was found on shell and dished end respectively against design value of 10.0 mm on shell and 12.0 mm on dished end.
n]	<b><u>H-1813 First Stage Intercooler of Hitachi compressor K-1801 :</u></b> Minimum thickness of 10.1 mm and 10.1 mm was found on shell and dished end respectively against design value of 10.0 mm on shell and 10.0 mm on dished end.

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CODE NO	JOB DESCRIPTION
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**o] V-1102 Ammonia Filter :**

Minimum thickness of 11.1 mm was found on shell against design value of 11.0 mm.

**p] V-1111 Intercooler Seperator :**

Minimum thickness of 5.3 mm and 7.9 mm was found on shell and dished end respectively against design value of 5.0 mm on shell and 6.0 mm on dished end.

**q] V-1112 After Cooler Seperator :**

Minimum thickness of 10.5 mm and 9.9 mm was found on shell and dished end respectively against design value of 10.0 mm on shell and 10.0 mm on dished end.

**r] V-1121 First Stage Seperator of PB compressor :**

Minimum thickness of 7.8 mm and 8.5 mm was found on shell and dished end respectively. Design thickness data is not available.

**s] V-1122 Second Stage Seperator of PB compressor :**

Minimum thickness of 16.1 mm and 20.0 mm was found on shell and dished end respectively. Design thickness data is not available.

**t] V-1406 Flash Tank :**

Minimum thickness of 8.7 mm and 10.0 mm was found on shell and dished end respectively against design value of 08.0 mm on shell and 10.0 mm on dished end.

**u] V-1409/A Urea Solution Filter :**

Minimum thickness of 6.2 mm was found on shell against design value of 6.0 mm.

**v] V-1409/B Urea Solution Filter :**

Minimum thickness of 6.4 mm was found on shell against design value of 6.0 mm.

**w] V-1418 Pre-evaporator :**

Minimum thickness of 11.2 mm and 11.0 mm was found on shell and dished end respectively against design value of 12.0 mm on shell and 12.0 mm on dished end.

115

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CODE NO                      JOB DESCRIPTION  
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02 41 04 PIPE LINES THICKNESS MEASUREMENT :

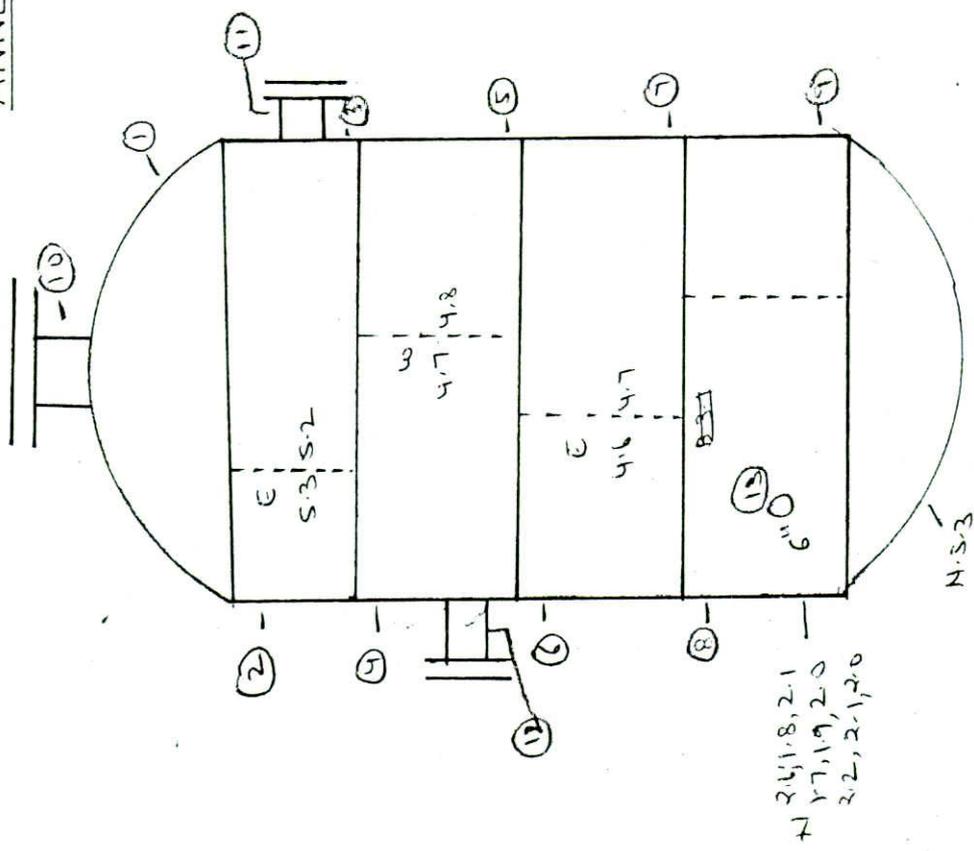
During this shutdown, a large no. of pipe lines were examined for remainder thickness. The detailed report on thickness measurement is enclosed herewith at Annexure -3 attached herewith.

## A N N E X U R E - 1

PROCEDURE FOR REPLACEMENT OF INSERT LINER OF  
FOURTH COMPARTMENT IN AUTOCLAVE

1. Remove old insert liner by grinding the welding without damaging the loose liner / bak up strip plate kept behind the insert liner.
2. After removal of corroded insert liner, old weld metal deposit from shell liner face shall be removed carefully by smooth grinding.
3. Prepare bevelling of shell liner end face by grinding.
4. Pressurise air from nearby weep hole to ensure clear air passage.
5. Inspection of level face of liner by DPT.
6. Ferrite check and thickness measurement of loose liner segments to be done.
7. Cut the new insert liner plate to the required profile. Plate shall be checked for thickness and ferrite before installation. The plate material shall be 2RE69. Thickness shall be 6.0 MM Minimum.
8. Root welding by TIG welding using 25-22-2 L Mn filler wire. No air pressure shall be present in the annular space. Remove air connections to weep holes, if any. Argon shall be pressurised at 0.1 Kg/cm<sup>2</sup> for purging in the annular space to prevent oxidation of weld metal.
9. Ensure no welding is done on carbon steel portion of shell.
10. Offer root run for DPT and Ferrite measurement.
11. After clearance of above tests, fill up the level using same filler wire while maintaining interpass temperature less than 150 degree C.
12. DPT and Ferrite measurement of final weld shall be carried out Ferrite shall be less than 2 %.
13. Air and soap solution test of new insert liner welding shall be carried out at 0.2 Kg/Sq.Cu. pressure in the annular space.
14. On satisfactory completion of the job, passivate new weld joints with 4% HNO<sub>3</sub> followed by rinsing with plenty of DM water.

ANNEXTURE - 2



V-1206 ATM VENT SCRUBBER

SR. NO.	THICKNESS SURVEY					
	T	B	N	S	E	W
1			8.7	8.5	8.7	8.1
2			5.3	5.1	5.1	5.0
3			5.1	5.1	5.1	5.0
4			4.7	4.8	4.5	5.3
5			4.1	4.2	4.2	4.2
6			4.1	4.3	4.2	4.4
7			2.7		3.1	3.3
8			2.6		3.1	3.4
9			2.2		3.7	
10			4.2	4.1	4.1	4.0
11	5.2	5.2	5.1	5.2		
12	10.9	10.9	11.0	11.0		
13	3.1	3.1	3.0			
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
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25						
26						
27						
28						
29						
30						
Line V-1206 Plant UREA						
From ATM VENT SCRUBBER						
To						

TECHNICAL DETAILS	PERSONNEL DETAILS	SUMMARY
Equipment: Computer	Tested By: Shalish	SHELL D.E.
Make: Pulseco	Date: /04/93	DESIGN 5.0
Probe: Pss 2mm, TR	Evaluated By:	MAX. Slow 5.3
PROCEDURE BASED ON		MIN. 1.7
		# Reductn: 5.3
		Remarks:

Client	I F F C O	Kalol Unit
W.O.Nc		
Period	SHUT DOWN '98.	

NOTE :- T=Top, B=Bottom, E=East, W=West, S=South, N=North. All measurements are in 'mm'

**THICKNESS MEASUREMENT OF PIPELINES OF UREA PLANT CARRIED OUT IN S/D APRIL 99**

SR NO	#REPORT NO	LINE NO.	N.B. Inch	SCH	NOMINAL THICK-MM	LINE DESCRIPTION FROM TO	LAST MEASURED	MIN THK(MM) OBSERVED	% RED.	REMARK
<b>GA-CO- ACID GAS LINES:</b>										
1	1277	GA-1201	6	X4	15.24	GA-1112 H-1201	APRIL 99	14	8.136	
2	1306	GA-1203	1	X1	4.55	GA-1202 H-1203	APRIL 99	3.9	14.29	
3	1302	CO-A3-2102	26	-	6.01	GA-1601 K-1801,I SUC.	APRIL 99	5.8	3.494	
4	1309	CO-B22-2114	8	20 S	6.35	V-1812 K-1801,III SUC.	APRIL 99	5.7	10.24	
5	1309	CO-B22-2114	6	10 S	3.4	V-1812 K-1801,III SUC.	APRIL 99	3.6		
6	1298	CO-B22-2119	8	160	23.01	K-1801,(III) H-1813	APRIL 99	22.2	3.52	
7	1284	CO-E10-2122	6	80 S	10.97	H-1813 V-1813	APRIL 99	9.3	15.22	
8	1283	CO-E10-2123	6	80 S	10.97	V-1813 K-1801,IVSUC	APRIL 99	9.6	12.49	
9	1278	CO-F10-2124	8	160	23.01	K-1801-DIS. G-1112	APRIL 99	20.4	11.34	
10	1290	CO-B22-2135	8	20 S	6.35	H-1812 V-1812	APRIL 99	5.7	10.24	
11	1319	CO-F10-2140	4	160	13.49	K-1801,(III) V-1813	APRIL 99	12.9	4.374	
	1319	CO-F10-2140	4	80 S	8.56	DISCHARGE	APRIL 99	7	18.22	
<b>MA- AMMONIA LINES:</b>										
12	1321	MA-1102	6	C2	7.11	H-1101 V-1102	APRIL 99	5.8	18.42	
13	1321	FS BYPASS	4	C2	6.02	MA-1104 VAPOUR ELITR	APRIL 99	5.7	5.316	
14	1321	TURBINE FSLINE	3	-	5.49	MA-1104 FS BYPASS	APRIL 99	5.8		
15	1321	MA-1104	6	C2	7.11	V-1102 V-1103	APRIL 99	6.1	14.21	
16	1289,1275	MA-1105	6	C2	7.11	V-1103 P-1102A/B/C	APRIL 99	6.1	14.21	
17	1297	MA-1106	4	E2/F	8.56	P-1102 A/B MA-1605-6"	APRIL 99	7.7	10.05	
18	1318	MA-1116	4	-	8.56	MA-1106 V-1103	APRIL 99	7.3	14.72	
19	1294	MA-1203	4	X4	8.56	MA-1605-6" PR-1230	APRIL 99	7.1	17.06	
20	1299	MA-1603	6	C2	7.11	V-1103 P-1102C,SUC	APRIL 99	6.5	8.579	
			4	C2	6.02	V-1103 P-1102C,SUC	APRIL 99	4.9	18.6	
21	1291	MA-1604	4	E2	8.56	P-1102C,DIS DIS. HEADER	APRIL 99	8.2	4.206	
22	1295	MA-1605	6	120	14.27	P-1102 A/B/C MA-1203-4"	APRIL 99	13.2	7.498	
<b>PR- UREA/CARBAMATE SOLUTION LINES:</b>										
23	1285	PR-1203	8	X1	19.58	H-1202,VAP. V-1201	APRIL 99	19.3	1.43	
24	1287	PR-1204	8	X1	19.58	H-1202 LIQ. V-1201	APRIL 99	18.6	5.005	
25	1300	PR-1205	6	X1	15.24	H-1201,LIQ. V-1201	APRIL 99	12.3	19.29	
26	1320	PR-1208	4	X1	10.41	V-1201 TOP H-1203	APRIL 99	8.5	18.35	
27	1276	PR-1212	4	X1	10.41	H-1203 V-1201	APRIL 99	9	13.54	
28	1280	PR-1224	4	120	11.13	P-1201 A/B/C PR-1230	APRIL 99	11.6		
29	1314	PR-1232	4	X1	10.41	H-1203 PR-1234	APRIL 99	10.2	2.017	
30	1316	PR-1234	4	X4	9.14	PR-1232 V-1203	APRIL 99	8.5	7.002	
31	1317	PR-1356	3	-	3.05	PICV-1351 V-1352	APRIL 99	3.9		
32	1325	PR-1362	4	-	3.05	V-1351, LIQ. H-1351	APRIL 99	2.9	4.918	
33	1305	PR-1363	4	-	3.05	LICV-1351D/S V-1301	APRIL 99	4.1		
<b>SC- STEAM CONDENSATE LINES:</b>										
34	1310	SC-1502	3	B4	5.49	P-1501/1506 V-1501	APRIL 99	4.8	12.57	
35	1311	SC-1507	3	B4	5.49	P-1505 A/B COND.HEADER	APRIL 99	5.6		
<b>ST- STEAM LINES:</b>										
36	1329	ST-1206	8	B4	8.18	4ATA HEADER H-1204	APRIL 99	6.9	15.65	
37	1324	ST-1211	2	B4	3.91	9ATA STEAM H-1202 SHELL	APRIL 99	3.1	20.72	
38	1363	ST-1502	8	C1	8.18	ST-1116 V-1503	APRIL 99	7.8	4.645	
			4	B4	6.02	ST-1116 V-1503	APRIL 99	5.8	3.654	
39	1363	ST-1502	2	B4	5.54	PICV-1502 V-1503	APRIL 99	5.4	2.527	
			3	B4	7.62	ST-1502 V-1503	APRIL 99	6	21.26	

119

PLANT TURNAROUND - APRIL-1999UREA PLANTC I V I L - J O B S

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CODE NO	JOB DESCRIPTION
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**02 51 01 CIVIL JOBS:**

- 1) Epoxy painting on R.C.C. structure at Prilling floor, Lift Room, Promotograph Room, North side wall near H.P. Condensor, Scrapper floor, CO2 Spray Cooler, Prill Cooling unit, Hydroliser.
- 2) Red Mandana stone flooring work.
- 3) Joint filling (wherever required) at Scrapper floor.
- 4) Epoxy chequered painting on outside wall of Urea Prill tower at 60 meter height.
- 5) False ceiling / False flooring and interior works in Urea Control Room.
- 6) Temporary earthen ramp for the movement of crane near Hydroliser.

120

PLANT TURNAROUND - APRIL-1999

UREA PLANT

ELECTRICAL JOBS

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CODE NO	JOB DESCRIPTION
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**02 61 01 ELECTRICAL JOBS:**

1. Preventive maintenance carried out on following T/F.  
TF-7A, 7B
  - a) Inspection of primary and secondary cable boxes, end termination, checking and tightening of connections.
  - b) Testing of oil in marshaling boxes on primary and secondary transformers and cleaning of chambers.
  - c) Replacement/Reactivating of silicagel in dehydrating breather of above transformer.
  - d) Checking of trip alarm circuit and cleaning of all emergency trip boxes.
  - e) Checking of IR value primary and secondary windings of the above transformer.
2. Preventive maintenance of TMG, Siemens, L&T make LT ACBs installed at MCC and replacement of damaged parts and worn out contacts.
3. Preventive maintenance carried out on all feeder compartments mounted on the following MCCs.  
MCC-6, MCC-14, and MCC-15.
4. Overhauling of critical motors.  
M-1402/1, M-1402/2, P-1131A, P-1131B, P-1132B, P-1231A, M-1419, M-1401A, 1401B.
5. Preventive maintenance, cleaning and checking of all motors operated valve's control panels.
6. Testing & calibration of various types of EE make Relays installed in above MCCs.

PLANT TURNAROUND - APRIL-1999

121

UREA PLANT

INSTRUMENTATION JOBS

CODE NO	JOB DESCRIPTION
02 71 01 (A)	<b><u>HITACHI (CO2) COMPRESSOR:</u></b> <ol style="list-style-type: none"><li>1. Calibrated all Trip Pressure and Level switches.</li><li>2. Calibrated and checked all Vibration Probes and Vibration Monitors.</li><li>3. Checked continuity and resistance of all RTDs and checked Thermocouples.</li><li>4. Installation, commissioning and programming of NT30C Event Sequence Recorder (ESR) of M/s.Omron PLC System.</li><li>5. Generation of 9 Outputs in PLC and 9 Inputs in DCS for live indication of Start Interlock conditions in DCS as per the requirement of Production Deptt.</li><li>6. Generation of 2 Inputs and 4 Outputs in PLC for group Radial vibration and group Axial Displacement High Alarm for alarm in Annunciator.</li><li>7. Cleaned PLC panel, AC Distribution Box, Local Control Penal, TLC Box and all instruments in filed.</li></ol>
(B)	<b><u>CONTROL VALVES COMPRESSOR AREA:</u></b> <ol style="list-style-type: none"><li>1. HICV-1801 : Opened for inspection. Replaced plug and seat. Checked air supply regulators, booster relays, positioner and I/P converters. Checked stroke.</li><li>2. PICV-1810 : Checked plug and seat. Found ok. Checked air supply regulator, booster relay, positioner and I/P converters. Checked stroke.</li><li>3. HICV-1802 : Checked plug and seat. Found ok. checked air supply regulator, booster relay, positioner and I/P converters. Checked stroke.</li><li>4. PICV-1181 : Opened the valve and Checked plug and seat. Found ok. Checked air supply regulator, booster relay, positioner and I/P converters. Checked stroke. Replaced plug seal ring.</li></ol>

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CODE NO                      JOB DESCRIPTION  
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02 71 02    CONTROL VALVES PLANT:

1.    HICV-1201 :    Replaced Diaphragm, plug and seat. Increased the stroke of valve by 5 mm. Cleaned and overhauled. Changed booster relay. Checked positioner, position indicator and air regulator. Checked stroke.
2.    LRCV-1201 :    Replaced Diaphragm, plug and seat. Provided with 21 nos of new gland packing rings. Checked positioner, position indicator and air regulator. Checked stroke.
3.    PRCV-1504 :    Checked plug and seat found Ok. Did general maintenance and cleaning. checked positioner, I/P convertor and air regulator. Checked stroke.
4.    PICV-1130 :    Checked plug and seat. Found some dents & notches on the surface of seat. Machined the seating area of the seat. Provided new ring gasket. Checked positioner, I/P converter and air regulator. Checked stroke.
5.    PICV-1128 :    Replaced the body of the valve. Provided new 2 nos of lens ring gaskets for the flange connection. Checked positioner I/P converter and air regulator. Checked stroke.
6.    PRCV-1202 :    Checked, overhauled and drilled one 1/4" hole in the body of control valve of 1/4" for 9 ata steam injection. Checked air regulator, positioner and I/P converter. Checked stroke. Provided new gland packing.
7.    HICV-1422 :    Checked plug and seat. Surface found damaged. Filled plug and seat surfaces. Checked air regulator, positioner and I/P converter. Checked stroke painted the valve.
8.    HICV-1421 :    Removed actuator from line. Overhauled actuator. There was leakage from "O" ring. Replaced new "O" ring. Again repaired the first "O" ring and changed the actuator (with repaired one).
9.    HICV-1202 :    Opened actuator. Replaced diaphragm. Checked positioner, air regulator and I/P converter. Checked stroke.
10.    LICV-1351 :    Overhauled and cleaned. Checked positioner, air regulator and I/P converter. Positioner and I/P converter were not working properly. Replaced I/P converter and positioner. checked stroke.

123

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CODE NO	JOB DESCRIPTION
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11. Overhauling and cleaning of I/P converter, positioner and regulators and checked stroke of following control valves.

a) PICV-1129	(b) PICV-1504	(c) PICV-1502-A
d) PRCV-1201	(e) TICV-1201	(f) PICV-1201
g) PICV-1131	(h) PICV-1425	(i) PICV-1422
j) TRCV-1421	(k) LICV-1201	(l) PICV-1502B
m) LRCV-1421	(n) LICV-1351	(o) FICV-1385
p) TRCV-1422	(q) PICV-1221	(r) TICV-1808
s) PICV-1501	(t) FICV-1301	

12. Monoblock valve of N/C ratio meter was overhauled provided new gland packing and bushes.

02 71 03 CONTROL ROOM JOBS:

1. Shifted vibration panel from Urea Control Room to ground floor (DCS Cabinet Room). Laid new cables for this purpose and for recording of vibrations. Did programming of Yokogawa Recorder HR2400 for recording of 28 vibration points. All cables from field to vibration monitors were rerouted and a JB was provided to extend one of the cables.
2. Cleaned DCS cabinets, I/O Modules, NIUs dust pads and fans of both ICS and FCS.
3. Isolated all ICS consoles, antisurge controller panel and woodward governor panel and lifted up for false flooring.
4. Did off-line loading in DCS through EWS for data logging and shift reports. Changed time by seven hours.
5. Shifted N/C Ratio meter and Water-in-carbamate signal converters and ammonia flow meter FI-1101 and CO2 flow computer from old panel to vibration panel.
6. Shifted Annunciator and Autoclave counter to a new location in control room.
7. Both printers of DCS shifted and their cables extended to new location.
8. Coordination with contractor people for false flooring and false ceiling and other related jobs.

124

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CODE NO	JOB DESCRIPTION
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**02 71 04 HP VESSELS AND OTHER FIELD JOBS:**

1. Checked all weep hole tubings and provided air supply arrangements to give 0.2 Kg air supply in Autocalve liner.
2. Removed and refixed thermocouples and other field instruments as required to open and box-up the various HP and LP vessels.
3. Checked stroke of all control valves in Co-ordination with urea production staff.
4. Changed Stripper Radioactive source. Calibrated Berthold level gauge for new source.
5. Overhauled and calibrated level trolls LT-1501, LT-1502 and LT-1504.
6. Also shifted the LRCT-1201 & LRT-1201 Radioactive transmitter to a new location.

PLANT TURNAROUND - APRIL-1999

125

UREA PLANT

TECHNICAL DEPARTMENT JOBS

CODE NO	JOB DESCRIPTION
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**02 81 01 TECHNICAL DEPTT.JOB:**

- (1) Pipeline hooking up job for lean ammonia solution from P-1304 C/D pumps to LP absorber was done as per EWR U-166.
- (2) Piping done for providing control valve in first desorber as per EWR -165.
- (3) Elevation of the liquid inlet nozzle in LPCC (V-1205A) reduced by 1.8 MTs as per EWR-U-181.
- (4) Modification in CO2 vent line is done as per EWR No.U-172. Control valve will be provided later on.
- (5) 3/4" tapping on line No. PR-1617-20"-x6 modified with 2" with NRV & isolation valve & joined with ammonia oil separators vapour line with flow meter.
- (6) 6" N.B. tapping with valve from H-1352 to reflux condenser inlet and 2" N.B. Tapping with valve is taken from discharge nozzle of V-1205 for providing 6" S.S. line connection as per EWR No.181 at a later stage.
- (7) A bypass valve is provided in level control for lean carbamate vessel, as per EWR No. U-181.
- (8) 23 ata line isolated from third floor. This line was going for flushing RVs- 1201 A/B/C and for gas chromatographer. The same was not in use, since presently flushing is done by 4 ata line. 23 ata steam line disconnected, plugged & removed as per EWR No:U-193.
- (9) 4 ata tapping on 2nd floor plugged. This tapping was for ejector and was not in use. Since new ejector was put in line and steam was given from different point, line was also removed .
- (10) On second floor 9 ata header was joined by 4 ata header though 6"/3" line, to reduce 9 ata steam consumption as per EWR No. U-193.

CODE NO	JOB DESCRIPTION
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- (11) 1 No. Equal Tee of 4" NB x 10.4 MM thick of PR-1208 line from V-1202 to H-1203 downstream of RV-1203-A/B/C replaced due to thickness reduction.
- (12) PW-1103-8" line replaced with S.S.304 due to leakages at many places and damage of rubber lines.

The above jobs mentioned at Sr.Nos.11 & 12 were carried out through M/s.JACOB H & G.Mumbai.

**INSTRUMENT JOBS:**

- (1) Air bleeder control valve PICV-1422 replaced with higher capacity control valve of masonlean make. Control vale air filter regulator replaced with new. S.S.tubing work completed & stroke was checked and found OK.
- (2) TICV-1365, First disorder control valve of Darling Museco make provided on 4 ata steam line. Tubing work done. For temperature controlling, cabling was done from valve to local junction box and connected with spare pair of cable which goes to control room.

Temperature sensor TIA-1365 is used as a temperature sensor for the loop. Stroke of control valve checked and found OK.

- (3) FICV - 4801 CO2 flow control valve and all its accessories were installed and stroke was checked.Provision for controlling the same from control room was also made.

**C I V I L - J O B S:**

- (1) Modification in roof of conveyor gallery at tail end of conveyor M-2110 i.e. increasing the height of the roof is done as per EWR No. U-HS-93 dtd. 24.12.97.

PLANT TURNAROUND - APRIL - 1999

127

OFFSITE & UTILITY PLANT

MECHANICAL JOBS

<u>JOB CODE</u>	<u>JOB DISCRIPTION</u>
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03 02 01 COOLING WATER PUMP P-4401/A

PREVENTIVE MAINT.:

- a) Both the journal bearings were checked and found okay.
- b) The clearances were checked and following are the reading :
  - Free end side : 0.008"
  - Coupling side : 0.007"
- c) Cleaning the turbine side coupling and greasing done.

03 02 02 COOLING WATER PUMP P-4401/B:

OVERHAULING THE PUMP:

- a) For checking of protective coating of impeller. Top casing of the pump was opened.
- b) It was observed that the coating of the impeller, particularly vanes area was pilled-off.
- c) Old reconditioned rotating assembly was installed.
- d) Journal bearing inspection done and general condition of the bearing was found okay. Clearance were checked and the readings are as follows.
  - Free end side : 0.008"
  - Coupling side : 0.008"
- e) Cleaned the turbine coupling and greasing done.

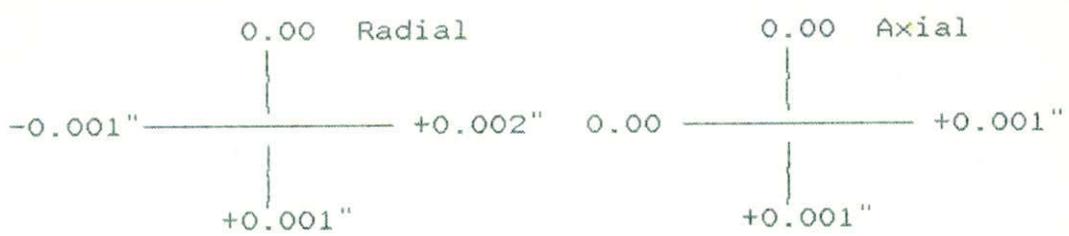
PARTS CHANGED:

- 1) Rotor assembly (Reconditioned old one issued from store) Store code : 333300035
- 2) Gland packing.

JOB CODE	JOB DISCRIPTION
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f) Pump & turbine alignment was done ; following are the readings.

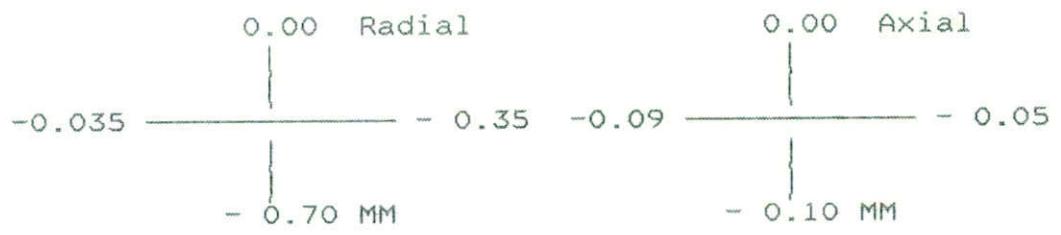
Alignment readings.



03 02 03 COOLING WATER PUMP P-4401/E

PREVENTIVE MAINT.:

- a) Euroflex coupling between Pump and Motor was checked. Two shims of the Euroflex coupling was found cracked.
- b) Alignment was checked and found mis-align about 1 MM.
- c) Alignment was done and following are the reading.



- c) Both the Radial bearings were flushed with oil

03 02 04 COOLING WATER PUMP P-4402:

OVERHAULLING THE PUMP:

- a) For inspection of the impeller, open the top casing.
- b) After opening the top casing, some position of vanes at suction Eye side and vanes tip of the Impeller was found pitted and was decided to change the Impeller.
- c) New rotating assembly was installed issued from store. Store code No.333300035.
- d) Cleaned the motor side coupling and greasing done.

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JOB CODE            JOB DISCRIPTION  
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- e) Journal bearings inspection and condition of bearing found okay. Radial clearances area checked . Following are the reading.  
  
Free end side            : 0.006"  
Coupling side            : 0.006"

03 02 05 AYR TURBINE Q-4411/A:

- a) All steam leak jobs attended.
- b) Oil console was drain and cleaned & fresh oil charged.

03 02 06 BFW PUMP (TURBINE DRIVEN) P-5111:

Preventive Maintenance:

- a) Thrust bearing inspection done and it was found that the thrust was 0.5 MM . Hence it was decided to replace the thrust tilting pads.
- b) Thrust tilting pads were replaced with new one. Store code No.335002054.
- c) Thrust clearance was checked and found okay. The reading is as follows :  
  
Thrust            : 0.35 MM
- d) Journal bearings were checked and found okay. Cleaning was done and clearances were checked. Following are the readings.  
  
Free end side            : 0.12 MM  
Coupling end side        : 0.11 MM
- e) Oil cooler opened,cleaned from tube side and boxed up it. Fresh oil charged.
- f) Coupling greasing done by B.R.B 100 grease after cleaning of coupling from inside.

03 02 07 BFW PUMP TURBINE Q-5111:

Preventive Maintenance

- a) Bearing inspection done and general condition of bearing found O.K. Following are the clearance.  
  
Coupling side            : 0.18 MM  
Governor side            : 0.22 MM  
Thrust                    : 0.25 MM

130

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JOB CODE            JOB DISCRIPTION  
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03 02 08 BFW PUMP (MOTOR DRIVEN) P-5112:

Preventive Maintenance

(A) BFW PUMP:

- 1) Bearing inspection done & general condition of bearing found O.K. Following are the clearances.
  - a) Motor side            : 0.09 MM
  - b) Free end side        : 0.10 MM
  - c) Thrust                : 0.50 MM
- 2) Lube oil console oil drained, cover opened, cleaned and fresh oil charged.

(B) GEAR BOX:

- 1) Oil cooler opened, general condition found okay, cleaned from tube side and shell side boxed up it, Fresh oil charged.

03 03 01 F.D.FAN TURBINE Q-5113:

- 1) Lube oil console oil drained, console cleaned and fresh oil charged.
- 2) Suction filter of Q-5113 cleaned and boxed up. Coupling pads changed with new one. Store code No.335413010.
- 3) Clutch oil "Servo Transfluid-A" drained and replaced with fresh one. Store code No.459100150.
- 4) F.D.Fan bearing was opened for Inspection. Inspection done, found in good condition and the same was boxed up after cleaning and flushing with oil. Fresh oil charged.

03 14 01 STEAM LEAK JOBS:

- 1) All steam leak jobs attended as per the shutdown job list.
- 2) All steam leak jobs as per the list were attended for cooling water pump (stand by) turbine Q-4403.

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 JOB CODE            JOB DISCRIPTION  
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03 15 01 BOILER INSPECTION:

BHEL BOILER F-5111 INSPECTION:

- 1) Boiler was inspected by Boiler Inspector in Open test condition, on 19/04/99. Hydrottest at 90 Kg/cm2 pressure was done, Witnessed by Boiler Inspector on 23/04/99.
- 2) All three relief valves were overhauled and tested on 26/04/99 and their pressure setting readings were as follows.

	Popping pressure in Kg/cm2g -----	Reset pressure in Kg/cm2g -----
Drum front R.V.	71.80	69.0
Drum Rear R.V.	69.00	66.50
Superheater R.V.	65.00	62.50

- 2) Damper of burner made free and greasing done.
- 3) All dampners were made free by greasing.
- 4) Flue gas leakage location was found and welding was done to arrest flue gas leakage. The flue gas was leaking around the super heater rear side area.
- 5) At various places of air duct, perticularly joints were found crack and hence welding were done.

03 15 02 REGENERATIVE AIR PREHEATER H-5111:

When Regenerative air preheater was in operation, flue gas was leaking at the Hot end bearing side rotor post seal and hence the oil Temp. was gone up to 86 Deg.C. To arrest the flue gas leak the following jobs were done.

- 1) Radial seal clearances of Hot end side and cold end side adjusted as per recommended clearance. The clearances reading are as follows. Drawing attached.
- 2) For taking clearance of radial seal, two nos. of finger taps were made of Aluminium. One channel was cutted and fixed in the Air duct near radial seal and both the finger taps were fixed and taken the clearances of all the 12 nos. Hot end side radial seals and 12 nos. cold end side radial seal.

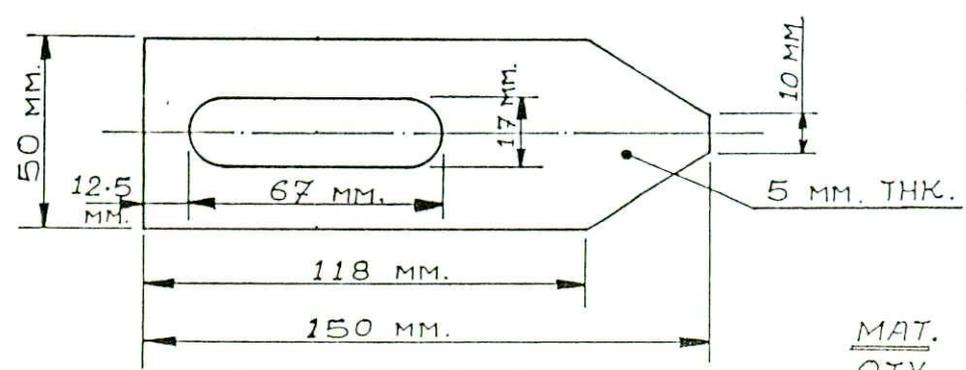
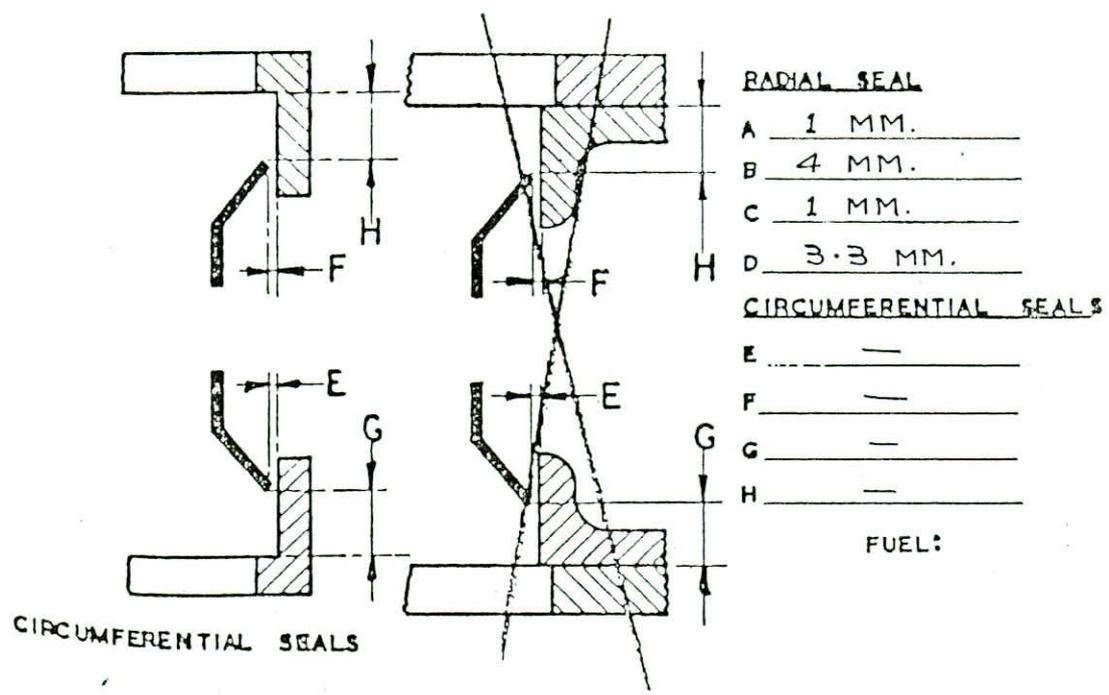
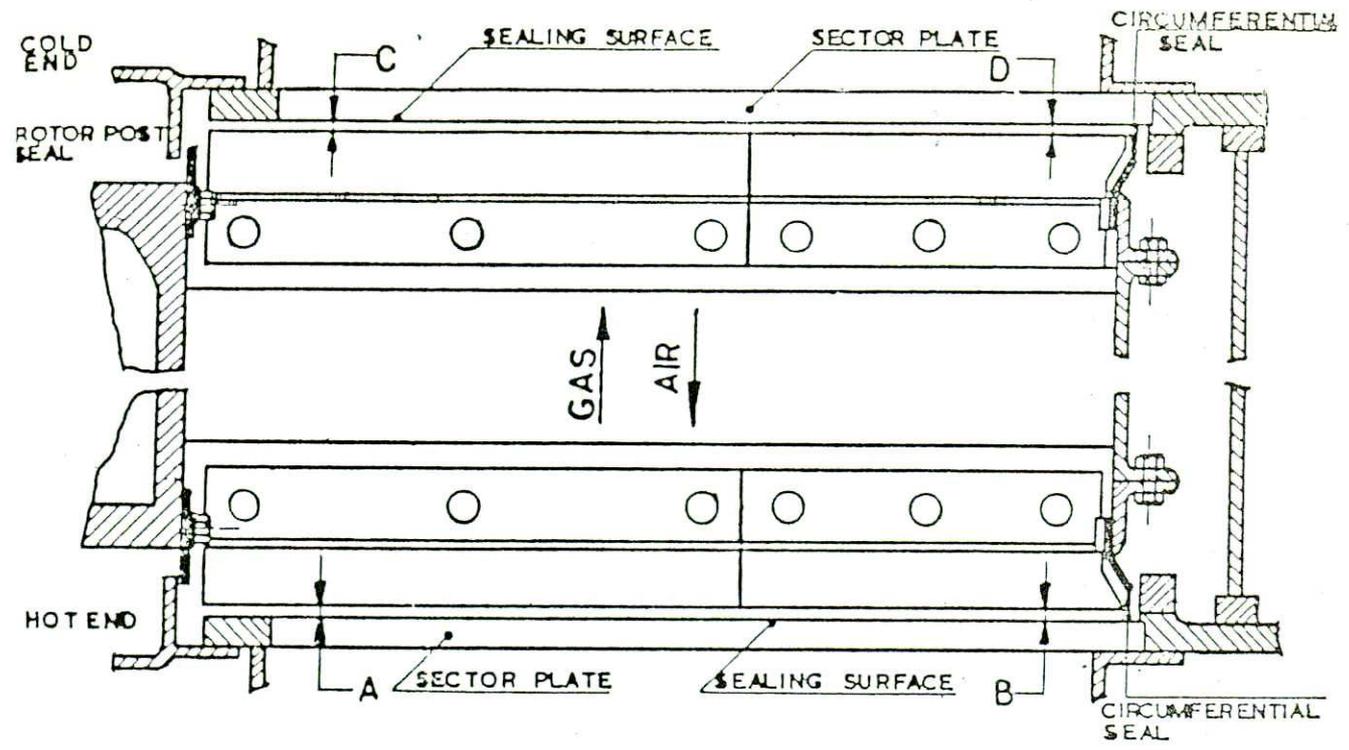
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JOB CODE            JOB DISCRIPTION  
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132

- 3) One set of Radial seal was replaced with new one in Hot end side. Store code No.335701105-Radial seal strip outer side Hot end. Store code No.335701115 inner.
- 4) General condition of APH baskets was found good.
- 5) At 1.0 O'clock to 3.0 O'clock area of rotor post seal was found more clearance, suspected flue gas leakage was leaking from these area and hence M-seal was applied to minimise the clearance, after start-up of plant RAH unit was in operation and oil temp. of Hot end side bearing were found normal.

# SEAL CLEARANCE CHART

L33



FINGER TAPS

MAT. : ALLUMINIUM  
QTY. : 2 NOS.

134

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JOB CODE	JOB DISCRIPTION
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03 20 01 FABRICATION JOBS:

a) COOLING WATER DISTRIBUTION HEADER:

Cooling water distribution headers at Ammonia side cooling tower for cell No.7 and 8 , cooling water return vertical pipe line from Ammonia as per our Drg.No.03-CL-13177 sheet 1 of 1, Rev.0 and Drg.No.03-DL-13175 sheet 2 of 2 Rev.0 were replaced with new one.

- b) Additional Cooling water line for jacket of RAH Hot end bearing was provided.
- c) Enlargment of raw water connection in the jacket of Hot end bearing was done from 1/2" to 3/4" .
- d) All the jobs as per shutdown list was done.
- e) Top burner gas gun tip of BHEL Boiler was replacced with new one with expansion bellow.

Gas gun tip - Store code No. : 335808019

Expansion bellow - Store code No. : 335808035

PLANT TURNAROUND - APRIL - 1999

135

OFFSITE & UTILITY PLANTINSPECTION JOBS

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<u>JOB CODE</u>	<u>JOB DISCRIPTION</u>
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INSPECTION JOB:03 41 01 BHEL BOILER (GT-2068):

Visual inspection of Steam Drum, Mud Drum, Furnace tubes and Super heater tubes was carried out during this shutdown. Also, ultrasonic thickness measurement of all accessible tubes, steam drum, mud drum and superheater tubes was carried out. The following observations were made during visual examination.

(1) STEAM DRUM:

- a) The internal surface of the drum had assumed blackish colouration.
- b) All the weld joints were found in good condition and free from any corrosion attack.
- c) All the internal fittings were found intact.
- d) The stub ends of the tubes were found free from defects.
- e) Overall condition of the steam drum was found to be satisfactory.

Ultrasonic thickness measurement was carried out. Min. thickness was observed to be 100.8 MM against nominal specified thickness of 97 MM in cylindrical shell area and 79.3 MM on dished end against nominal specified thickness of 77 MM.

(2) MUD DRUM:

- a) The shell had assumed blackish colouration.
- b) The condition of the weld joints was found satisfactory.
- c) The tube stub ends were free from any defect.
- d) Clamps of phosphate dosing line were found loose which were attended by Maint. group.
- e) In general, the overall condition of the mud drum was found satisfactory.

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JOB CODEJOB DISCRIPTION  
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136

Ultrasonic thickness measurement was carried out. Min. thickness was observed to be 81.7 MM in cylindrical shell area against nominal specified thickness of 78 MM and 55.9 MM on dished end against nominal specified thickness of 57 MM. (54 MM min. specified).

(3) FURNACE:

In general, the condition of the furnace tubes and superheater tubes exposed to flue gases is satisfactory. The thickness measurement of Stage-I & II Primary and Secondary Superheater tubes, Bank tubes, Sidewall tubes, Baffle wall tubes, D-Panel tubes, Cut corner tubes, Rear wall tubes and Front wall tubes were carried out and no abnormalities were detected.

During departmental hydrotest, one No. boiler side wall down comer tube of Row-Y (as referred in BHEL Drawing) tube No.29 got leaked, which was confirmed by cutting the window on boiler North wall casing plate to have access to the tubes at bottom end. Visual examination of the tubes in this area revealed excessive external corrosion on the tube surface. In view of the high corrosion, 6 Nos. tubes ( No. 27 to 32) were plugged in steam drum and Mud drum. Condition of the tube No. 24 to 26 was also found to be very bad due to heavy external corrosion. In view of the findings, it has been decided to replace all the 66 side wall tubes during next opportunity.

03 41 02 HOT WATER RETURN HEADER FROM AMMONIA PLANT:

Based on the observations made by the Person Survey team of PDIL during underground cooling water pipelines inspection, the main return header of cooling water near the Cooling Tower area (HW-5-36") was exposed for the top surface visual inspection during Shutdown. The pipe external surface was found badly corroded and thick oxide scales were present on the pipe surface. Thickness measurement could not be carried out due to heavily corroded external surface not allowing proper probe contact.

It is suggested to replace the HW-5-36" header for the entire length in Ammonia - Utility Plants looking to its present condition.

PLANT TURNAROUND - APRIL - 1999

137

OFFSITE & UTILITY PLANT

C I V I L - J O B S

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JOB CODE	JOB DISCRIPTION
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03 51 01 CIVIL JOBS:

(A) WATER TREATMENT PLANT:

- 1) Acid / Alkali proof, Anti-Skid, Duro-Flex lining on floor of NAOH Storage area.
- 2) F.R.V.lining on side and bottom of weak and strong Effluent drain in water treatment plant.
- 3) Acid / Alkali proof bricks lining on side of HCl storage tank T 2 and side of tank farm.
- 4) Bitumastic lining work on floor near mix beds (S.M.B & P.M.B) and blower area.

(B) COOLING TOWER AREA:

- 1) Removing and Re-fixing A.C.Louvers for C.T.basin cleaning.
- 2) Fixing of wooden plank by S.S.Nails, on side of Ammonia and Urea side, Cooling towers cell near farms.
- 3) Acid/Alkali proof bricks lining and Bitumastic for H2SO4 tank area.

(C) S.P.C. AREA:

- 1) Bitumastic lining work on floor of S.P.C. I.G.plant and Ammonia plant.

(D) BOILER:

- 1) Refractory work in combustion zone, burner face/ Super heater area and flooring of New Boiler (S.G.Plant) and old boiler.
- 2) Opening and closing of man holes.
- 3) Replacement of A.C.sheet at S.G.Plant.

(E) EFFLUENT TREATMENT PLANT:

- 1) Acid / Alkali proof lining work in strong effluent pit.

PLANT TURNAROUND - APRIL - 1999

OFFSITE & UTILITY PLANT

138

ELECTRICAL JOBS

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JOB CODE            JOB DISCRIPTION  
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03 61 01 ELECTRICAL JOBS:

(A) UTILITY AREA:

1. Preventive maintenance carried out on following TRs.  
TR-2A,2B,3A,3B,4A,4B for..
  - a) Inspection of primary and secondary cable boxes, end termination,checking and tightening of connections.
  - b) Testing of oil in marshaling boxes on primary and secondary transformers and cleaning of chamber.
  - c) Replacement / Reactivating of silicagel in dehydrating breather of above transformer.
  - d) Checking of trip alarm circuit and cleaning of all emergency trip.
2. Preventive maintenance of alternator and AMF set and its control panels.
3. Preventive maintenance of TMG/Siemens make LT ACBs installed at various MCCs and replacement of damaged parts and worn out contacts.
4. Preventive maintenance carried out on all feeder compartment mounted on the following MCCs.  
MCC-1,MCC-2,MCC-2A,MCC-2B/2E, MCC-2F,MCC-8,MCC-11, MCC-12 & MCC-13.
5. Overhauling of critical motors.  
E-5119, E-5117, E-5111, Viscosity motor.
6. Checking of all push button stations and replacing wherever required.
7. Preventive maintenance of new MPSS breakers,2.2MW AMF set and battery panels.
8. Testing and calibration of various types of EE make Relays installed.

JOB CODE                      JOB DISCRIPTION

139

(B) OFFSITES AREA:

1. Preventive maintenance carried out on following transformers.  
TR-4A,TR-4B for....
  - a) Inspection of primary and secondary cable boxes, end termination,checking and tightening of connections.
  - b) Testing of oil in marshaling boxes on primary and secondary transformers and cleaning of chamber.
  - c) Replacement/reactivating of silicagel in dehydrating breather of above transformer.
  - d) Checking of trip alarm circuit and cleaning of all emergency trip boxes.
2. Preventive maintenance carried out on all feeder compartment mounted on MCC-3.
3. Preventive maintenance of TMG,Siemens make LT ACBs installed at MCC and replacement of damaged parts and worn out contacts.
4. Testing and calibration of various types of EE make Relays installed.

(C) 66 KV YARD:

1. Bus bar tie line isolator replaced.
2. Checking for alignment of all isolators at 66 KV yard for proper opening and closing.
3. Checking earth resistance of all earthing installation at 66 KV switch yard.
4. Preventive maintenance of BHEL make OCB & MOCBs, HHE and CTR make on load tap changes installed on the transformers and replacement of the damaged parts and oil.
5. Preventive maintenance of JYOTI, TMG / Siemens make HT CBs installed at panels and replacement of damaged parts and worn out contacts.
6. Testing of EE make relays installed at 66 KV Sub/Station.

PLANT TURNAROUND - APRIL - 1999

OFFSITE & UTILITY PLANT

INSTRUMENTATION JOBS

140

JOB CODE            JOB DISCRIPTION

03 71 01 NEW BOILER:

(1) CONTROL ROOM PANEL INSTRUMENT:

(A) RECORDERS AND RECEIVER GAUGES:

Overhauling and Calibration of following Receivers and Recorders. Cleaning of Flapper Nozzle, Restriction, Orifice and Supply Ports.)

Sr.No.	Tag Name	Description
01	PR-1/PR-2	(Feed Water Pressure)
02	FR-3/FR-4	(Steam to Turbine)
03	FRC-1/FRC-2	(Feed Controller)
04	FRC-21/FR-22	(Fuel oil/Gas Flow)
05	FRC-11/PR-15	(Air Flow/Furnace Pressure)
06	DPI-12,14, PI-3,4,6,7, 8,22	(Steam Flow)
07	LI-1,	Raw water tank level, Raw water low flow, C.W.basin level, C.W.pump discharge, PI-16.

(B) CONTROLLERS:

Cleaned Orifice , Flapper Nozzle and Pilot. Checked Synchronization and replaced "O" ring of cascade and Auto Manual Switch.

Sr.No.	Tag Name	Description
01	TRC-5	(Outlet steam temp.)
02	FRC-1	(Feed Controller)
03	LRC-2	(Drum Level)
04	LRC-3	(Blow Down tank Level)
05	FRC-21	(Fuel Oil)
06	FRC-11	(Air Flow)
07	PIC-5151	
08	TRC-4	
09	PRC-5	

\* TRC-4 (Desuper Heater Temperature) Set point was found non-linear,so replaced with new one after cleaning and calibration.

141

JOB CODE	JOB DISCRIPTION
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\* PRC-5 (Steam Header Pressure controller) Bracket Threads were worn out, so bracket is replaced with new one.

(C) RECEIVER SWITCHES:

Following receiver switches behind the Control panel were checked, cleaned and calibrated.

Sr.No.	Tag Name	Description
01	LAL-3	(Drum Level Low)
02	LAL-4	(Drum Level High)
03	FSL-11	(Air Flow Low)
04	PAL-4	(60 ata Steam pressure low)
05	PSL-6	
06	FSL-2	
07	PSL-2	
08	PSL-7	
09	PSL-8	
10	FSL-5111	

(D) BMS Panel & Boiler Control Panel were cleaned and all the wires were tightened in their respective terminal strips.

03 71 02 FIELD INSTRUMENTS:

(A) TRANSMITTERS:

Following Transmitters were checked, flapper and nozzle were cleaned and calibrated.

Sr.No.	Tag Name	Description
01	FT-1	(Feed Flow)
02	FT-2	(Steam Flow)
03	FT-3	(Steam to Turbine)
04	FT-4	(Water Flow)
05	FT-13	
06	FT-21	(Fuel oil Flow)
07	FT-11	(Air Flow)
08	PT-15	(Furnace Pressure)
09	PT-4	(Steam Header Press)
10	PT-6	(Soot Blower Steam Press)
11	PT-7	(Atomizing Steam Pressure)
12	PT-21	(Fuel oil Pressure)
13	PT-1	(Feed Water Pressure)
14	PT-5	(Steam Header Pressure)
15	PT-2	(Feed Water Pressure)
16	PT-3	(Drum Pressure)
17	LT-5	
18	LT-4	(Drum Level)
19	DPT-5, DPT-1	
20	DPT-12	(D.P.across Air Heater)

142

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JOB CODE            JOB DISCRIPTION  
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**(B) SWITCHES:**

Following switches were calibrated and micro switch assembly were cleaned.

Sr.No.	Tag Name	Description
01	PSH-11	(Furnace Pressure High)
02	PSH-12	(Furnace Pressure very high)
03	TSL-22, TSL-12	
04	PSH-12, PSL-26 PSL-24	
05	PSL-23	(Heavy Oil Pressure Very Low)
06	PSL-25	(Fuel Gas Pressure Very Low)
07	PSL-27	(Ignitor Gas Pressure Very Low)

**(C) OXYGEN ANALYSER:**

O2 analyser was taken out and all the units of assembly were dismantled, there was a chocking sample line, cleared the chocking. Two purging lines, one for internal and other for external purging of filter were provided O2 analyzer was shifted to new location for the ease of maintenance. Representative of M/s.Chrone Marshal, Mr.Bhavsar visited the IFFCO Kalol site and checked the new location of analyzer and also checked the electronic parts of the assembly. He confirmed the new location of O2 analyzer satisfactory from the operation and safety point of view.

**(D) VISCOSITY METER:**

Viscosity meter was drawn out from the line and whole assembly was dismantled. There were some deposition of foreign particles near the bearing of rotary disk and also "O" rings of flanges were damaged, cleared the unwanted deposition and provided the new "O" rings. Assembly was again installed on their location. Now it is working satisfactory.

**(E) CONTROL VALVES:**

**1) PICV-2 (ATOMIZING STEAM PRESSURE C/V):**

Valve was drawn out from the line, some decay was found on the seat so dimensions were taken and sent to Workshop for material filling and machining, after the machining of seat, valve was hydrotest and found passing so valve was provided with new seat, stem and backup ring.

143

JOB CODE	JOB DISCRIPTION
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2) TCV-2:

Valve was drawn out from the line, dismantled and all the parts were cleaned and again fixed in the line. Elliot positioner was not working properly so replaced with Fisher positioner. Stroke checking was done and found working properly.

(F) IGNITORS:

Operation of two 25 SU-3-4167, three 25SU-3-4170 and one new microprocessor base 2SU3-2000 Flame Scanners was checked, they are working properly. One Infrared sensor 45 RM5 and two Ultraviolet sensors 45UV5 were also checked they are found O.K.

(G) DAMPERS:

Overhauling, Cleaning and checking of operation were done of following Dampers.

1. FD Fan Inlet damper and it's valve positioner
2. FD Fan outlet damper and it's valve positioner
3. Both fuel air dampers and their valve positioners
4. Air heater inlet damper
5. Air heater outler damper

03 71 03 COOLING TOWER AREA:

(A) CONTROL VALVES:

Valve positioner cleaning, I/P calibration, Valve stroke checking and cleaning of following valves were done.

- a) LCV-01 (b) LCV-4407-CT Basin Level Control Valve
- c) LCV-02 (d) PICV-5154
- e) FCV-01 (Limit switches were checked and adjusted, Now AYRT open indication is coming.)
- f) PICV-5153 (Nipple isolation valve was changed by new one after testing on dead weigh tester)

(B) Base plate of Basin Level Transmitter was replaced, as it was leaking, Transmitter installed back after calibration.

(C) Tachogenerator of Q-4401-B & Q-4403 were checked.

144

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JOB CODE            JOB DISCRIPTION  
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- (D) PH Recorder length was reduced as it was creating problem in closing panel doors.
- (E) 1350 H.P.Motor bearing temperature junction box was removed from Control Room and installed in new location outside the Control Room.

03 71 04 COMPRESSOR HOUSE AND I.G.PLANT:

- (A) 2nd stage suction THI of K-5401 and K-5501 were replaced.
- (B) PCV-5501 (Crack Gas Flow Control valve) was not opening as it was not getting supply through flame detectors interchanged the detectors, now it was working properly.

(C) O2 ANALYZER:

New electroflux solution was filled in mixing chamber, flushed and adjusted sample line flow. Jamming of stirrer motor was cleared.

- (D) A new bulb holder was provided for "RHS in Service" indication on J-53002 (Indcon Air Dryer Panel)
- (E) Removed air supply tubing and refixed the same for the completion of root valve replacement job.

(F) PIC-5511 (NEW I.G.SUCTION PRESSURE CONTROLLER):

Cleaned controller flapper and nozzle and adjusted again.Feed back lever was also adjusted as it was not remaining in contact.

PLANT TURNAROUND - APRIL - 1999

OFFSITE & UTILITY PLANT

145

TECHNICAL DEPARTMENT JOBS

JOB CODE	JOB DISCRIPTION
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03 81 01 TECHNICAL DEPTT. JOB:

(A) MECHANICAL JOBS:

(1) Following tappings with valves were taken in connection with installation of new CO2 condensor in Dry Ice plant.

(a) In dryice plant :

- i) 100 N.B. Ammonia vapour line.
- ii) 65 N.B. & 50 N.B. for liquid CO2 line.
- iii) 40 N.B. CO2 gas line.
- iv) 25 N.B. 2 Nos. for ammonia liquid line before and after control valve.

(b) In Ammonia Plant :

- 100 N.B. for Ammonia vapour line from inlet of 111-F.
- (2) 4" N.B. C.S. line provided by removing 2" N.B. 60 ata steam superheater drain line in BHEL Boiler as per EWR No. SG-46 except isolation valve.
- (3) Over flow line of CBD tank of BHEL boiler was elevated by 700 MM as per EWR SG-41. Condensate pumps also commissioned.
- (4) 2" steam tapping from 60 ata steam inlet to F.D. fan turbine and 1 1/2" steam tapping for LSHS turbine steam inletline is taken. This is in connection with isolating 40 ata steam header partly, as per EWR No.U-169.
- (5) 1 1/2" N.B. C.S. CO2 line from urea plant to dryice plant changed from C.S. to S.S.304

(B) INSTRUMENT JOBS:

- (1) Level switch connections were made for condensate pump near CBD tank of BHEL Boiler.
- (2) Control valve in bypass line of 14 ata to 4 ata provided, as per scheme No. TM/02/1500 dtd. 11.6.97 & 17.12.97.

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JOB CODE                      JOB DISCRIPTION  
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- (3) PICV - 3A , 14 to 4 ata heating control valve installation and tubing in new boiler was done.
- (4) Condensate recovery scheme ( New - Boiler ) level transmitter installation & its tubing job was done.

146

PLANT TURNAROUND - APRIL-1999

147

B&MH PLANTMECHANICAL JOBS

CODE NO	JOB DESCRIPTION
04 03 01	<b><u>RECLAIM MACHINE M-2116:</u></b>  Overhauling of Reclaim machine carried out against W.O.No.04849 dated 25/02/99 by M/s.EMTICI ENGG.LTD. EMTICI personnels reported at site on 15/04/99 and worked up to 27/04/99.  Following jobs were carried out.  1) General cleaning of machine, lubrication, tightening of structure and drive unit foundation bolts.  2) Oil replacement of travel gear box, main drive gear, Hoist gear box and gear train.  3) Structure supports which were corroded and broken from joints are removed and provided new supports at same place; after surface preparation.  4) Gear train Idel pinion 1 No replaced with new one.  5) Repaired scraper chain guide at take-up end and replaced 2 Nos. scraper blades.  6) Replaced coupling pin and rubber bushes of travel, Hoist, slewing and link conv.drive couplings.  7) Chain tension adjustment done for scraper and elevator.  8) Idel pinion teeth adjustment according to scraper and bucket travelling sequence.  9) Replaced link conveyor drive gear box with new one .  10) Provided extra vertical guide roller brecket inside the slewing king post (2 Nos)  11) Testing and trail run of scraper reclaimer taken which found satisfactory and normal.  12) Belt weigher idler frame slight lifted to avoid rubbing with belt.
04 21 01	<b><u>PLANT TRANSFER CONVEYOR M-2110:</u></b>  1) New tail pulley replaced with MPG-75 bearings.  2) Skirt rubber replaced.

147

CODE NO	JOB DESCRIPTION
	3) Return roller 25 Nos. replaced.
	4) Carrier roller 2 Nos. replaced and servicing done for other rollers.
	5) Gear box oil seal at both side replaced.
	6) Motor to gear box coupling assembly replaced.
	7) Pulley side and Motor side coupling bushes replaced.
	8) M-2111 flapper attended for proper sealing and smooth operation.
	9) M.S.frame with side cover fabricated on flapper valve side plate.
	10) Brush roller shaft rebuilded and replaced the both side bearings after machining.
	11) Gear box oil replaced.

**04 21 02 FRESH UREA SHUTTLE CONVEYOR M-2112:**

- 1) All return rollers replaced.
- 2) Gear box foundation frame new fabricated and replaced in place of old one.
- 3) Head pulley bearing MPG 75 at coupling side replaced.
- 4) Head pulley M.S.structure reinforced with channel welding.
- 5) Carrier roller serviced.
- 6) Gravity pulley one side bearing replaced.
- 7) Motor to gear box M.S.coupling new replaced.
- 8) Coupling bushes replaced.
- 9) Gear box oil replaced.

**04 21 03 RECLAIM CONVEYOR M-2117:**

- 1) All return roller replaced.
- 2) All carrier rollers serviced.
- 3) Gear box coupling bushes replaced.

CODE NO	JOB DESCRIPTION
	4) Motor to gear box coupling new replaced and alignment done.
	5) All bearings greasing done.
	6) Gear box oil replaced.
04 21 04	<b><u>BAGGING FEED CONVEYOR M-2121:</u></b>
	1) All 25 Nos. return rollers replaced.
	2) Tail end both side skirt guard rubber replaced.
	3) Carrier roller serviced.
	4) Gear box oil seals replaced.
	5) All bearings greasing done.
	6) Rubber bushes of couplings replaced.
	7) 2 Nos Conveyors belt joints. Vulcanised by adding 20 meter long 750 BW piece.
	8) Complete greasing done.
	9) Gear box oil replaced.
04 21 05	<b><u>BAGGING HOPPER FEED CONVEYOR M-2122:</u></b>
	1) Skirt rubber replaced.
	2) All 9 return rollers replaced.
	3) Gear box oil seals replaced.
	4) 2 Nos joints vulcanised after adding 20 meter long 750 BW piece.
	5) Gear box coupling bush replaced.
	6) Tripper big pulley bearing MPG 75 replaced one No.
	7) Complete greasing done.
	8) Gear box oil replaced
04 21 06	<b><u>SLAT CONVEYOR M-2124:</u></b>
	1) Gear box attended for oil replacing.
	2) Gear box coupling bushes replaced.
	3) All bearings greasing done.

149

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CODE NO                      JOB DESCRIPTION  
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04 21 07    TRANSFER TOWER DUST CONVEYOR M-2137:

- 1) Dust conveyor attended for free operation of rollers.

PLANT TURNAROUND - APRIL-1999B&MH PLANTC I V I L - J O B S

160

CODE NO	JOB DESCRIPTION
04 51 01	<u>CIVIL JOBS:</u>
	1) Epoxy Monolithick plaster on railing suspender supports of conveyor gantry 2112, 2117.
	2) Epoxy painting of wall & ceiling of conveyor gantry for Urea to Silo, Silo to Bagging ; R.C.C.structure of Silo floor at 2110,2117 and Transfer Tower.
	3) I.P.net Epoxy painting at Silo transfer tower G.F. and upto 4 meter height.
	4) Epoxy painting on ceiling of Hopper floor, Bagging floor, Columns, beams at Hopper, Bagging floor, and at platform.
	5) Concrete patch work and plaster work at walk way of 2112,2114 Silo, Transfer tower.
	6) Anti-Skid, Acid / Alkali proof Duro-Flex lining at top of Bagging controll room.
	7) I.P.S.Flooring and F.R.V.lining at dust removal plant on top of empty bags storage area.

PLANT TURNAROUND - APRIL-1999

B&MH PLANT

151

ELECTRICAL JOBS

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CODE NO	JOB DESCRIPTION
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04 61 01 ELECTRICAL JOBS:

1. Preventive maintenance of TMG/Simens make LT ACBs installed at MCC and replacement of damaged parts and worn out contacts.
2. Preventive maintenance carried out on all feeder compartments mounted on the following MCCs.  
MCC-4, MCC-4A, MCC-4EX & MCC-9.
3. Overhauling of critical motors.  
M-2110, M-2112, M-2116/2, M-2116/3, M-2117, M-2121, M-2122.
4. Inspection, cleaning of reclaim control panels.
5. Checking of controls of entire conveyor system for proper operation.
6. Testing & calibration of various types of EE make Relays installed.

PLANT TURNAROUND - APRIL-1999

B&MH PLANT

INSTRUMENTATION JOBS

152

CODE NO	JOB DESCRIPTION
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INSTRUMENT JOBS:

**04 71 01 BAGGING PLANT:**

- (A) Calibration and data pound checking of P/S No.3 & 7 with representative of M/s.Power Build were done.
- (B) All Libra machines were dismantled and load cells were inspected and painted in presence of Service Engineer.
- (C) Cleaning,Painting,Terminal Tightening and calibration checking were done for all the Packer Scales.
- (D) All the Libra Weighing machines were calibrated and painted.
- (E) Old hand switches were replaced with U-type mounting switches for all the Packer Scale.
- (F) P/S No.3 & 4 : All cables were removed from J.B. and rewiring / dressing were done.
- (G) P/S No.3 : Local Box operation made possible.
- (H) P/S No.1 : Replaced RIC card, changed NC contact of Local / Remotr Stop push button.
- (I) P/S No.1,2,4 : Checked Bucket alignment provided Zero/Span calibration.
- (J) P/S No.8 : Changed display unit.
- (K) Calibration of UBM-1 and 2 (JRSL m/c) were done.

**04 71 02 AMMONIA STORAGE AREA:**

- (A) Panel cleaning,Terminal tightening for both PLC Panel and Control Panel were done.
- (B) Four new exhaust fans (supply 200 Vac, 50 Hz) were provided in control panel in place of old exhaust fans (SUPPLY 110 vAC 50 hz) as they were not working properly.
- (C) PCV-3008 : Control Valve Positioner cleaned and checked valve stroking.
- (D) New Ammonia Tank Level Indicator was checked and safely working was confirmed by the representative of M/s.Endraff.

PLANT TURNAROUND - APRIL-1999

B&MH PLANT

TECHNICAL DEPARTMENT JOBS

153

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CODE NO                      JOB DESCRIPTION  
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04 81 01 TECHNICAL DEPTT. JOBS:

(A) MECHANICAL JOBS:

Fire hydrant line laid around extended bagging platform. Also Line was hydrottested and back filled.